Chronic Pain

A Primary Care Guide to Practical Management

Dawn A. Marcus, MD

Second Edition

CD-ROM Included

Humana Press

Chronic Pain

For other titles published in this series, go to
www.springer.com/series/7633

Dawn A. Marcus, M.D.

Chronic Pain

A Primary Care Guide to Practical Management

Second Edition

Humana Press

Dawn A. Marcus, M.D.
University of Pittsburgh
School of Medicine
Pittsburgh, PA
USA
www.dawnmarcusmd.com

ISBN: 978-1-60327-464-7 e-ISBN: 978-1-60327-465-4
DOI:10.1007/978-1-60327-465-4

Library of Congress Control Number: 2008929443

Cover illustration: Drawing of migraine experience by adolescent migraine sufferer, Steven Marcus.

Printed on acid-free paper

springer.com

Series Editor's Introduction

"They are and suffer, that is all they do"

W.H. Auden[1]

"Although the world is full of suffering, it is also full of overcoming it."

Helen Keller[2]

When patients come to us with their pain, they present us with a marvelous opportunity – the chance to understand them, to understand how their pain is affecting their lives, the challenge of discovering what is causing their pain, and finally the opportunity to prescribe medications and lifestyle changes to help them gain relief from their pain. This second edition of *Chronic Pain*: *A Primary Care Guide to Practical Management* is, once again, an important resource in furthering those clinical objectives.

Like the first title in 2005, this updated edition is not only clearly written and practical, offering concrete evidence-based approaches to diagnosing and treating chronic pain, but it also includes three critical new topics: risk management; pain in the shoulder, upper extremity, and lower extremity; and cancer and end-of-life pain. The book is again replete with excellent easy-to-understand figures, tables, and algorithms. In addition, and very importantly, the screening tools and patient education materials that made the first edition so popular have been expanded.

Chronic Pain: *A Primary Care Guide to Practical Management* (*Second Edition*) approaches the discussion of pain management as primary care clinicians approach their patients, first trying to determine – with as much clarity as possible – the etiology of a patient's pain, and then discussing the specific treatments and general treatments of the condition that has been diagnosed as well as the pain it causes. All this occurs

[1] From Auden WH. "Surgical Ward" – The Selected Poetry of W. H. Auden. Vintage, New York, NY, 1971.

[2] From http://www.quotationspage.com/quotes.php3?author = Helen + Keller, http://quota-tions page.com/quotes.php3?author = Helen + Keller (accessed July 9, 2004). Quoted also on <http:// www.brainyquote.com/quotes/authors/h/helen_keller.html, http://www.brainyquote.com/ quotes/ authors/h/helen_keller.html (accessed July 9, 2004).

against a backdrop of general issues relevant to all pain management. Most of the common conditions that lead patients to come into our offices with a pain as their chief complaint are covered. The book presents clear recommendations for treatment and supports those recommendations with useful references.

The *Current Clinical Practice Series*, conceived by a number of editors at Humana Press, has as its mission to create high-quality, evidence-based books for primary care clinicians, with an emphasis on relevance, and provide practical approaches to common problems. The books in the *Current Clinical Practice Series* can be used to gain an updated understanding of common problems and/or can be placed on office shelves to serve as important references when questions come up during the course of patient care. A cornerstone book of this series *Chronic Pain*: *A Primary Care Guide to Practical Management* (*Second Edition*) again fulfills the mission of this series – it is practical, useful, and highly relevant. There is no higher compliment for any book of medicine.

Neil Skolnik, MD
Professor of Family and Community Medicine
Temple University School of Medicine

Preface

Patients with chronic pain present a unique set of challenges to the primary care physician, who must first recognize and accept the difficult and complex constellation of problems often encountered in these patients. When confronted with patients suffering from pain, it is important to recognize three common but false myths about chronic pain:

1. Patients with chronic pain are easy to manage.
2. Chronic pain is easily relieved with just a pill.
3. As pain improves, associated problems (e.g., depression, disability, relationship issues) will spontaneously resolve.

The clinical management of chronic pain is frequently requested by patients seeing primary care physicians, although most medical schools provide little background for dealing with these often complex patients. Patients with chronic pain typically report a diversity of complaints, including pain, sleep abnormalities, mood disturbance, and interference with personal, social, and work relationships. Lack of easily identified pathology in patients who report disabling symptoms may result in conflicts between patients and their treating clinicians. In addition, managing chronic pain generally requires assessment and treatment of pain, associated symptoms, and disability.

This book is designed to provide a practical approach to assessing and treating the complex issues characteristic of patients with chronic pain. This second edition has substantially updated the information provided in the first edition *Chronic Pain: A Primary Care Guide to Practical Management*. It expands the evidence-based recommendations previously provided, and new additions to this edition include the following:

- Risk management of patients with chronic pain
- Pain syndromes in the shoulder, upper extremity, and lower extremity
- Cancer and end-of-life pain
- Expanded patient educational materials

The patient educational resources provided in the supplement have been tested and refined through use in clinical patients. The popular patient materials included

in the first edition have been expanded to include additional resources, such as the following:

- Screening tools for depression and anxiety
- Neuropathic pain tools
- Fibromyalgia assessment tools

Incorporating these practical techniques into a busy clinic practice is designed to improve the confidence with which the primary care physician can approach patients with complex pain complaints, reduce staff stress, and improve patient success.

Dawn A. Marcus, MD
Professor of Anesthesiology
University of Pittsburgh

Contents

Chapter 1
Chronic Pain and Headache Overview

Key Chapter Points:

- Pain is reported in four out of every ten primary care visits.
- The most common chronic pain locations are the back, head, and joints.
- Nearly half of all patients with chronic pain will report persistent pain complaints when re-evaluated after 1 year.
- Patients typically believe that their healthcare providers are not interested in addressing chronic pain complaints.
- A pain drawing can provide a concise picture of a patient's pain complaints.

Key Words Drawing, Impact, Persistence, Prevalence

Case History

During her annual examination, Ms. Malone, a 53-year-old nurse, reports increased interference from her chronic back pain. She developed low back pain while lifting equipment at work 2 years earlier. Ms. Malone was initially work disabled for 6 months, but successfully returned to modified nursing duties after completing physical therapy. "I'm still having problems with my back. I'm limited at work. I have trouble keeping my house in order, I'm missing my grandkids' performances in school, and don't even ask about my sleep. Is there anything else we can do?" After glancing at his watch, and realizing that the appointment has already extended 15 minutes beyond schedule, her doctor suggests they schedule a follow-up appointment to address her ongoing pain complaints. Ms. Malone begins to sob, "You don't believe I have pain! My family doesn't believe I'm in pain! And my boss is positive that I'm making it all up just to get out of work! I've been trying to just pretend everything's fine, but it's not and I need help! Why can't I find a doctor who is willing to help me?"

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

Chronic Pain: Epidemiology

Chronic pain is a frequent patient complaint, with 70% of patients with persistent pain being managed by their primary care physician and only 2% seeing a pain management specialist.[1] Pain is a primary or secondary complaint in 40% of primary care office visits (Fig. 1.1).[2] A World Health Organization survey of patients in primary care in 14 countries revealed that the back, head, and joints are the three most commonly affected areas (Fig. 1.2).[3] Interestingly, two-thirds of patients reported pain affecting more than one body region. As expressed by Ms. Malone, nearly half of these patients similarly reported persistent pain complaints when

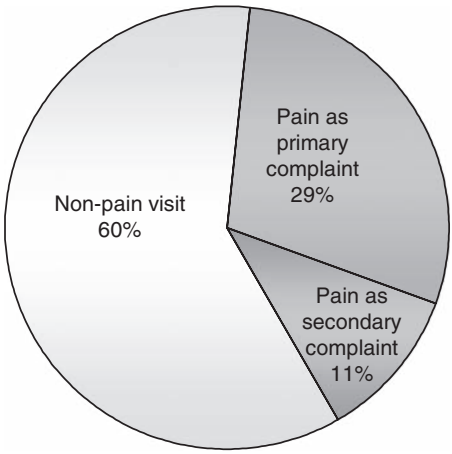


Fig. 1.1 Percentage of primary care visits for pain (based on Mäntyselkä[2]).

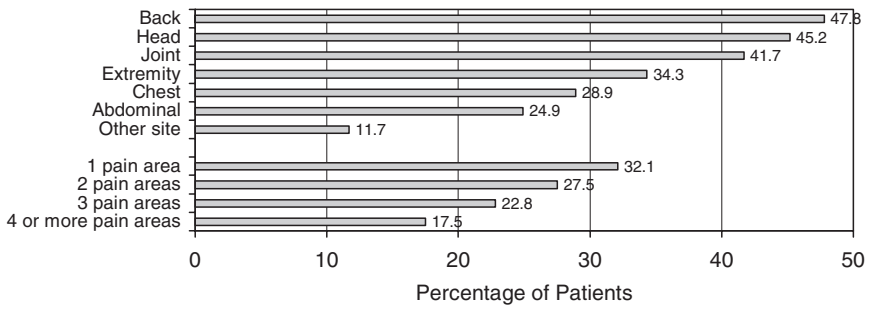


Fig. 1.2 Pain location reported in international survey of primary care patients (based on Gureje[3]).

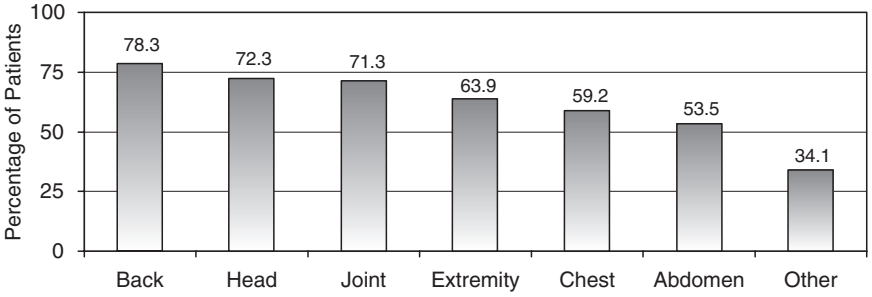


Fig. 1.3 Percentage of patients with persistence of chronic pain after 1 year by pain location (based on Gureje[4]).

re-evaluated after 12 months (49.2%).[4] The probability of persistent pain varied with the location, with the greatest persistence being seen in the three most commonly reported pain areas: back, head, and joint (Fig. 1.3).

As seen in Ms. Malone's case, chronic pain negatively affects sleep, mood, and productivity (Table 1.1). The economic impact of chronic pain is also substantial. An estimation of annual costs (2002) on account of chronic low back pain revealed that the majority of pain-related costs were indirect, with work absence being the most important one (Fig. 1.4).[5] About 60% of employed patients with low back pain missed at least one work day during the preceding 3 months, with an average loss of 33 out of 60 possible work days. These data suggest that healthcare providers should minimize concerns about treatment costs to actively address pain complaints with a view to reducing disability and avoiding the substantially greater costs of pain-related disability.

Table 1.1 Impact of chronic pain (based on Breivik[1])

Impact	Percentage
Sleep disturbance	65
Mood affected	21
Restricted household chores	54
Restricted social activities	47
Job changed due to pain	29
Job lost due to pain	19

Healthcare providers are often perceived by their patients as having a negative attitude about treating chronic pain. One in three people with chronic pain is not currently receiving treatment. This is often due to patient perceptions that their healthcare providers cannot help, that they should just live with their pain, or treatments will not be effective (Box 1.1).[1] Physicians likewise, report a negative outlook on chronic pain, with only 15% of primary care physicians endorsing feeling comfortable treating patients with chronic pain.[6] Primary care physicians are also

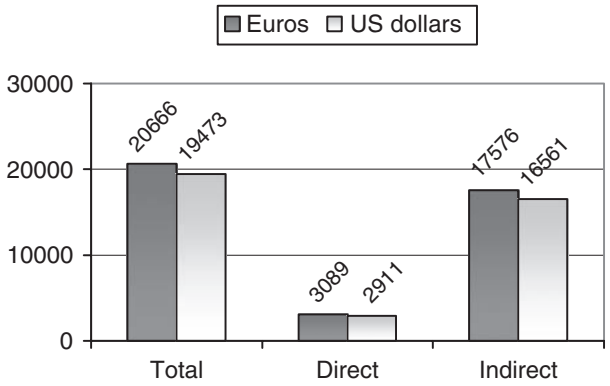


Fig. 1.4 Annual per-patient costs from chronic low back pain (based on Ekman[5]).

Box 1.1 Percentage of patients reporting beliefs about doctors' attitudes toward chronic pain (adapted from Breivik[1])

- My doctor does not think my pain is a problem – 20%
- My doctor never asks me about my pain – 22%
- I don't get enough time to talk to my doctor about pain – 23%
- No one believes my pain is as bad as it is – 29%
- My doctor would rather treat an illness than my pain – 43%

uncomfortable with the expanded need to prescribe opioids to patients with chronic pain; 41% of doctors waited for patients to initiate a request for pain medication.

Chronic Pain Assessment Tools

The evaluation of pain begins with identifying pain location. This is most conveniently done by asking patients to complete a simple pain drawing (Fig. 1.5). This drawing effectively identifies all potentially important pain areas, rather than focusing only on a particular area of immediate concern to the patient.

Although the majority of patients will report more than one active pain area,[3] many patients may only express verbal complaints about the area that is most troublesome on the day of evaluation or for which the patient believes treatment is available. For example, patients with fibromyalgia may complain most of headache or low back pain to the doctor, despite having other widespread pain areas. Failure

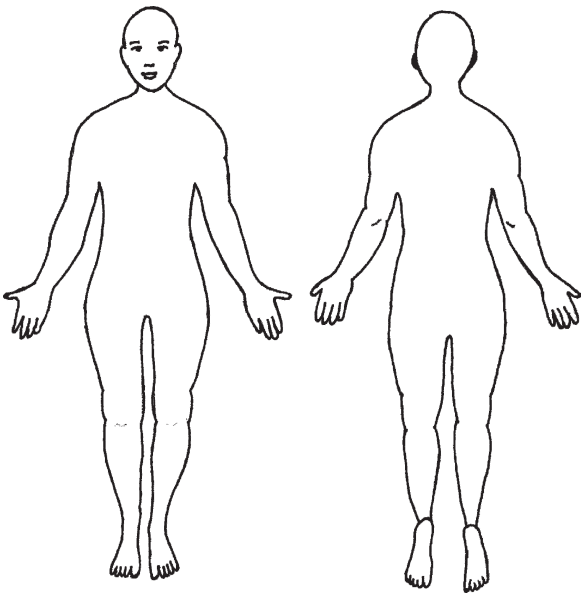


Fig. 1.5 Pain drawing. Instructions to pain drawing: please shade all painful areas, using the following key: /////, pain; :::::, numbness; ***, burning or hypersensitivity to touch.

to recognize additional pain complaints may result in an incomplete diagnosis and failure to adequately identify all of the patient's disabling complaints. Samples of completed pain drawings are shown in Fig. 1.6.

Some patients find it easier to describe pain complaints using a drawing rather than describing them verbally. A study evaluating headache complaints in 226 children showed the diagnostic sensitivity of a pain drawing for evaluating pain in patients with migraine was 93%, with a specificity of 83%, and a positive predictive value of 87%.[7] Findings in a second study were perhaps most significant, because up to half of children eventually diagnosed with symptoms of migraine failed to endorse features of migraine during the initial interview.[8] For example, aura was not identified in 46% who were later discovered to have an aura; vomiting was not confirmed by 50%, nausea by 31%, unilateral location by 38%, throbbing quality by 29%, photophobia by 11%, or phonophobia by 11%.

Patients should also be asked to rate the severity of their pain. Verbal rating scales (using selected descriptive adjectives), visual analog scales (marking a severity score on a line scaled from 0 to 100), and numerical rating scales (e.g., 0 = *no pain* and 10 = *excruciating pain*) may all be used. Numerical rating scales ("select a pain severity rating between 0 and 10") are valid, easy for patients, and sensitive to treatment impact.[9] Furthermore, recorded numerical pain scores are easy to use to assess and document the effectiveness of treatment interventions.

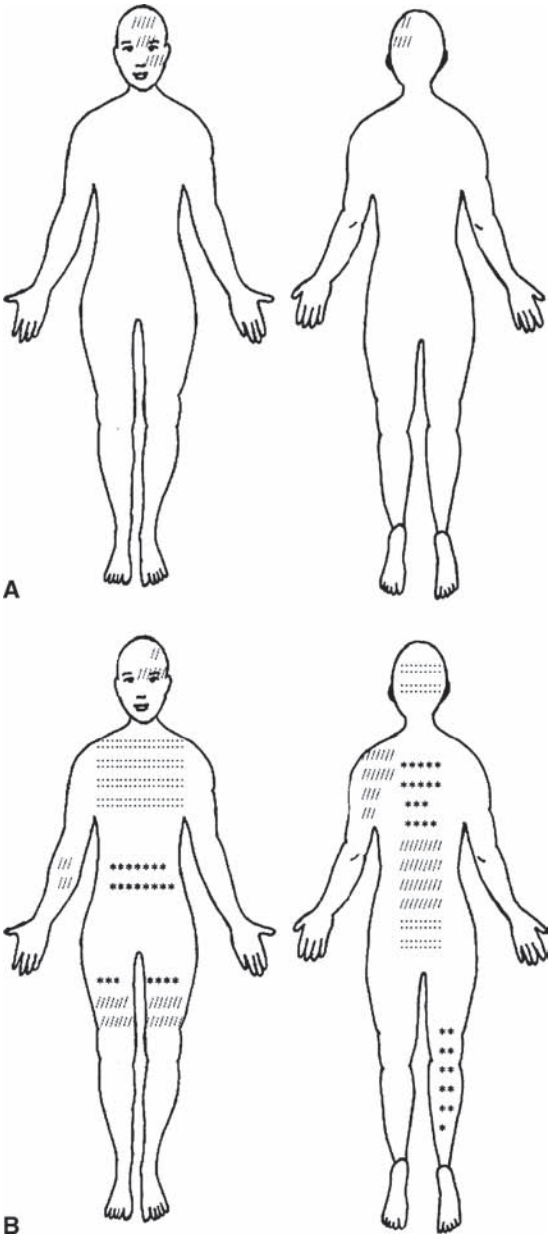


Fig. 1.6 Chief complaints with sample pain drawings: (**A**) episodic, left-sided, incapacitating headache; (**B**) episodic, left-sided, incapacitating headache. Diagnoses: (**A**) migraine; (**B**) migraine plus fibromyalgia.

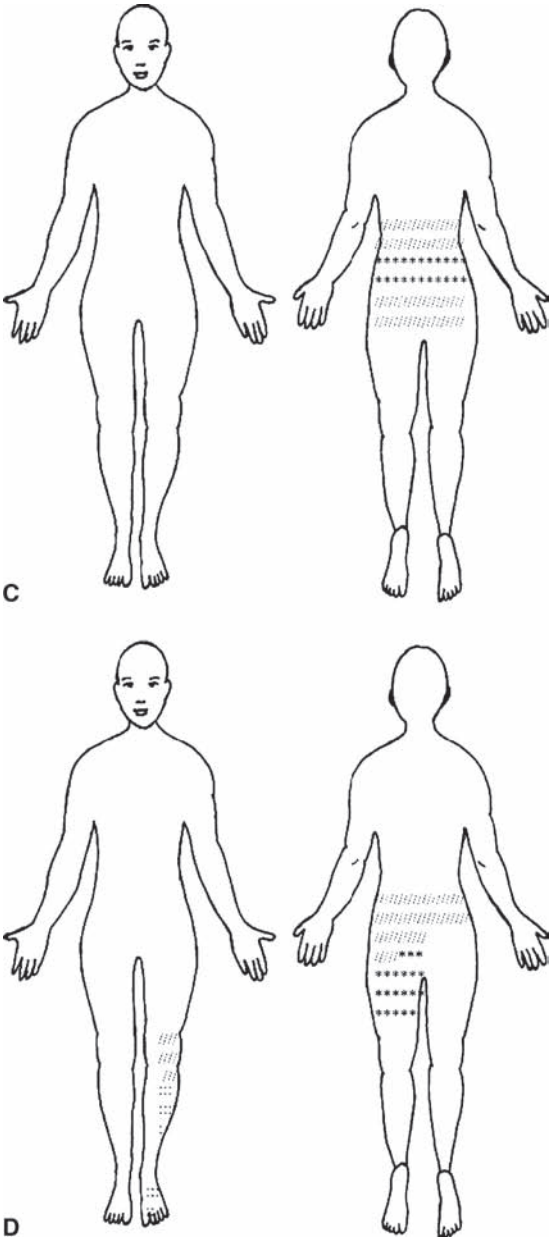


Fig. 1.6 (continued) Chief complaints with sample pain drawings: (**C**) persistent low back pain; (**D**) persistent low back pain. Diagnoses: (**C**) myofascial low back pain; (**D**) low back pain with radiculopathy.

Summary

Clinicians can gain confidence in managing chronic pain by getting to know more about the causes, diagnosis, and treatment options for patients with chronic pain. This can be achieved through easy-to-use pain assessment strategies and tools. This book is designed to provide practical information about the pathogenesis, diagnosis, and treatment of the most common chronic pain conditions seen in typical patients, as presented in case histories. In addition, patient assessment and educational materials are provided in formats that are easy to use in most busy primary care practices. The practical information provided in this text should improve both the understanding of these conditions and the efficacy of chronic pain management options in primary care. The CD that accompanies this book can facilitate patient education and charting documentation by providing easily reproduced materials to be used in the clinic. The information and tools provided in this book should help the busy clinician simplify broad patient complaints into manageable problems, so that commonly encountered problems can be addressed.

References

1. Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. Eur J Pain 2006;10:287–333
2. Mäntyselkä P, Kumpusalo E, Ahonen R, et al. Pain as a reason to visit the doctor: a study in Finnish primary health care. Pain 2001;89:175–180
3. Guereje O, von Korff M, Simon GE, Gater R. Persistent pain and well-being: a World Health Organization study in primary care. J Am Med Assoc 1998;280:147–151
4. Gureje O, Simon GE, Von Korff M. A cross-national study of the course of persistent pain in primary care. Pain 2001;92:195–200
5. Ekman M, Jönhagen S, Hunsche E, Jönsson L. Burden of illness of chronic low back pain in Sweden. Spine 2005;30:1777–1785
6. Potter M, Schafer S, Gonzalez-Mendez E, et al. Opioids for chronic nonmalignant pain. Attitudes and practices of primary care physicians in the UCSF/Stanford Collaborative Research Network. J Fam Pract 2001;50:145–151
7. Stafstrom CE, Rostasy K, Minster A. The usefulness of children's drawings in the diagnosis of headache. Pediatrics 2002;109:460–472
8. Metsähonkala L, Sillanpää M, Tuominen J. Headache diary in the diagnosis of childhood migraine. Headache 1997;37:240–244
9. Von Korff M, Jensen MP, Karoly P. Assessing global pain severity by self-report. TEN 2002;4:34–39

Chapter 2
Summary of Pain Management Issues: Frequent Concerns in Treating Chronic Pain Patients

Patients with chronic pain often come to their doctors with a myriad of complaints and expectations. When confronted with such a patient, doctors often have their own concerns about the legitimacy of reported pain severity and associated disability, the amount of time and resources required by patients to address these concerns, and the inadequate amount of information healthcare providers had received during their medical education and training for the management of chronic pain.

This book is designed to fill this knowledge gap for the most common chronic pain conditions and to provide useful clinical tools to facilitate an effective approach to patient complaints in a busy office practice. Several concerns about pain legitimacy, significance, and the ability to effectively treat patients with pain are addressed here. Each of these issues is addressed in greater detail in the following chapters.

Do People Really Have Chronic Pain Long After They Have Recovered From an Injury?

- Chronic pain is one of the most common reasons for seeing a primary care physician. For example, about one-third of primary care visits are for musculoskeletal pain.
- Studies in laboratory animals consistently show changes in the nervous system in response to old injuries. Increased nerve sensitivity and the rewiring of nerves to activate pain pathways occur after injuries and correspond to demonstrated pain behaviors.
- Complete fabrication of pain symptoms, or malingering, is rare and usually easy to identify.
- Premorbid mood disturbance, poor social support, and smoking increase the risk of developing a chronic pain complaint.

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

Is It Unusual for Children to Report Chronic Pain?

- Chronic pain complaints are reported by approximately 5–15% of children and adolescents.
- The most common chronic pain complaints in pediatric patients are headache, stomach pain, and musculoskeletal pain.
- Children should not be expected to quickly "outgrow" their pain complaints. For example, chronic musculoskeletal pain persists for at least 1 year in approximately 75% of children.
- Untreated chronic pain in children is associated with significant distress and disability (including school absences) and may predispose children to chronic pain in adulthood.

Are Aches and Pain Part of the Normal Aging Process?

- Approximately one-third of elderly patients are affected by chronic pain, often because of arthritis, osteoporosis-associated fractures, and lumbar stenosis. These conditions are treatable and should not be considered to be part of the normal aging process.
- Untreated chronic pain in elderly patients can result in depression, poor quality of life, and loss of independence.
- The ability to identify and manage pain in elderly patients becomes increasingly important in primary care settings, because the world population is aging.

I Have Heard That You Cannot Really Treat Chronic Pain and Patients Just Need to "Learn to Live With It". Are There Really Any Effective Treatments for Chronic Pain?

- Although it is not necessarily curable, chronic pain is definitely a treatable condition.
- Individual pain conditions often require different treatment modalities.
- Some treatments – e.g., stretching exercises, relaxation techniques, antidepressant therapy, and antiepileptic drugs – are beneficial for a wide variety of chronic pain conditions.

Are Opioids Effective for Patients With Chronic Pain, or Do They Usually Lead to Addiction?

- Opioids can help reduce the severity of pain, but they must be used within the context of a comprehensive pain treatment program.

- Patients with chronic pain who are treated with opioids need to be monitored closely. Approximately 25–30% of patients with chronic pain who are treated with opioids will demonstrate medication abuse behavior.
- Misuse and abuse of opioids can be minimized by establishing realistic treatment goals, using low doses of medications, and employing strictly followed opioid contracts.

Is Caring for Chronic Pain Patients Too Time-Consuming for a Busy Practice?

- Chronic pain patients may have complicated complaints that cannot all be addressed in a single office visit. Patients may present multiple long-term issues to their primary care doctors: pain severity, sleep disturbance, depressed mood, work disability, and family conflicts.
- Office tools, such as pain drawings and other self-assessment tools, can help patients focus on short- and long-term goals that can be addressed with treatment. Helping patients focus on specific goals is also facilitated by using goal assessment and attainment tools. These tools can be utilized by most patients with minimal instruction.
- Educational tools, such as written handouts, can reinforce treatment messages and minimize the amount of interactive time needed to deliver patient education.

Is It Really Important to Address Chronic Pain? Is My Office Time Better Spent Focusing on "Real" Medical Problems, Like Diabetes, Heart Disease, and Hypertension?

- Chronic pain complaints are very common and frequently bring patients to the doctor's office with requests for information, diagnosis, and treatment.
- Untreated chronic pain conditions can exacerbate frustration and psychological distress and result in significant disability, including absence from school in children and unemployment or underemployment in adults.
- Chronic pain complaints may also be caused or aggravated by other medical conditions, such as diabetes-related neuropathy and the aggravation of mechanical joint pain by obesity. Compliance with treatment for the primary medical disorder is often enhanced when that treatment also improves a secondary pain condition.
- Treatment options for patients with chronic pain – such as exercise, relaxation skills, stress management, and appropriate use of medication – are also invaluable for maintaining overall good health and maximizing the efficacy of treatment prescribed for other medical conditions.

Chapter 3
Risk Management in Chronic Pain Practice

Key Chapter Points:

- Clinicians must balance achieving pain relief and minimizing risk of drug abuse and diversion.
- Pain relievers are the third most commonly abused illicit drug category after marijuana and cocaine.
- Patient assessment, clinician decision-making, and discussions with the patient about pain treatment can be readily documented using standardized charting tools.
- Reasons for selecting specific therapy, treatment objectives, goal attainment, and consideration of therapy adjustment must be clearly documented in the patients' medical records.
- Reasons for using opioid therapy include failure of other pain therapy, inability to tolerate other medications, and severe, disabling pain.
- Continued opioid treatment must be contingent on treatment compliance and achievement of functional improvement goals, such as increased household chores, return to work, or increased ability to participate in physical or occupational therapy.

Key Words Documentation, Goals, Guidelines, Substance abuse

Case History

"If you don't give me a prescription for narcotics, you'll be sorry," were the parting words from Mr. Devlin as he stormed out of the clinic. Mr. Devlin was a 46-year-old with chronic low back pain following a work injury and several unsuccessful surgeries. He had a history of incarceration for drug charges prior to the development of his pain complaint and had been discharged from several physicians' offices after abusing prescription pain killers. After evaluation at a new doctor's office, he was advised to participate in a comprehensive pain rehabilitation program, focusing on physical therapy, occupational therapy, and the development of non-medication pain-coping strategies. He was not considered to be a candidate for opioids due to

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

his strong history of drug abuse and active drug-seeking behavior. Two months after this evaluation, the attending pain physician was notified that she was under investigation by the state prosecutor for reports of failure to treat pain and patient abandonment brought by Mr. Devlin. The doctor was informed at her initial meeting with the prosecutor's aide that these investigations typically take several years for resolution, during which time she would need to disclose the ongoing investigation when applying for medical licenses or hospital privileges. Fortunately, excellent documentation within the patient's clinic chart describing the patient's thorough assessment and treatment recommendations, reasons for selecting non-opioid therapy, and the patient's refusal to participate in care, as well as notations describing numerous angry phone calls from the patient demanding specific narcotics and refusing any other offered treatment, resulted in the case being dropped within 1 month, with no charges brought against the doctor.

Introduction

Clinicians are saddled with the responsibility of promoting effective pain management while minimizing the risk for developing drug abuse. Doctors are often torn between a desire to ease suffering and fears about fostering harmful abusive behaviors. In June 2007, the *New York Times Magazine* published an article, titled "When is a pain doctor a drug pusher?" This article described the case of a doctor convicted of drug trafficking after repeatedly prescribing high doses of opioids to patients for whom adequate documentation was absent. Additional actions taken by the Drug Enforcement Agency (DEA) are detailed on the DEA Office of Diversion Control Web site (http://www.deadiversion.usdoj.gov), including the eight actions taken by the agency in 2007. While doctors might prefer to avoid using pain medications altogether to avoid risks from patient abuse and diversion, new regulations requiring that healthcare providers take a stronger role in pain assessment and alleviation have also resulted in actions against healthcare providers for failure to adequately treat chronic pain complaints. Cases of successful litigation for failure to adequately treat terminal pain are detailed in medical literature.[1,2] Furthermore, the national advocacy group Compassion & Choices (http://www.compassionandchoices.org) provides information and legal services to patients with terminal illnesses and their family when concerns are raised about inadequately controlled pain.

A review of cases brought against healthcare providers prescribing pain killers typically reveals clear healthcare provider abuse or failure to follow clinical standards or fully document patient care. Prescribing medicines/treatment to patients before completing a full assessment and review of prior records and prescribing to nonpatients (e.g., relatives, friends, staff members, etc.) are common causes of actions against physicians. In some cases, better documentation would have clarified the appropriateness of prescribing practices. Patient care can be maximized and healthcare provider risk minimized by adopting routine practices of pain assessment and documentation for every patient, not only those for whom abuse is thought to be likely. As in the case of Mr. Devlin, good documentation not only

improves communication between the doctor and the rest of the treatment team and between healthcare providers and the patient, but also effectively documents patient encounters and healthcare provider decision-making for those reviewing the records. This chapter provides an overview of risk management issues for chronic pain management, along with easy-to-use, practical documentation tools that can be readily included in patient records for all patients reporting pain.

Mandate to Assess and Alleviate Pain

In January 2001, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) established guidelines to mandate the regular assessment of pain and policies and procedures that support the appropriate use of pain medication. Their recommendations are summarized in Box 3.1.

Box 3.1 JCAHO guidelines for pain management

- Apply standard good clinical practice assessment to pain management
  - Routinely ask patients about pain
    - Location, severity, quality
    - Factors that improve or worsen pain
    - Pain impact
  - Educate staff, patient, and family about chronic pain
  - Document pain like other symptoms
    - Evaluation
    - Diagnosis
    - Treatment plan
  - Reassess pain symptoms
    - Include measures of treatment efficacy, side effects, and compliance
- Treat pain complaints seriously
  - No particular treatment regimen is endorsed by JCAHO
  - Record rationale for choice of treatment
    - If prescribing opioids, possible reasons for use may include:
      - Failure of alternative therapies
      - Dangerous overuse of analgesics
      - Severe pain resulting in excessive disability or inability to participate with other treatment
- Routinely document pain assessments, treatment, and follow-up
  - Recognize and record important comorbidity: physical conditions, psychological distress, disability, and social factors

Statistics on Pain Medication Abuse

The United States Department of Health and Human Services conducts annual surveys on substance abuse for Americans ≥12 years old. A summary of survey findings can be found at the Substance Abuse and Mental Health Service Administration Web site: http://www.oas.samhsa.gov. Findings from the 2006 survey are summarized here:

1. The overall rate of illicit drug use among people ≥12 years old was about 8%.
   - Marijuana was the most commonly used illicit drug.
   - First-time illicit drug users were equally likely to abuse marijuana or pain relievers.
2. Nearly 3% of people ≥12 years old reported using a prescription drug non-medically in the preceding month – primarily pain medications.
   - Among people using pain relievers non-medically, 56% received the drug at no charge from a friend or relative, while 19% got the drug from their doctor. Only 4% secured the medication from a stranger or drug dealer.

Pain medications are a common source of substance abuse. According to the 2006 National Survey on Drug Use and Health, it is estimated that pain relievers are the third most commonly abused illicit drug (Fig. 3.1). Contrary to the expectations of many healthcare providers, the number of persons abusing prescription pain relievers nearly equaled the number abusing cocaine, with 1,635,000 persons estimated to be abusers of pain relievers in 2006, compared with 1,671,000 cocaine abusers. Unfortunately, substance abuse treatment occurred for only about half as many people abusing pain relievers compared with cocaine abusers.

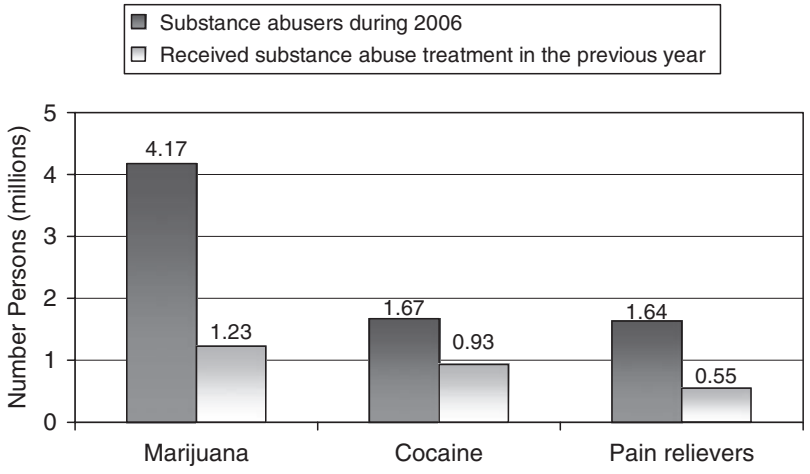


Fig. 3.1 Illicit drug abuse in the United States during 2006 (Data available at http://www.oas.samhsa.gov).

Regulations to Balance Pain Relief and Medication Abuse

Regulations for managing chronic pain in the United States have been established by individual states. A summary of state guidelines can be reviewed at the Federation of State Medical Boards Web site: http://www.fsmb.org. A number of states have adopted guidelines established by the Federation of State Medical Boards (Box 3.2). Guidelines stress the importance of documenting patient assessments, diagnosis, treatment recommendations, and progress. Patient documentation must be complete and up-to-date and should be reviewed at each follow-up visit.

Box 3.2 Federation of State Medical Boards pain management guidelines

- Document patient evaluation
  - History and physical examination
  - Pain diagnosis, severity, impact, and treatments
  - Comorbidity, including psychological distress
  - History of substance abuse
- Document treatment plan
  - Clarify specific treatment recommendations and why individual therapies were chosen
  - Describe goals of treatment
  - Define measures of treatment success
  - Note that treatment adjustments will be considered
- Provide patient with treatment risk-benefit assessment
  - Provide patient with clear treatment expectations (e.g., receiving medications from a single provider, complying with dosage recommendations, etc.) and the consequences of non-compliance
  - Consider using an opioid contract
- Conduct periodic review
  - Pain diagnosis and symptoms
  - Comorbid illness
  - Treatment efficacy, tolerability, and compliance
  - Functional status
  - Goal attainment – revise treatment if goals have not been obtained
- Consider consultation to address
  - Recalcitrant pain or disability
  - Psychological distress and/or psychiatric illness
  - Substance abuse

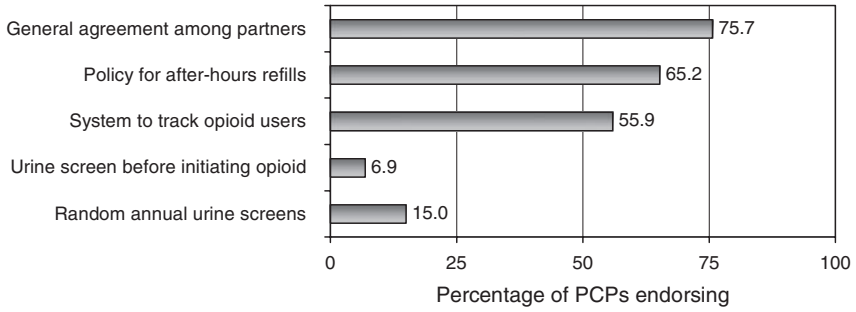


Fig. 3.2 PCP practice policies for opioids for chronic pain (based on Bhamb[3]).

Risk for substance abuse can be assessed by questioning patients about prior and current use of alcohol and other substances of abuse. Urine tests are convenient and relatively inexpensive to determine drug use over a period of several days. Patients should be screened prior to initiating opioids and at random intervals when prescribing opioids to verify treatment adherence and identify medication misuse/abuse. It is often helpful to let the laboratory know the specific compound that the patient is prescribed, as even low levels of this drug are of interest to the doctor ordering the test. Further, some commonly prescribed medications cross-react with drugs of abuse on standard drug screening tests and may produce a false-positive. For example, with routine drug-screening testing, the nonsteroidal anti-inflammatory drug oxaprozin may cross-react with benzodiazepines and ketorolac with cocaine. Comprehensive drug-screening tests identify specific compounds as possible substances of abuse rather than general drug categories. The increased cost of comprehensive testing limits its use to patients with unexplained abnormalities on routine screening. Unfortunately, only a minority of primary care practices utilize urine toxicology screening. A survey of 248 primary care physicians (PCPs) catalogued practice behaviors regarding opioid prescriptions.[3] Most of the participating physicians believed that they prescribed opioids equally (50%) or less often (35%) than their practice partners. Although most doctors were in general agreement regarding the management of opioids for chronic pain, including a policy for after-hours refill requests, patient monitoring for compliance using urine toxicology screening was inadequate in almost all practices (Fig. 3.2).

Implementing Pain Management Practice Guidelines

Although many doctors are concerned about the risks of medication misuse and abuse in their patients, proper documentation of patients with chronic pain treated with opioids is poor. A recent survey of general medical clinic patients treated with opioids for chronic pain showed that the necessary documentation, including establishment of a treatment plan and demonstration of treatment response, was missing

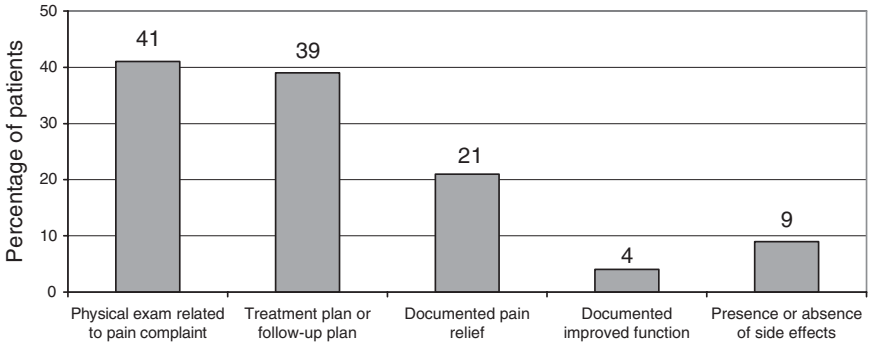


Fig. 3.3 Documentation in patients treated with analgesic opioids (based on Clark[4]).

from most charts (Fig. 3.3).[4] These data support the need for additional education about the benefits and risks of opioids, as well as development of practical guidelines and documentation tools for their use.

Identifying Comorbidity

Psychological distress affects at least half of the patients seeking treatment for chronic pain. In a survey of 500 consecutive pain patients treated with stable opioid doses at a pain treatment center, depression occurred in 59% of the patients, with anxiety in 64%.[5] Comorbidity of psychological distress predicted drug abuse, with abuse more likely to occur in depressed vs. non-depressed patients (12% vs. 5%, $P = 0.05$). Drug abuse was numerically higher among anxious vs. non-anxious patients (11% vs. 6%), although this difference did not achieve statistical significance.

Psychological screening should be routinely performed in all patients with pain because of the preponderance of psychological distress among chronic pain patients and its impact on treatment compliance and risk of drug abuse. Initial screening can be achieved by using standardized self-assessment tools, which can be accessed and completed online (Table 3.1). A wide range of psychological screening tests are

Table 3.1 Screening tools for psychological distress

Internet screening tools	Symptoms assessed
http://www.med.umich.edu/depression/screen.htm http://www.med.nyu.edu/psych/screens/depres.html http://www.freedomfromfear.org/screenrm.asp	Depression
http://www.med.nyu.edu/psych/screens/anxiety.html http://www.psychtests.com/tests/minitests/anxiety_abridged_access.html http://www.freedomfromfear.org/screenrm.asp	Anxiety
http://www.amihealthy.com/	Quality of life

available online, with many tests accessible through the HealthyPlace.com Web site (http://www.healthyplace.com/site/tests/psychological.asp). Screening tools for depression and anxiety are also provided in Appendix C. Patients screening positive for psychological distress or reporting symptoms of depression, anxiety, or other mental illness should receive a more detailed psychological assessment and may benefit from referral to a therapist or psychiatrist.

Characterizing Goal Setting

Prior to developing a treatment plan, patients should be asked to establish clear and specific treatment target goals. While pain reduction may be included as a target goal, it should not be the only or primary treatment target. Patients should be counseled that pain reduction is expected to be modest at best, setting a target of reduction in pain to moderate severity levels and reducing pain flares (i.e., frequency, severity, and/or duration).

Contrary to the expectations of many patients, functional improvement typically precedes pain reduction. Establishing primary goals focused on attainable functional targets motivates the patient to continue therapeutic engagement and compliance and improves treatment success. Goals should be directly related to identified problematic symptoms. Therapies can then be linked to specific target goals (Table 3.2).

Table 3.2 Goals of pain management treatments

Identified problem	Outcome goal	Therapy prescribed
Poor sleep	Increase sleep time to 6 hours	Sleep hygiene training
	Reduced wake-ups	Tricyclic antidepressant
Burning, hypersensitive area	Reduced burning/sensitivity to light touch	Neuropathic medications
Intolerable pain	Reduction in average pain score to moderate pain levels (5–7/10, with 0/10 = no pain and 10/10 maximal pain)	Scheduled long-acting opioid
Reduced activity level	Reconditioning	Physical therapy
	Ability to do household chores	Occupational therapy
	Return to work	
	Return to leisure activities	
Depression	Improved mood	Psychology
	Reduced irritability	Antidepressants

Evaluating Appropriateness of Opioid Analgesia

When opioids are used, they should be included in a more comprehensive, multidisciplinary pain management treatment program. Opioids are rarely beneficial when used as monotherapy or primary therapy. An algorithm can be regularly applied to

patients with disabling, non-malignant pain for whom opioids are being considered, to determine the appropriateness of initiating opioids, type and dosage of opioid, and treatment compliance and efficacy (Fig. 3.4). Benefits are maximized and risks minimized when following standardized criteria for identifying appropriate opioid candidates, treatment outcome measures, and documentation requirements (Box 3.3). Prior to opioid initiation, an algorithm should be completed to ensure the patient is an appropriate treatment candidate (Fig. 3.5). After initiation, another algorithm should be completed at each subsequent visit to ensure that patients continue to be appropriate candidates for continuing opioid analgesia (Fig. 3.6).

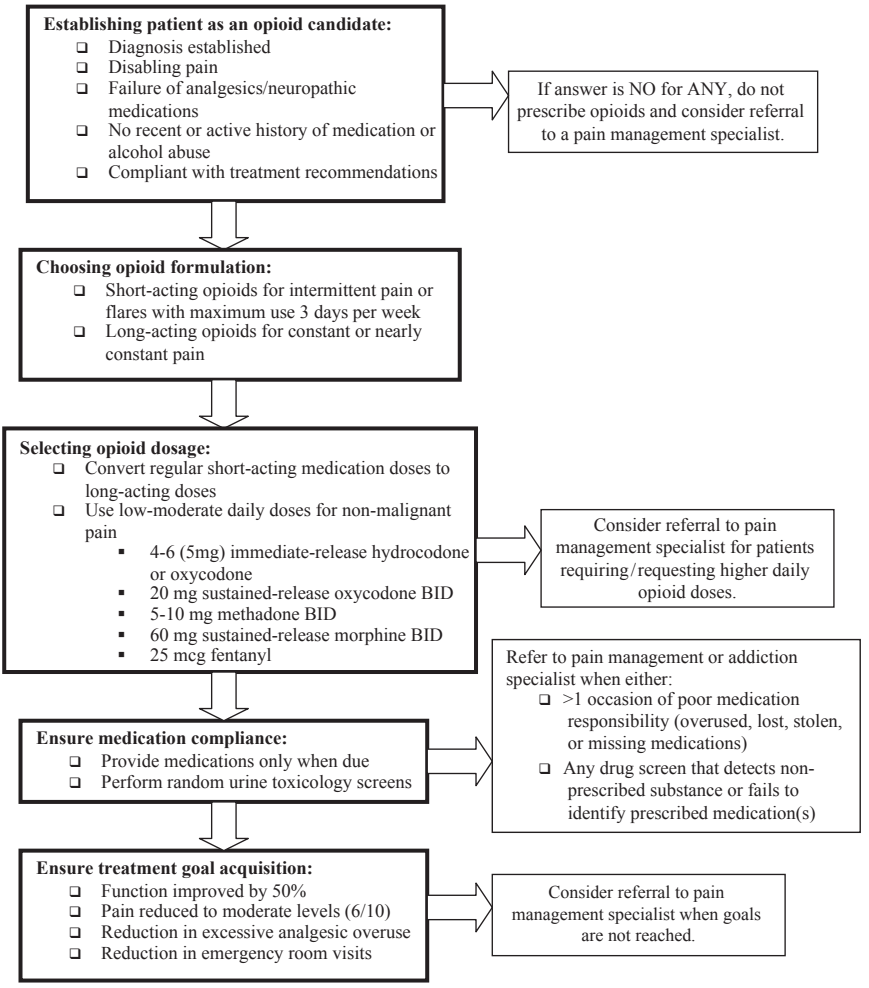


Fig. 3.4 Rational use of opioids for non-malignant pain by primary care physicians. BID = twice daily.

Box 3.3 Requirements for prescribing opioids for chronic pain

- Prescribe only for documented patients
  - Never prescribe for patients before a full evaluation is completed
  - Never prescribe for non-patients (yourself, relatives, employees, friends)
- Document evaluation and specific pain diagnosis
  - Prescribe opioids only for patients with a clear pain diagnosis
  - Never prescribe for the undiagnosed patient to "improve ability to cooperate with testing," unless the patient is acutely ill
- Document reason for choosing opioid analgesic
  - For example, failure or inability to tolerate non-opioid analgesics
- Catalogue specific treatment goals
  - Minimize gastric/renal toxicity from non-opioid analgesics
  - Improve functional ability
  - Improve ability to participate in rehabilitative pain therapy
- Document regular follow-up with identification of treatment efficacy and tolerability
  - Specify target goals that have been met or improved
  - Document side effects, e.g., change in bowel habits or cognition
- Document treatment plan at each visit
  - Continue therapy due to demonstrated efficacy/goal attainment
  - Modify therapy due to failed goal attainment
  - Medication discontinuation for non-efficacy or non-compliance

Requiring Patient Responsibility

Patients must be informed that the significant risk of misuse or abuse of opioids requires them to exercise considerable responsibility over their medications. Patients must know the policy for medication adherence before beginning opioids and understand that these rules represent a strict policy of the clinic and are not applied on a case-by-case basis. Repeated reports of misplaced, stolen, or damaged medications demonstrate poor patient responsibility and should result in strong consideration for discontinuing medications. All patients with chronic pain should be asked about current, recent, and remote abuse of alcohol and drugs. Patients with current addiction problems should be referred to a drug rehabilitation facility before

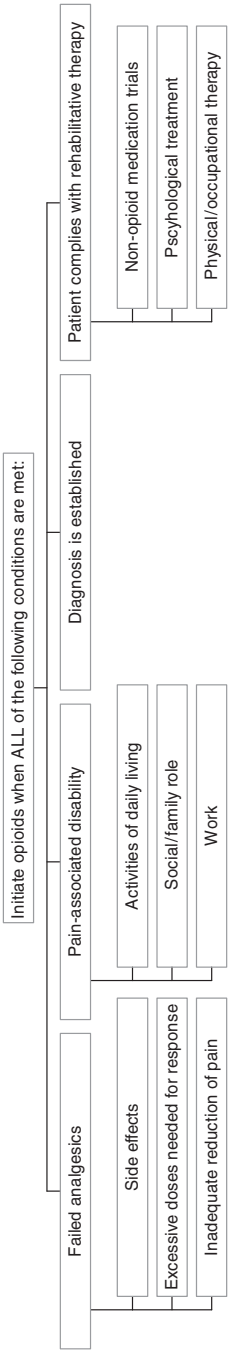


Fig. 3.5 When to initiate opioids for chronic pain.

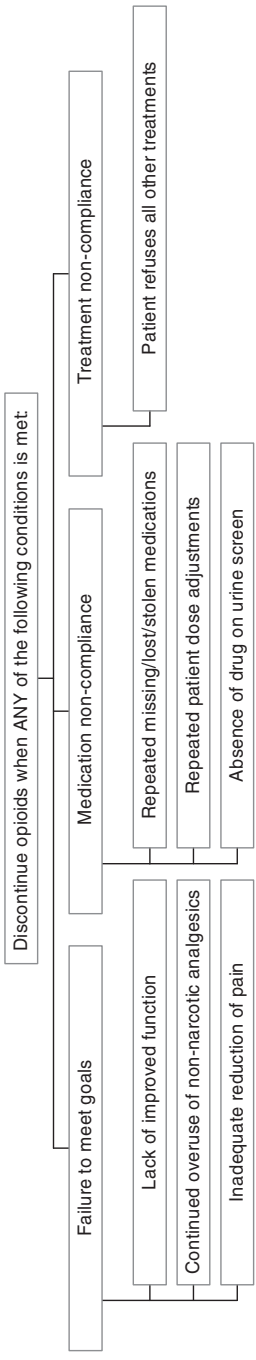


Fig. 3.6 When to discontinue opioids in chronic pain patients.

any pain management is attempted. Patients with recent problems of abuse or addiction should be managed by a pain specialist, ideally in conjunction with an abuse counselor.

Specific reasons for a lack of responsible behavior are not important. Whether the patient launders pain pills or spills them into the toilet, or whether the pills are stolen by a neighbor or consumed by a pet, the patient has not displayed responsible behavior. Many practices allow patients to have a single occasion of irresponsible behavior; however, if this recurs, the medications will not be continued. For example, if opioids were laundered in March and then stolen by the neighbor in April, the healthcare provider must let the patient know that, while sympathetic to the patient's chaotic life, he or she cannot, in good conscience, continue to prescribe a therapy that requires strict monitoring when that appears to be impossible in the patient's life. Doctors should never argue with patients about the credibility of the stories about missing medications: "Your poodle couldn't possibly have eaten 80 Percocets and be fine," or "How could 40 pills possibly have fallen into the narrow opening of a nail polish remover bottle?" Without great effort, these stories cannot be proven to be false and discussions about excuse veracity encourage patients to develop more plausible stories for the next time. Doctors need to accept the face-value validity of their patients' stories and present them as examples of lack of medication responsibility.

Medication use must be vigilantly monitored. Opioid prescriptions should be limited to a single healthcare provider. Prescriptions must be logged in the patients' records, with new prescriptions written on schedule to avoid medication overuse. In addition, random urine drug screens should be performed periodically on all patients using opioids to ensure appropriate medication use, confirm lack of abuse of non-prescribed habit-forming substances, and prevent drug diversion. It is important to remember, however, that most laboratories set limits for drug detection that are designed to identify common levels of drugs of abuse. These levels may be too high to detect low levels used in patients prescribed opioids for chronic pain. If a routine drug screen is negative in a patient who is prescribed an opioid analgesic, repeat testing with a comprehensive screen designed to report even low levels of drugs should be performed.

Charting Documentation

Standardized documentation tools can be inserted into each patient's evaluation record at the initial evaluation and subsequent follow-up visits (Boxes 3.4 and 3.5). Reviewing these sheets with the patient assists communication, reduces misunderstanding about treatment goals and expectations, and provides effective charting to monitor progress. Sample completed sheets for a patient with chronic low back pain who failed earlier analgesic therapy are provided (Boxes 3.6 and 3.7).

Patients prescribed opioid analgesics may also benefit from using an opioid contract (Box 3.8). The contract clearly outlines expectations of opioid benefits,

Box 3.4 Documentation charting sheet for treatment initiation for chronic pain

Pretreatment assessment
Patient name: _____ Date: _____
Pain diagnosis: _____

Treatment recommendations (check all that apply):

☐ Medication

- ❑ Analgesic: _____
- ❑ Non-analgesic: _____

☐ Non-medication

- ❑ Physical therapy
- ❑ Occupational therapy
- ❑ Psychology
- ❑ Other: _____

Reason for selecting specific medication therapy (check all that apply):

❑ Diagnosis suggests benefit from specific therapy (e.g., antiepileptics for neuropathic pain or migraine)
❑ Treatment of comorbid condition: _____
❑ Failure with non-opioid analgesics
❑ Unable to tolerate non-opioid analgesics: _____
❑ Pain is disabling and/or precludes participation in rehabilitation

Treatment goals (check all that apply):

☐ Improve function

- ❑ Household chores
- ❑ Yard work
- ❑ Leisure activities
- ❑ School attendance
- ❑ Work

☐ Improve ability to participate in rehabilitation
☐ Provide safe, tolerated treatment
☐ Reduce pain to moderate severity level

Follow-up scheduled in _____ weeks/months
Provider signature and date: _____
I certify that my doctor and/or his team explained my diagnosis, treatment recommendations, and the expected benefits and risks from treatment. I am satisfied that my questions were answered and will comply with my treatment recommendations and follow-up. _____
(Patient signature and date)

Box 3.5 Documentation charting sheet for post-treatment assessment for chronic pain

Post-treatment evaluation
Patient name: _____ Date:_____

Goal attainment (include specific targets achieved):

☐ Improve function

- ❑ Household chores
- ❑ Yard work
- ❑ Leisure activities
- ❑ School attendance
- ❑ Work

☐ Improve ability to participate in rehabilitation
☐ Provide safe, tolerated treatment
☐ Reduce pain to moderate severity level

Compliance with prescribed therapy: YES NO
Tolerability:

- ❑ Regular bowel movements (record frequency): _____
- ❑ Sedation/cognitive effects
- ❑ Weight change: _____
- ❑ Dry mouth
- ❑ Dizziness
- ❑ Nausea
- ❑ Other: _____

Treatment recommendations:

- ❑ Continue current treatment
- ❑ Change in therapy: _____

Follow-up scheduled in ___weeks/months
Provider signature and date: _____
I certify that my doctor and/or his team explained my diagnosis, treatment recommendations, and the expected benefits and risks from treatment. I am satisfied that my questions were answered and will comply with my treatment recommendations and follow-up. _____
(Patient signature and date)

concerns for possible side effects and risks of abuse, healthcare provider behaviors, and compliance expectations. The consequences of failure to achieve treatment targets or comply with prescription recommendations are also described.

Box 3.6 Sample treatment initiation documentation

Pre-treatment assessment
Patient name: Mr. Walter **Date:** Mar 19, 2008
Pain diagnosis: Failed back syndrome, mechanical back pain

Treatment recommendations (check all that apply):

☒ Medication
- ☒ Analgesic: Hydrocodone, as needed for severe pain
- ☐ Non-analgesic: _____

☒ Non-medication
- ☒ Physical therapy Modalities, stretching exercises
- ☒ Occupational therapy Work place assessment, body mechanics, pacing, job simplification
- ☒ Psychology Coping skills, mood assessment
- ☒ Other: Nurse consultation for sleep hygiene and nutritional counseling

Reason for selecting specific medication therapy (check all that apply):

☐ Diagnosis suggests benefit from specific therapy (e.g., antiepileptics for neuropathic pain or migraine)
☐ Treatment of comorbid condition: _____
☒ Failure with non-opioid analgesics NSAIDs, tramadol, acetaminophen
☒ Unable to tolerate non-opioid analgesics: anemia with NSAIDs
☒ Pain is disabling and/or precludes participation in rehabilitation

Treatment goals (check all that apply):

☒ Improve function
- ☐ Household chores
- ☐ Yard work
- ☐ Leisure activities
- ☐ School attendance
- ☒ Work Increase work hours to at least 4 hours/day

☒ Improve ability to participate in rehabilitation
☒ Provide safe, tolerated treatment
☒ Reduce pain to moderate severity level

Follow-up scheduled in 1 **weeks** (**months**)
Provider signature and date: Dr. Smith Mar 19, 2008
I certify that my doctor and/or his team explained my diagnosis, treatment recommendations, and the expected benefits and risks from treatment. I am satisfied that my questions were answered and will comply with my treatment recommendations and follow-up. Mike Walter March 19, 2008
(Patient signature and date)

Box 3.7 Sample post-treatment assessment documentation original

Post-treatment evaluation
Patient name: Mr. Walter **Date:** Apr 17, 2008

Goal attainment (include specific targets achieved):

☒ Improve function

- ☐ Household chores
- ☐ Yard work
- ☐ Leisure activities
- ☐ School attendance
- ☒ Work: working 6 hours/day instead of 2 hours/day

☒ Improve ability to participate in rehabilitation: Resumed exercise program
☒ Provide safe, tolerated treatment
☒ Reduce pain to moderate severity level: Pain severity reduced from 9/10 to 6/10

Compliance with prescribed therapy: YES (NO)

Requiring frequent and excessive use of short-acting hydrocodone to achieve necessary long-lasting pain reduction. Needs to switch to sustained-release opioid.

Tolerability:

☒ Regular bowel movements (record frequency): daily bowel movement if takes prune juice
☐ Sedation/cognitive effects
☐ Weight change: _____
☐ Dry mouth
☐ Dizziness
☐ Nausea
☐ Other: _____

Treatment recommendations:

☐ Continue current treatment
☒ Change in therapy: Discontinue hydrocodone. Begin sustained-release morphine 15mg twice daily

Follow-up scheduled in 4 (**weeks**) **months**
Provider signature and date: Dr. Smith April 17, 2008
I certify that my doctor and/or his team explained my diagnosis, treatment recommendations, and the expected benefits and risks from treatment. I am satisfied that my questions were answered and will comply with my treatment recommendations and follow-up. Mike Walter April 17, 2008
(Patient signature and date)

Box 3.8 Opioid contract

Your doctor has diagnosed you with: _____

You have been prescribed the following opioid analgesic:_____

Opioid analgesics are strong pain-relievers. They may cause constipation, nausea, and confusion. Therefore, you should not drive or operate machinery while adjusting to opioid therapy or if these effects occur. In addition, opioid analgesics are habit-forming. Patients using opioid analgesics regularly for 2–3 weeks usually develop medication habituation. This means that you may have withdrawal symptoms, like diarrhea, irritability, sleep disturbance, agitation, and runny nose, if you abruptly discontinue opioid therapy. Sometimes, patients can begin to crave the medication and develop serious problems with drug abuse. Some people also find that they build up a tolerance to opioid analgesics. Tolerance means that the medication becomes less and less effective the longer you use it. In that case, your opioid analgesic will need to be tapered and discontinued. Your doctor will help you minimize risks with your medication by establishing strict guidelines for medication use and requiring regular follow-up to assess treatment response and any side effects.

You have been prescribed opioid analgesic therapy for treatment of chronic pain because:

- ❑ You cannot take other non-opioid analgesics
- ❑ You have failed to respond to non-opioid analgesics and other therapy
- ❑ Your pain is disabling

Opioids analgesics are **NOT** expected to completely relieve your pain or treat non-pain problems, like depression, sleep disturbance, and anxiety. The goals of taking an opioid analgesic are:

- ❑ Improve function
- ❑ Improve your ability to participate in pain rehabilitation therapy
- ❑ Provide a safe pain-relieving treatment
- ❑ Reduce your pain to a moderate pain severity level

Continued prescription of this medication requires demonstration of:

- ❑ Improved function: _____
- ❑ Improved ability to participate in therapy: _____
- ❑ Pain reduction to moderate pain severity: _____/10

Your doctor will need to ensure that you are taking your medication correctly by requiring you to:

- ❑ Take your medication on a regular schedule and not adjust the dosage without written instructions from your doctor
- ❑ Obtain prescriptions only at one pharmacy:_____
- ❑ Attend regular follow-up visits:_____
- ❑ Not request early medication refills
- ❑ Not obtain any additional pain-relieving medications from any other healthcare provider

Misuse or abuse of opioid analgesics occurs in about 25–30% of chronic pain patients. Failure to comply with these requirements or the development of medication tolerance may result in discontinuation of therapy and/or referral to a drug abuse counselor.

I have read the above contract with my treating physician and agree to its terms. In addition, I agree to allow my doctor and his staff to share this contract and communicate with my pharmacy and my other healthcare providers.

_____ _____

Consenting patient signature Date of contract

_____ _____

Prescribing healthcare provider's signature Date

Summary

When treating chronic pain complaints, clinicians must balance achieving effective pain relief with minimizing risk for drug abuse and diversion. Unfortunately, pain relievers are the third most commonly abused illicit drug category after marijuana and cocaine, with abusing patients most often securing pain relievers from family, friends, or their doctors. Despite risks of medication misuse and abuse, opioid analgesics may become necessary in patients with disabling, recalcitrant pain due to failure of other pain therapy, inability to tolerate other medications, and severe, functional impairments. Continued opioid treatment must be contingent on treatment compliance and achievement of functional improvement goals, such as increased household chores, return to work, or increased ability to participate in physical or occupational therapy.

Patient assessment, clinician decision-making, and discussions with the patient about pain treatment must be clearly documented, including reasons for selecting a specific therapy, treatment objectives, goal attainment, and consideration of therapy adjustment at follow-up visits. Standardized documentation sheets can be used to improve communication about pain diagnosis and treatment within the treatment team, between the treatment team and the patient, and for third party chart reviewers.

Test Your Knowledge

1. In 2006, what percentage of people reported using a prescription drug non-medically in the preceding month?

   a. <1%
   b. 3%
   c. 10%
   d. 25%
   e. 35%

2. Where do pain relievers rank among common illicit drugs of abuse:

   a. First
   b. Second after marijuana
   c. Third after marijuana and cocaine
   d. Fourth after marijuana, cocaine, and heroin

3. Which of the following guidelines are recommended by the Federation of State Medical Boards when treating pain patients:

   a. Document a complete history and physical examination
   b. Document a treatment plan
   c. Periodically re-evaluate prescribed treatment
   d. Document treatment compliance
   e. All of the above

4. According to the Joint Commission on Accreditation of Healthcare Organizations, which patients should be asked about experiencing pain:

   a. All patients with medical conditions that might result in pain
   b. Only patients spontaneously reporting pain or requesting pain relievers
   c. Only patients with a history of prescription drug abuse
   d. Only patients with a history of illicit drug abuse

5. Follow-up visit documentation should include information about:

   a. Pain reduction
   b. Functional improvement
   c. Psychological distress
   d. Treatment compliance
   e. Treatment adjustments
   f. All of the above

6. Changes in opioid treatment should be considered in patients who

   a. Self-regulate medication dosing
   b. Report pain relief without functional benefits
   c. Fail to achieve treatment goals
   d. a and c
   e. All of the above

Answers: 1b, 2c, 3e, 4a, 5f, 6e

References

1. Scheinfeld N. The law on failure to treat pain. Ostomy Wound Manage 2004;50:9–10
2. Tucker KL. A piece of the puzzle: bringing accountability to failure to treat pain adequately. J Palliat Med 2003;6:615–617
3. Bhamb B, Brown D, Hariharan J, et al. Survey of select practice behaviors by primary care physicians on the use of opioids for chronic pain. Curr Med Res Opin 2006;22:1859–1865
4. Clark JD. Chronic pain prevalence and analgesic prescribing in a general medical population. J Pain Symptom Manage 2002;23:131–137
5. Manchikanti L, Giordano J, Boswell MV, et al. Psychological factors as predictors of opioid abuse and illicit drug use in chronic pain patients. J Opioid Manag 2007;3:89–100

Chapter 4
Physiology of Chronic Pain

Key Chapter Points:

- Chronic pain is the consequence of abnormal nerve sensitivity, firing, and connections.
- Pain persisting for 3 months is unlikely to resolve spontaneously.
- Premorbid psychological distress, occupational issues, nicotine use, and a previous pain condition can be used to predict the persistence of pain.
- Complete fabrication of pain complaints or malingering occurs rarely.

Key Words: Allodynia, Hyperalgesia, Malinger, Predictor, Sensitization

Case History

Mr. Thompson, a 46-year-old school custodian, has always enjoyed his work and has an excellent work attendance record. While lifting a large bucket of water, he developed excruciating back pain that radiated down his leg and felt that he "couldn't stand up straight." He left work and went home to bed, but noticed numbness in his big toe the next morning and needed his wife's assistance to get out of bed. Mr. Thompson saw his doctor, who diagnosed a herniated lumbar disc with an L5 radiculopathy. Mr. Thompson proceeded to have surgery and noticed some decrease in numbness postoperatively. He and his wife were told by the surgeon that the surgery was a success. At a follow-up visit with the surgeon 1 month later, Mr. Thompson reported persistent, disabling pain. Physical examination showed good muscle strength and reflexes and appropriate sensation in his legs. Forward flexion of the back was moderately decreased, and the muscles next to the spine were increased in bulk and tender to gentle palpation. Repeat magnetic resonance imaging and electromyographic testing were unremarkable. The surgeon provided a book showing back exercises and suggested that Mr. Thompson return to work when he felt ready. Three months after surgery, Mr. Thompson saw his family doctor, who read the surgeon's notes of good neurological outcome from the procedure. Mr. Thompson, however, continued to report persistent pain. He reported

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

an inability to do the exercises because of pain and had not returned to work. Mr. Thompson spent the day watching television and had discontinued all household chores. Mr. Thompson noted that his wife was "just an angel," bringing him his meals in bed and helping him dress. He asked the primary care physician (PCP) for a note to continue staying home from work. Mr. Thompson was advised to begin his exercise program and return to work part time. A follow-up appointment was made in 3 months. Six months after surgery, Mr. Thompson continued to report persistent pain, as well as irritability and frustration over continued pain and disability. He remained sedentary throughout the day and had not returned to work. Mr. Thompson came to the appointment with a disability form and a request for handicapped parking. His wife frequently adjusted pillows behind his back and carried a drink for him. Repeat examination and review of testing again revealed no obvious pathology. The PCP became suspicious of symptom magnification and secondary gain and ordered a psychological evaluation.

Introduction

Acute pain is a frequent life experience, occurring when stubbing a toe, hitting a finger with a hammer, or falling on an icy sidewalk. Acute pain typically occurs as a consequence of injury or trauma and may be associated with symptoms of inflammation. A twisted ankle, for example, is hot, red, tender, and swollen, with spasms occurring in the surrounding muscles. These acute changes are beneficial: pain teaches the person to be more careful in the future to avoid additional injury and promotes rest for healing. A muscle spasm provides a natural protective cast, and increased blood flow brings repair cells. Healing occurs over several weeks to months and is generally associated with a reduction of pain, muscle spasm, and inflammation (Fig. 4.1). Chronic pain is defined as pain lasting longer than 3 months. Chronic pain may occur as a sequel to an acute injury, as a symptom of a degenerative illness (e.g., rheumatoid arthritis), or insidiously. Chronic pain beginning after trauma is associated with greater severity, disability, and psychological distress than non-traumatic pain.[1–3] The link between trauma and emotional distress in patients with chronic pain may be particularly strong in males.[4] This association between potentially compensable injury and resultant pain severity often leads to a suspicion that chronic pain is, for the most part, imagined, exaggerated, or feigned for secondary gain (e.g., worker's compensation or disability benefits, reduced household chores, and increased spousal attention).

Interestingly, once patients have developed a chronic pain condition, they respond to new pain differently. An interesting study compared response to experimental electrical stimulation in 16 patients with chronic back pain and 16 pain-free controls.[5] The controls showed habituation to repeated stimulation, with a lessening of response following recurring stimulation. While the first shock was painful, the nervous system became less responsive to subsequent exposure to the same stimulation. Among chronic pain patients, however, repeated stimulation resulted in an intensified

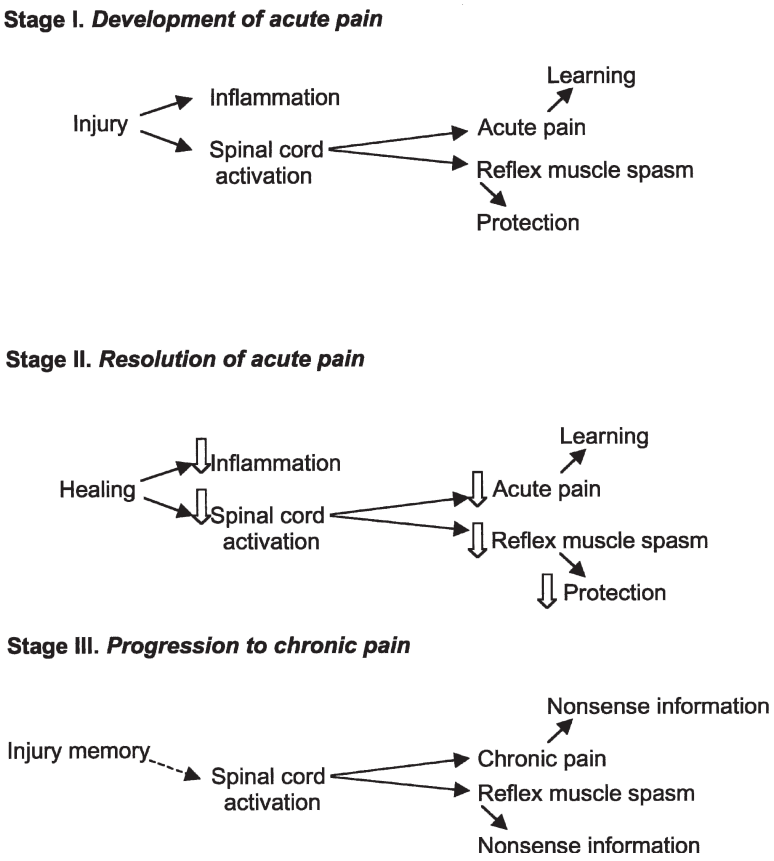


Fig. 4.1 Pathogenesis of acute and chronic pain. Stage I: Acute pain is associated with inflammation and activation of spinal pathways that send instructive pain messages to encourage future injury avoidance and cause protective muscle spasm. Stage II: Over ensuing weeks, injured tissues heal, inflammation resolves, and fewer central impulses are sent that can be registered as pain or trigger muscle spasm. Stage III: In patients who develop chronic pain, the nervous system continues to send signals for pain and muscle spasm as though in response to an acute injury, even though the injury is only a memory. Therefore, someone with chronic lumbar pain who is sitting in a chair may receive useless information that he or she is being injured and experience pain and muscle spasm, even though no active injury is present.

pain response, showing neural sensitization. This change in response to painful stimulation in individuals experiencing chronic pain may result in an accentuation of pain severity during clinical testing and predispose them to the development of additional pain complaints.

Mr. Thompson's case illustrates many common features of the course of chronic pain, as well as the common change from effective worker to disabled person. Chronic pain frequently occurs in the absence of identifiable pathology, leading to the frequent misperception that the pain is imaginary or being fabricated to obtain

financial benefits or solicitous behavior from others. Current research from animal models, however, clearly demonstrates long-lasting changes in the central nervous system wiring and activity as a result of an initial painful injury from which the animal has recovered. These studies suggest that similar patterns of neural plasticity may be responsible for persistent pain in humans, even after any identifiable pathology has been corrected. Why some individuals exposed to an injury develop only acute pain, while others develop chronic pain, is unknown. Healing appears to occur with both types of pain, but pain signals are reduced with healing in those with only acute pain. In patients who develop chronic pain, it is believed that neural connections are rewired and neural stimulus sensitivity changes during the healing process (Fig. 4.1). These changes in central plasticity have been well defined in rodent models of chronic pain.[6]

Pathophysiology of Chronic Pain

Investigators have identified consistent behavioral and physiological changes in animal studies that occur in response to trauma. These findings have been used to isolate physiology from possible secondary gain issues and help to confirm the veracity of chronic pain complaints for both the healthcare provider and patient. The most useful findings have been obtained from partial sciatic nerve ligation studies in the rat.[7,8] For these studies, a temporary ligature is tied around the exposed sciatic nerve and later removed. Although the nerve regains neurological function, the rats display pain behaviors – they attempt to auto-amputate the affected leg (i.e., commit *autotomy*) by biting it. Autotomy is believed to be the laboratory equivalent of human pain behaviors, such as verbalizing complaints or rubbing the painful back. Autopsy of rats used in these experiments revealed widespread neurological changes, with rewiring of neurons in the dorsal horn, spinal cord, and brain.[9,10] Such changes increase neuronal excitation, as well as the risk of abnormal connections from touch nerves to pain pathways.

The most carefully studied area in chronic pain models is the dorsal horn. Evaluations of models of chronic pain in rats reveal increased sensitivity of second-order neurons in the dorsal horn, with an increased number of action potentials and spontaneous discharges. These changes result in increased sensitivity to painful stimuli, or hyperalgesia. In addition, central terminals of mechanoreceptors are redistributed within the dorsal horn to connect with pain pathway neurons that would normally be triggered by pain stimuli (Fig. 4.2). In this case, stimulation with non-painful tactile stimuli, such as light touch or vibration, will activate pain neurons and result in a perception of pain or allodynia. The size of the neuronal receptive field also increases in the dorsal horn, resulting in the spread of pain perception to areas that were not originally involved with the injury that induced acute pain.

This model is similar to that of chronic lumbar pain that persists after “successful” herniorrhaphy and discectomy, as in the case of Mr. Thompson. As with rats, the human nerve may recover function, while significant physiologic and microscopic neural

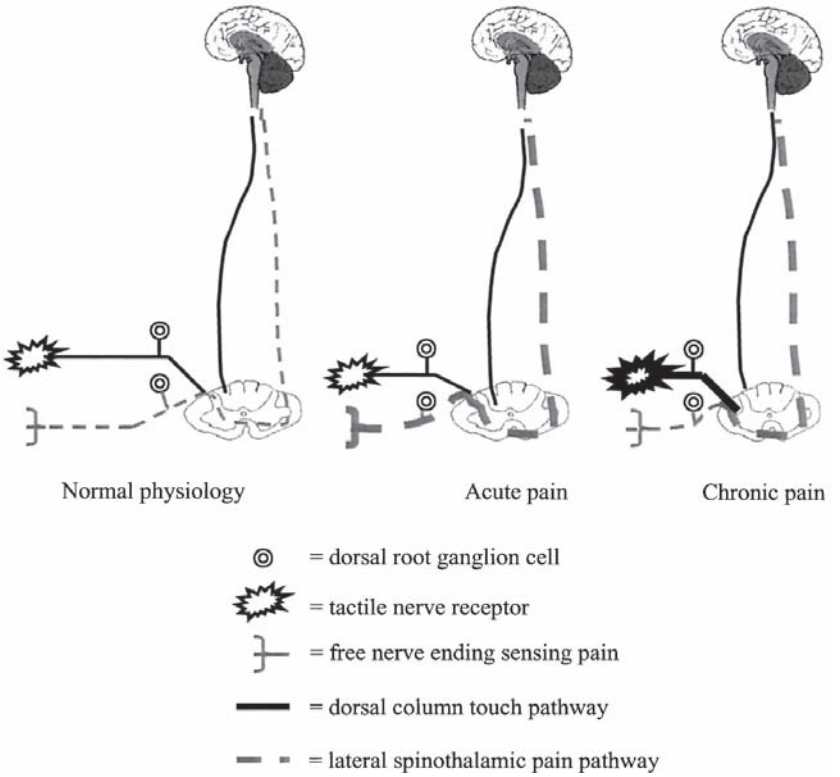


Fig. 4.2 Pathogenesis of chronic pain. Normally, stimulation of tactile receptors activates the dorsal column pathway and activation of free nerve endings activates the lateral spinothalamic pain pathway. Painful stimuli that are active during acute pain increase the signaling rate within the lateral spinothalamic pain pathway. Physiological changes occurring during chronic pain result in stimulation of tactile receptors (e.g., touch or vibration) activating lateral spinothalamic pathways, which results in the false interpretation by the brain that pain-sensitive nerve endings have been activated.

changes persist (Fig. 4.3). Patients may express symptoms of neural rewiring, including hyperalgesia, allodynia, and the spread of pain (Table 4.1). Evidence of changes in central nervous system function in chronic pain patients was supported by a recent functional magnetic resonance imaging study in which brain activity was compared in 15 chronic back pain patients and 15 matched controls.[11] During an attention task, researchers expected areas of the brain not involved in the attention task to become deactivated, allowing the brain to focus energies on critical areas involved in the task. When asked to perform an attention task, the medial prefrontal cortex, amygdala, and posterior cingulated gyrus did become less active in controls, but failed to sufficiently deactivate in chronic pain patients. Inability to deactivate non-critical areas in patients with chronic pain may result in difficulties in concentration and decision making,

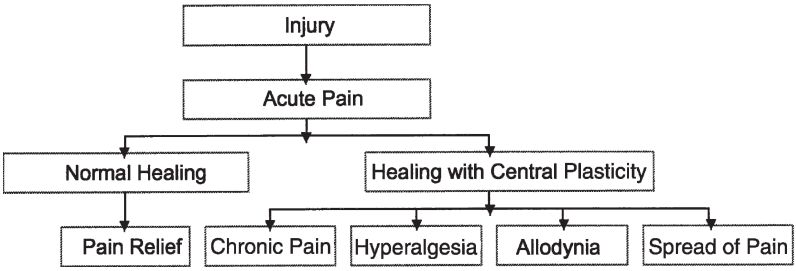


Fig. 4.3 Course of acute pain. The injury causing acute pain may heal and the pain may resolve. Alternatively, extensive neural changes may occur during the healing process, resulting in persistent pain and changes in neural physiology.

Table 4.1 Neurological changes with injury and resultant symptomatic complaints

Physiological change	Medical symptom	Typical patient complaints	Typical examination finding
Lower pain threshold Increased action potentials Spontaneous firing	Hyperalgesia: increased sensitivity to painful stimuli	Increased sensitivity to scratches, pinches, or hot water	Exaggerated pain response to gentle pinprick
Touch mechano-receptor neurons reconnect to pain pathways	Allodynia: non-painful touch stimuli perceived as painful	Bedclothes touching bare feet is painful Wind blowing across or cool water touching a limb is painful	Limb withdrawal and grimacing from light touch Guarding painful area to prevent touching
Increase in receptive field size	Spread of pain to adjacent, non-injured areas	Pain spreads from originally injured ankle to affect entire foot	Tenderness to palpation in areas near site of original injury

frequently expressed by such patients, and may help explain additional complaints common to them, such as mood and sleep disturbances.

Long-Term Changes from Pain Exposure

Recent studies investigating brain physiology suggest that even though the older child or adult may not consciously remember early painful experiences, the cerebral cortex is activated. Using near-infrared spectroscopy, two studies of preterm newborns have confirmed that pain generates a cortical response rather than just a brainstem reflex withdrawal in preterm infants.[12,13] For example, hemodynamic

changes in the cortex have been noticed following a clinically required heel lance in infants as young as 25 weeks postmenstrual age.[13]

The clinical significance of this early brain activation is demonstrated in studies comparing pain response to routine vaccination between babies who have had circumcision with or without anesthesia or no circumcision after delivery.[14,15] Previously circumcised babies display a strong pain response to vaccination injections performed at 6 months, with a significantly greater expression of pain among boys circumcised without anesthesia (P <0.05). These data support the theory that painful peripheral stimulation can produce long-lasting changes in central pain processing mechanisms. Furthermore, untreated, persistent pain may produce long-lasting changes in neural mechanisms that outlast the initial pain symptoms. These data suggest a need to aggressively treat the initial stages of chronic pain to hopefully prevent long-term central nervous system activation in response to pain signaling.

Expected Course of Chronic Pain

Pain persisting longer than 3 months is unlikely to resolve spontaneously.[16] Prospective studies of patients with a complaint of new low back pain who are seen in a primary care setting have demonstrated that symptoms persist longer than 3 months in 48–79% of these patients and longer than 12 months in 42–75% of these patients.[17–19] Anecdotally, however, doctors often notice only a small minority of patients consult them again following the initial assessment of acute pain. This implies that most instances of acute pain resolve spontaneously. In a sample of 463 new general practitioner consultations for acute back pain, the percentage of patients returning with pain complaints was very low.[17] When patients were contacted and asked directly about persistent and troublesome symptoms, however, reports of chronic pain and disability were high (Fig. 4.4). These data suggest that significant pain complaints often do persist, despite a lack of reconsultation. In addition, pain failing

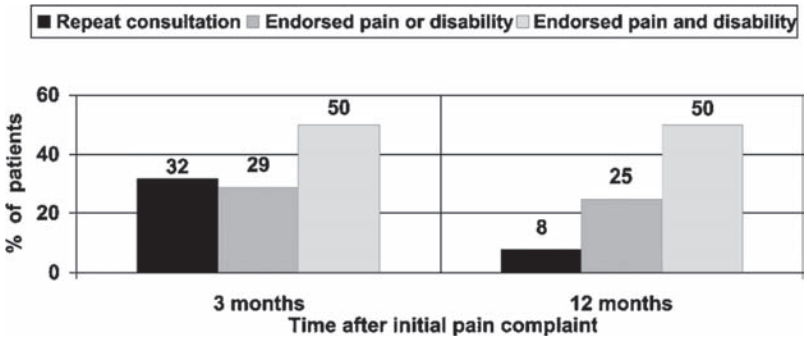


Fig. 4.4 Discrepancy between reconsultation rate and persistence of symptoms following acute back pain. Disability reflects difficulty performing activities of daily living (based on data from Croft[17]).

to resolve after 3 months is likely to persist for at least 12 months. Therefore, treatment should be initiated for pain that persists for at least 3 months.

Predictors of Chronic Pain

Medical science is unable to explain why two persons exposed to a seemingly similar injury may have different pain outcomes – one with only acute pain and the other with years of chronic pain. Several studies have identified physical, psychological, and social features that predict a greater likelihood of persistent pain (Table 4.2).[18,20–25] Interestingly, gender and premorbid psychological characteristics predict persistent pain for seemingly disparate pain conditions, such as myofascial masticatory pain and chronic low back pain. These features can be used to predict a greater likelihood of persistent pain when positive predictive features are present and indicate the need for a more aggressive type of therapy.

Certain types of chronic pain also occur more commonly in people with certain occupations. For example, professions strongly associated with high risk for developing chronic low back pain include those that require lifting, pushing, or pulling 25 lb or more; prolonged standing; or sustained postures.[26,27] Such high-risk occupations include some healthcare occupations (e.g., nurse's aides, nurses, dentists, and chiropractors), construction workers, automobile mechanics, housekeepers/janitors,

Table 4.2 Predictors of chronic pain

	Factors predicting chronic pain
Physical findings	Back pain associated with restricted lumbar flexion Abnormal neurological examination
Symptoms	Non-localized pain Insidious pain onset Back pain radiates to leg
Psychosocial factors	
Personal issues	Female gender Prior chronic pain history Prior trauma history Delay before consultation (≥30 days) Dissatisfaction with consultant Depression or psychological distress Nicotine use
Family issues	Lack of social support Family de-legitimizes pain Family history of chronic pain
Occupational issues	Dissatisfaction with work or work status Unemployment Previous job change related to pain

and hairstylists.[28–31] A survey of nurses' aides, for example, revealed complaints of musculoskeletal pain during the previous 2 weeks in 89% of respondents, with 51% rating the pain as intense.[32] A work-related back injury is more likely to occur in individuals with these high-risk occupations than in sedentary workers. In addition, identifying a worker as being at high risk for chronic pain based on physical, psychological, or social characteristics may result in implementing early and more aggressive treatment.

Identifying the Malingerer

To provide appropriate care for patients with chronic pain, the clinician must be able to trust the patient's reports of discomfort and pain experiences, because there are no objective measures of pain. The clinician must also consider the fact that the patient's descriptions and displays of pain are influenced by past pain experiences, gender, and cultural background. Different responses to pain can be readily noted in the labor suite, for example, where uterine contractions of the same magnitude result in quiet, deep breathing in one woman and loud cries from another. The stoic person may report pain as discomfort, with little display of pain mannerisms, whereas a more demonstrative person may use pain descriptors like "searing" or "crippling" and frequently change positions, grimace, or moan in pain during the interview. Healthcare providers may question the validity of reports from either type of patient and be reluctant to prescribe treatment to patients with either seemingly minor or exaggerated pain complaints. It is important to remember, however, that the most reasonable patient can be frustrated by chronic pain and the resulting sleep deprivation, along with an apparent need to "prove" there is really something wrong when all test results are normal. It is essential to treat all patients with respect and openness and let them see that you trust each patient as a treatment partner, not as an adversary. When patients trust their healthcare provider in return, they are most likely to cooperate with evaluations.

Malingering patients are fortunately rare and are usually easy to spot (Box 4.1). Malingerers are consciously aware that they are reporting false symptoms. They typically believe that they can fool most doctors, but it is doubtful that they will be able to fool every doctor. Therefore, malingerers try to avoid providing information, either during the history or examination, that could identify the false character of their complaints. They will avoid providing any historical information and insist the doctor rely on available medical records or that the doctor provide descriptions to which they can agree. Later, if a discrepancy is identified, they will rightly remind the doctor that *they* had not stated the falsehood – either the chart or doctor did. These patients will also insist that they cannot complete a pain questionnaire or a physical examination because their pain is intolerable. Malingerers have learned to successfully make healthcare providers feel guilty about not treating them, even when the provider does not feel comfortable prescribing therapy. Malingerers will usually insist that they need medication first before undergoing any diagnostic

Box 4.1 Warning signs for malingering

- Uncooperative with providing historical data
- Uncooperative with basic physical examination, including gait testing
- Refuses additional testing or reports tests were completed and normal, although the doctor cannot access them because they are lost, destroyed, or at a facility whose name is unknown to the patient
- Insists on one particular treatment and refuses all other options
- Interview focuses exclusively on completion of disability forms or providing specific requested prescriptions rather than on improving patient symptoms

evaluations and will threaten to go to the emergency department if the doctor fails to provide pain relief. In contrast to the malingerer who will refuse additional testing, most patients with chronic pain are eager to have additional tests to identify their pathology.

Patients with "legitimate" pain typically want to get better and will, therefore, cooperate with examinations. Some patients will seem to exaggerate the severity of their symptoms, although this may be in anticipation of a painful examination or their perception that the doctor does not believe the pain is real. If a patient cannot be adequately cooperative during an examination to allow the clinician to establish a diagnosis, the clinician should explain that his or her ability to select an effective treatment is contingent on establishing a diagnosis; if necessary, a second appointment should be made at a time when the patient is more likely to be cooperative. The malingerer will take his or her case elsewhere, whereas the person who is truly interested in improvement is likely to cooperate during a repeat visit.

Signs of non-organic pathology, symptom magnification, or malingering have been categorized by Waddell and colleagues.[33] These categories were recently evaluated for their usefulness in identifying non-organic symptoms in patients with pain.[34] Waddell's signs include superficial skin tenderness, diffuse tenderness, pain on pressing on the top of the head or rotation of the thorax, change in straight leg raise performance when distracted from testing, give-away weakness, non-dermatomal sensory loss, and excessive expression of pain. As expected, patients with these signs tend to endorse higher pain levels and greater disability. Contrary to prediction, however, these signs do not correlate with psychological distress or secondary gain, nor do they discriminate between patients with organic and non-organic pathology. For example, patients may produce a greater straight leg raise test when distracted because they anticipate pain with testing and tense muscles before testing occurs. This does not mean that the patient is exaggerating the level of restriction, but rather that straight leg raise testing should be performed during distraction to achieve optimal testing accuracy.

Summary

Experimental rodent studies clearly demonstrate changes in neural connections and activity that persist despite the recovery of gross neural function. Documentation of neural abnormalities that result in symptoms of hyperalgesia, allodynia, and the spread of pain in rodent models adds credence to patient reports of similar symptoms after recovery from an acute injury is complete. Knowledge of these studies is beneficial for both the healthcare provider and patient, particularly because there are no objective measures of pain that can be identified with clinical, laboratory, or radiographic testing.

Test Your Knowledge

1. Experimental nerve injuries can result in rewiring of the central nervous system that causes:

   a. Lowered pain threshold
   b. Increased sensitivity to pain
   c. Spread of pain to contiguous body regions
   d. All of the above

2. Choose the correct statement:

   a. Ninety percent of injuries causing acute pain will lead to chronic pain.
   b. Pain persisting for 3 months is likely to persist if untreated.
   c. Pain beginning after an automobile accident is usually a sign of malingering.
   d. None of the above

3. Which of the following occupations is not associated with high risk for developing chronic back pain?

   a. Hairstylist
   b. Receptionist
   c. Carpenter
   d. Janitor
   e. Nurse

4. Which of the following patient characteristics is associated with high risk for chronic pain?

   a. Male gender
   b. No history of depression or anxiety
   c. No history of previous injury or chronic pain
   d. Supportive family
   e. Nicotine use

5. Choose the TRUE statement:

   a. Perinatal analgesia is unnecessary because babies do not remember painful experiences.
   b. Repeated pain stimulation results in a dampened response habitation in controls and intensified pain with sensitization in chronic pain patients.
   c. Pain persisting beyond the expected period of healing is unusual and typically suggests new, likely correctable pathology.
   d. A and B
   e. All of the above

6. Which of the following may be regarded as a warning sign for malingering?

   a. Pain persisting beyond the healing period
   b. Widespread pain or fibromyalgia
   c. Pain attributed to work injury
   d. Patient refuses to provide historical information or participate in a physical examination
   e. All of the above

Answers: 1d; 2b; 3b; 4e, 5b, 6d

References

1. Turk DC, Okifuji A, Starz TW, Sinclair JD. Effects of type of symptom onset on psychological distress in fibromyalgia syndrome patients. Pain 1996;68:423–430
2. Turk DC, Okifuji A. Perception of traumatic onset, compensation status, and physical findings: impact on pain severity, emotional distress, and disability in chronic pain patients. J Behav Med 1996;19:435–453
3. Marcus DA. Disability and chronic post-traumatic headache. Headache 2003;43:117–121
4. Spertus IL, Burns J, Glenn B, Lofland K, McCracken L. Gender differences in associations between history and adjustment among chronic pain patients. Pain 1999;82:97–102
5. Flor H, Diers M, Birbaumer N. Peripheral and electrocortical responses to painful and nonpainful stimulation in chronic pain patients, tension headache patients and healthy controls. Neurosci Lett 2004;361:147–150
6. Decosterd I, Woolf CJ. Spared nerve injury: animal model of persistent peripheral neuropathic pain. Pain 2000; 87:149–158
7. Bennett GJ, Xie YK. A peripheral mononeuropathy in rat that produces disorders of pain sensation like those seen in man. Pain 1988;33:87–107
8. Seltzer Z, Dubner R, Shir Y. A novel behavioral model of neuropathic pain disorders produced in rats by partial sciatic nerve injury. Pain 1990;43:205–218
9. Guilbaud G, Gautron M, Jazat F, et al. Time course of degeneration and regeneration of myelinated nerve fibers following chronic loose ligatures of the rat sciatic nerve: can nerve lesions be linked to the abnormal pain-related behaviours? Pain 1993;53:147–158
10. Behbehani MM, Dollberg-Stolik O. Partial sciatic nerve ligation results in an enlargement of the receptive field and enhancement of the response of dorsal horn neurons to noxious stimulation by an adenosine agonist. Pain 1994;58:421–428
11. Baliki MN, Geha PY, Apkarian AV, Chialvo DR. Beyond feeling: chronic pain hurts the brain, disrupting the default-mode network dynamics. J Neurosci 2008;28:1398–1403

12. Bartocci M, Bergqvist LL, Lagercrantz H, Anand KS. Pain activates cortical areas in the preterm newborn brain. Pain 2006;122(1–2):109–117
13. Slater R, Cantarella A, Gallella S, et al. Cortical pain responses in human infants. J Neurosci 2006;26(14):3662–3666
14. Taddio A, Goldbach M, Ipp M, Stevens B, Koren G. Effect of neonatal circumcision on pain responses during vaccination in boys. Lancet 1995;345(8945):291–292
15. Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. Lancet 1997;349(9052):599–603
16. Carey TS, Garrett JM, Jackman A, Hadler N. Recurrence and care seeking after acute back pain: results of a long-term follow-up study. North Carolina Back Pain Project. Med Care 1999;37:157–164
17. Croft PR, Macfarlane GJ, Papageogiou AC, et al. Outcome of low back pain in general practice: a prospective study. Br Med J 1998;316:1356–1359
18. Thomas E, Silman AJ, Croft PR, et al. Predicting who develops chronic low back pain in primary care: a prospective study. Br Med J 1999;318:1662–1667
19. Schiotz-Christensen B, Nielsen GL, Hansen VK, et al. Long-term prognosis of acute back pain in patients seen in general practice: a 1-year prospective follow-up study. Fam Pract 1999;16:223–232
20. Macfarlane GJ, Thomas E, Croft PR, et al. Predictors of early improvement in low back pain amongst consulters to general practice: the influence of premorbid and episode-related factors. Pain 1999;80:113–119
21. Reis S, Hermoni D, Borkan JM. A new look at low back pain complaints in primary care: a RAMBAM Israeli Family Practice Research Network study. J Fam Pract 1999;48:299–303
22. Croft PR, Papageogiou AC, Ferry S, et al. Psychological distress and low back pain. Evidence from a prospective study in the general population. Spine 1995;20:2731–2737
23. Scott SC, Goldberg MS, Mayo NE, Stock SR, Poitras B. The association between cigarette smoking and back pain in adults. Spine 1999;24:1090–1098
24. Palmer KT, Syddall H, Cooper C, Coggon D. Smoking and musculoskeletal disorders: findings from a British national survey. Ann Rheum Dis 2003;62:33–36
25. Velly AM, Gornitsky M, Philippe P. Contributing factors to chronic myofascial pain: a case–control study. Pain 2003;104:491–499
26. Macfarlane GJ, Thomas E, Papageogiou AC, et al. Exercise and physical activities as predictors of future low back pain. Spine 1997;22:1143–1149
27. Smedley J, Egger P, Cooper C, Coggon D. Prospective cohort study of predictors of incident low back pain in nurses. Br Med J 1997;314:1225–1228
28. Leighton DJ, Reilly T. Epidemiological aspects of back pain: the incidence and prevalence of back pain in nurses compared to the general population. Occup Med 1995;45:263–267
29. Diakow PR, Cassidy JD. Back pain in dentists. J Manipulative Physiol Ther 1984;7:85–88
30. Mior S, Diakow PR. Prevalence of back pain in chiropractors. J Manipulative Ther 1987; 10:305–309
31. Guo HR, Tanakas S, Cameron LL, et al. Back pain among workers in the United States: national estimates and workers at high risk. Am J Ind Med 1995;28:591–602
32. Eriksen W. The prevalence of musculoskeletal pain in Norwegian nurses' aides. Int Arch Occup Environ Health 2003;76:625–630
33. Waddell G, McCulloch JA, Kummel E, et al. Nonorganic physical signs in low-back pain. Spine 1980;5:117–125
34. Fishbain DA, Cole B, Cutler RB, et al. A structured evidence-based review on the meaning of nonorganic physical signs: Waddell signs. Pain Med 2003;4:141–181

Chapter 5
Headache

Key Chapter Points:

- Chronic headache needs to be treated because of its association with significant disability.
- Migraine is the most common type of headache presenting to primary care.
- Hallmarks of serious headache include change in headache pattern, posterior head pain, headache occurring after middle age, and associated neurological abnormalities.
- Regular, frequent use of analgesics and other acute headache medications aggravates underlying headaches and reduces efficacy of standard therapy.

Key Words Cluster, Migraine, Rebound, Tension-type, Post-trauma

Case History

Ms. Sharpe is a 38-year-old high school administrator. She describes incapacitating headaches accompanied by vomiting that can take her to bed 2–3 times a week, although she rarely misses work because of this affliction. She reports that her family becomes angry with her for wanting to spend Friday evenings in bed rather than going to the movies or attending some family activity. She has never found relief with analgesics or triptans. Her primary care physician (PCP) diagnoses Ms. Sharpe with migraine, prescribes a night-time dose of amitriptyline, and arranges a follow-up visit in 3 weeks. Three weeks later, she reports no improvement and her PCP subsequently prescribes trials with propranolol, verapamil, and valproate, all without relief. At this point, Ms. Sharpe is given a daily headache-recording diary, which she is asked to keep over the next month. When the diary is reviewed, her PCP notes that, in addition to the one or two severe migraine episodes each week, she also records a daily headache that fluctuates in severity between mild and moderate, lasting most of the day. She is taking four to six tablets of Excedrin a day, four ibuprofen tablets 3 days a week, and Imitrex

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

twice a week. In her history, she notes drinking approximately six cups of coffee daily. As excessive use of analgesics, caffeinated products, and other acute-care medications (e.g., triptans) typically aggravates underlying headache disorders, Ms. Sharpe's PCP asks her to discontinue all acute therapies and limit coffee to two cups per day. She is also prescribed Relafen twice daily as treatment for medication overuse or rebound headache and is allowed to take one additional Relafen dose on days with severe pain. One month later, she reports that she no longer suffers from daily headaches, but still has a severe migraine once a week. This is easily managed with infrequent use of Imitrex, which had previously proved ineffective when taken in conjunction with daily analgesics.

Introduction

This case demonstrates the importance of extracting an accurate history of headache pattern to correctly assign a headache diagnosis and prescribe effective therapy. Because headaches often begin in childhood or adolescence, a full headache history can become quite lengthy, especially as headache characteristics may change with age and reproductive status in women. This chapter provides tools to help focus patient questioning to accurately identify diagnosis(es). After identifying correct headache diagnosis(es), management is relatively straightforward, with treatment divided into first-, second-, and third-line therapies for most commonly recurring headaches.

Epidemiology and Impact of Chronic Headache

Headache is endorsed as a current complaint by nearly half (46%) of all adults worldwide,[1] and is the fourth most common somatic complaint seen in primary care after pain in the back, lower extremity, and upper extremity.[2] The vast majority of chronic headache patients are managed by PCPs. According to the National Ambulatory Medical Care Survey, two in every three migraine patients are treated by PCPs, with only 17% treated by neurologists.[3]

Chronic Headache Diagnoses Seen in Primary Care

Lifetime prevalence of headache worldwide is 66%.[1] The most common types of chronically recurring headaches are tension-type and migraine. When considering currently active headache, tension-type affects nearly four times as many people as migraine (Fig 5.1). Although tension-type headache is more prevalent than

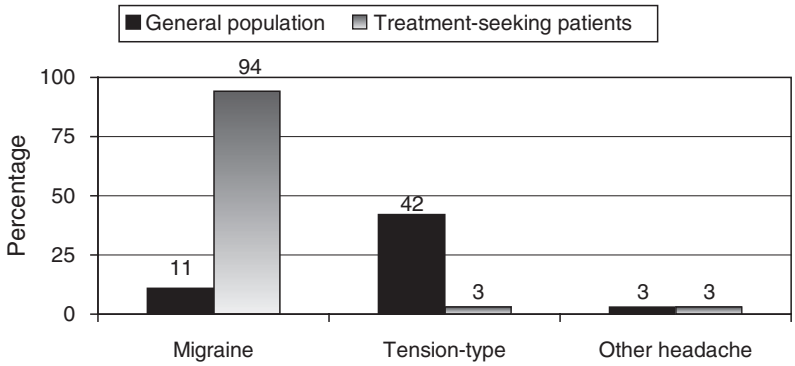


Fig. 5.1 Comparison of the prevalence of active headache in the general population vs. individuals who seek treatment from primary care physicians. Although migraine occurs in only 11% of the general population, 94% of patients who seek primary care treatment for headache have migraine (based on Tepper[5], Stovner[1]).

migraine, people with the latter are more likely to seek care, as seen from the fact that the number of family practitioner office visits for migraine surpasses that for tension-type headache.[4] An international survey of patients seeking treatment for headache from PCPs revealed a diagnosis of migraine in 94%, with tension-type headache in only 3% (Fig. 5.1).[5] Both migraine and tension-type headache are more prevalent among women. [1] For example, the American Migraine II survey of nearly 30,000 Americans identified migraine in 18% of females and 6.5% of males.[6]

Cluster headache is an uncommon, but important chronic headache, occurring in less than 1% of adults. Curiously, the male predominance of cluster headache has decreased in recent decades, with a 6:1 male predominance reported during the 1960s decreasing to a 2:1 predominance in the 1990s.[7] Changes in lifestyle, such as increased use of tobacco and nicotine products by females, as well as their increased role in the workforce, have been postulated to contribute to this changing epidemiology. Furthermore, the overall incidence of cluster headache has been decreasing sharply over the last several decades. For example, the incidence rate in Rochester, Minnesota during 1979–1981 was 9.8 cases per 100,000 persons, dropping to 2.07 per 100,000 between 1989 and 1990.[8] Patients with cluster headaches often engage in bizarre behavior during a cluster attack, such as hitting their heads against the wall or pounding the painful eye. Many patients and their families become concerned that this signifies serious psychiatric disease rather than a reaction to intense pain. It is, therefore, useful to ask patients with cluster headaches about any such actions to assure them that these represent typical cluster behavior. Clearly, potentially harmful behavior should be discouraged. As cluster pain is controlled, such actions will remit.

Chronic headache may also begin as a consequence to head injury. For example, a survey of 357 college athletes who had sustained sport-related concussions revealed headache in 70% of football players and 73% of soccer players.[9] Post-trauma headaches begin within 7 days of a head injury associated with concussion. In 60% of

cases, headache will persist longer than 2 months.[10] Post-traumatic headache resolves for most patients within 6–12 months after injury, persisting longer than 1 year in 33% and longer than 3 years in 15–20%.[11] The type of injury may predict the likelihood of persistent post-traumatic headache. A survey of victims of rear-end collisions revealed headache 7 years after the accident in 22% who also reported associated whiplash versus 7% without whiplash.[12] Headache prevalence in a comparative, non-accident group was 5%. Interestingly, the presence or resolution of litigation does not significantly impact post-traumatic headache.[11,13–15]

Headache Impact and Disability

The World Health Organization has identified migraine among the top 20 causes of disability worldwide.[16] Societal impact from chronic headache is large because of the high prevalence of headache. In addition, individual impact is also significant. Economic impact from headache-related disability is similar in Europe, North America, and Central America.[17] Migraineurs reported losing an average of 19.6 workdays annually because of absenteeism and reduced productivity. Additional employer cost for each employed migraineur was estimated at more than $3,000 annually. Significant disability may also be associated with non-migraine headache.[18] Schwartz and colleagues evaluated headache-related work disability in a community sample of more than 13,000 employed adults.[19] Work absenteeism or reduced productivity as a result of headache occurred in 9.4% of adults. Migraine was more likely to be associated with work absenteeism than tension-type headache (57 vs. 43%), whereas tension-type headache was more likely to cause reduced work productivity (64 vs. 36%). A recent survey of 289 treatment-seeking headache sufferers, similarly identified greater overall disability for work and daily activities in patients with non-migraine headache (Fig. 5.2).[20]

As noted by the patient, Ms. Sharpe, headache-related disability extends beyond work loss. The American Migraine II survey identified frequent disability for school or work activities, household chores, and social functions (Fig. 5.3).[6]

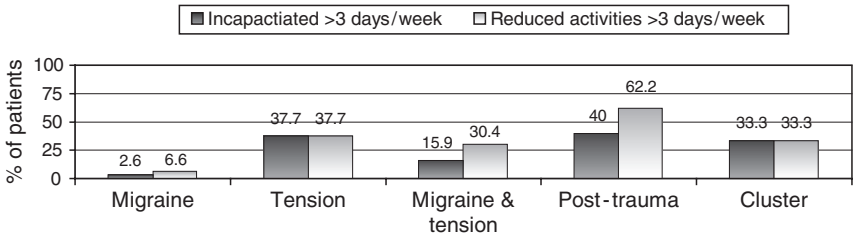


Fig. 5.2 Rate of disability due to chronic headache. Non-migraine headaches are associated with significantly greater disability than migraine ($P < 0.001$) (based on Marcus[20]).

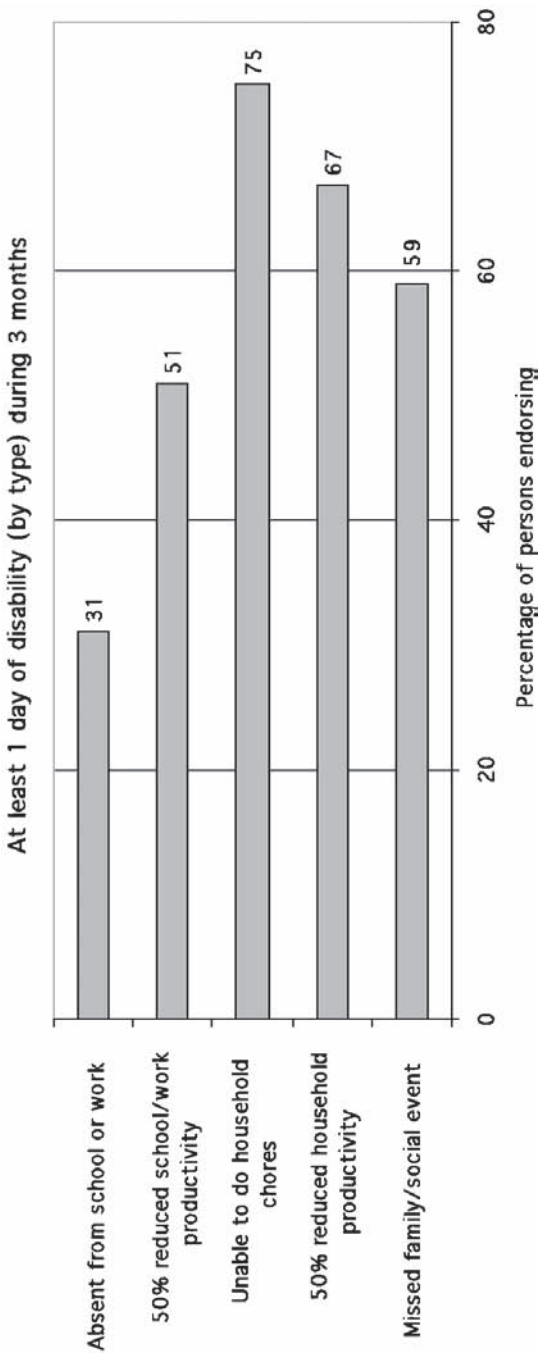


Fig. 5.3 Disability identified in migraineurs by American Migraine II survey (based on data from Lipton[6]).

A similar survey of more than 8,000 households in the United States and England identified significant impact of migraine on both the sufferers and their household members.[21] Among migraineurs who lived with a household partner, 85% reported significant reduction in the ability to perform household chores, 45% missed family or social activities, and 32% avoided making plans because of the fear of developing a headache. Eleven percent of partners of migraine sufferers missed three or more days of family or social plans during the previous 3 months because of their partner's migraine, and 12% avoided making plans because of the partner's migraine. In addition, parents with migraine reported a substantial impact on their children, including reduced ability to care for children and school absenteeism for the child because of their headache. Like Ms. Sharpe, migraineurs are more likely to reduce productivity, household chores, and family or social commitments than miss work or school.

Evaluation of Headache Complaints

Patients address headache complaints with their PCPs to ensure that the pain is not caused by serious pathology, such as a brain tumor, and to obtain symptomatic relief. Several clinical characteristics have been associated with more serious headache (Box 5.1).[22] Patients with any warning signs of serious headache or associated additional medical or neurological symptoms should be evaluated, to rule out serious causes of headache (Box 5.2). Fortunately, most patients who seek treatment for headache have migraine, a benign and fairly easy-to-treat headache.[5]

When asking diagnostic questions, it is essential to specify if a patient has one or more unique types of headache, for example, frequent, mild tension-type headache and infrequent, incapacitating migraine. If this is not clarified, patients may lump together the symptoms of different kinds of headaches as they are described. In this case, a patient with both migraine and tension-type headache may report daily headache and being bedridden with headache episodes, leading to the false perception that the patient is exaggerating headache symptoms. Patients rarely have more than two unique types of headaches. If patients report many headache "types," they should be asked to describe their most severe and their most frequent type of

Box 5.1 Warning signs and symptoms suggesting the need for additional work-up (based on Ramirez[22])

- New headache or significant change in headache character within 2 years
- Posterior head or neck pain
- Patient ≥50 years of age
- Abnormal neurological examination

Box 5.2 Evaluation of new-onset or worrisome headaches

- History and physical examination
  - Complete review of systems
  - Vital signs
  - Cervical spine examination
    - Resting posture
    - Active range of motion
    - Palpation
  - Neurological evaluation
    - Gait
    - Fundoscopy for papilledema
    - Assess symmetry of face and eye movements
    - Strength and reflex testing
    - Sensation to touch
    - Able to identify two of three numbers drawn in the palm without looking
- Laboratory
  - Radiological testing
    - Computed tomography or magnetic resonance imaging (MRI) of brain
    - X-ray of cervical spine for mechanical abnormalities[a]
    - MRI of cervical spine for radiculopathy[b]
  - Blood work
    - Autoimmune tests (antinuclear antibody)
    - Hematology (blood count)
      - Sedimentation rate or C-reactive protein and temporal arteritis workup for new headache in patients aged >50 years
    - Chemistries (electrolytes; liver and kidney function tests)
    - Endocrine (thyroid function tests)
    - Infections (rapid plasma reagin for syphilis)

[a]Mechanical abnormalities include abnormal posture, restricted range of motion, or pain reproduced with neck motion.
[b]Radiculopathy should be considered if focal strength, reflex, or sensory loss is present in an upper extremity.

headache for diagnostic purposes. A structured diagnostic interview can help focus patients to identify worrisome headache features, as well as patterns of common benign headaches (Box 5.3). Stable headache patterns can often be distinguished by applying the information learned through the structured interview to a diagnostic algorithm (Fig. 5.4).

Box 5.3 Questions to be answered by new headache patients

1. How long have your headaches been the way they are now?
   If new or change in headache has occurred within the past 2 years, consider more extensive evaluation.
2. Do you have one type of headache or more?
   If >1 type, ask questions to identify each type of headache.
3. Does your headache occur intermittently, or do you always have one?
   Ask about frequent prescription or over-the-counter analgesic use if headache occurs daily.
4. How often do you get a headache?
5. How long does each headache episode typically last?
   Headaches lasting <2 hours may indicate cluster headache. Also, the time course of headache may dictate therapy: short-acting medications are best for headaches that reach maximum intensity quickly; long-acting medications are often needed for headaches lasting ≥12 hours.
6. What do you typically do when you have a headache?
   a. Are usual activities reduced or curtailed?
   b. Do you go to bed?
   c. Do you need to turn off the television, radio, or lights in the room?
7. Are you having a headache right now? If so, is this how severe your headaches usually gets, or is this an especially "good" or "bad" day?
   Patient behavior in the clinic can be compared with historical reports if the patient is having a typical headache during the examination.
8. Where is the pain located? Is it always in the same location?
   Headache pain typically shifts between areas on the head during different headache episodes. Pain that is always located in the same spot (with the exception of cluster headache, which usually involves the same eye with each episode) or is located in the back of the head or neck often requires additional work-up.
9. Any other new problems since the headache began?
   Identification of new medical or neurological symptoms will suggest the need for additional evaluations.

Headache Diagnosis

Benign headaches are diagnosed by identifying common patterns. Recall of headache patterns can be difficult for many patients, particularly if they have frequent headache or two types of headache. In this circumstance, daily headache diary recordings for 1 month can be a useful tool to help elucidate headache pattern and diagnosis (Fig. 5.5). (A sample diary is provided in Appendix E.)

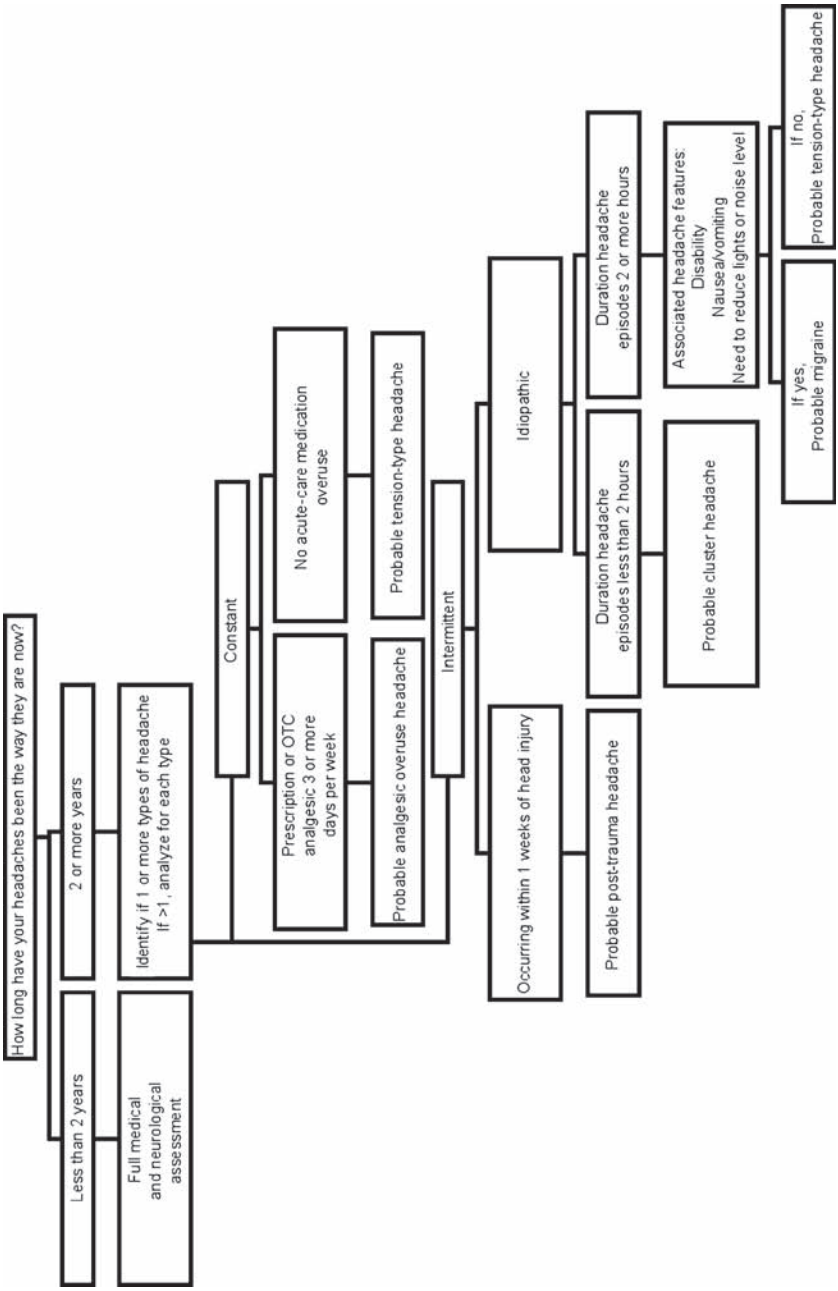


Fig. 5.4 Headache diagnostic algorithm.

Patient A. Intermittent, moderate-to-severe headache lasting >24 hours

Day 08 / 03 / 03	Severity (0-10)				Medication used (Prescription & OTC)	Menstrual days
Sunday	0	0	0	0		
Monday	0	0	0	0		
Tuesday	0	5	8	4	4 Excedrin	
Wednesday	3	0	0	0	1 Excedrin	
Thursday	0	0	0	0		
Friday	0	0	0	0		X
Saturday	0	0	0	0		X

Patient A diagnosis: Episodic migraine, non-menstrual

Treatment recommendation: Acute therapy with long-acting triptan

Patient B. Intermittent, disabling headache occurring with menses

Day 12 / 14 / 01	Severity (0-10)				Medication used (Prescription & OTC)	Menstrual days
Sunday	0	0	0	0		
Monday	4	6	0	0	2 Excedrin	X
Tuesday	0	5	8	4	4 Excedrin	X
Wednesday	0	0	7	6	2 Aleve	X
Thursday	0	0	0	0		X
Friday	0	0	0	0		
Saturday	0	0	0	0		

Patient B diagnosis: Menstrual migraine

Treatment recommendation: 5-day course of treatment perimenstrually

Patient C. Daily headache

Day 06 / 20 / 02	Severity (0-10)				Medication used (Prescription & OTC)	Menstrual days
Sunday	2	4	3	2	4 Excedrin, 2 Tylenol	
Monday	1	3	0	0	2 Tylenol	
Tuesday	0	4	6	4	6 Excedrin, 2 Fiorinol	
Wednesday	1	3	2	2	3 Ibuprofen	
Thursday	4	2	1	0	2 Imitrex	
Friday	2	3	5	0	2 Imitrex, 1 Fiorinol	
Saturday	1	2	2	1	3 Ibuprofen	

Patient C diagnosis: Medication overuse headache

Treatment recommendation: Discontinue current therapy; use Aleve twice daily; reassess diary in one month

Fig. 5.5 (continued)

Patient D. Daily mild headache, with occasional incapacitating headache lasting 8-12 hours

Day *06 / 20 / 02*	*Severity (0-10)*				*Medication used (Prescription & OTC)*	*Menstrual days*
Sunday	2	1	3	2		
Monday	1	3	0	0		
Tuesday	0	6	8	7	6 Excedrin, 2 Fiorinol	
Wednesday	0	0	2	2		X
Thursday	0	2	1	0		X
Friday	2	3	0	0		X
Saturday	0	0	2	1		X

Patient D diagnosis: Combined migraine & tension-type headache

Treatment recommendation: Preventive therapy plus fast-acting triptan when headache severity exceeds 5/10

Patient E. Cycle of brief, excruciating nightly headaches lasting 90 minutes

Day *10 / 13 / 01*	*Severity (0-10)*				*Medication used (Prescription & OTC)*	*Menstrual days*
Sunday	0	0	0	10		
Monday	0	0	0	10		
Tuesday	0	0	0	10		
Wednesday	0	0	0	9		
Thursday	10	0	0	9		
Friday	0	0	0	10		
Saturday	0	0	0	10		

Patient E diagnosis: Cluster headache

Treatment recommendation: Verapamil daily plus O_2 with attacks

Fig. 5.5 Sample diaries with headache diagnoses and treatment recommendations (Severity scale: 0 = no headache; 10 = incapacitated).

Patients with frequent or daily headache often focus on their most troubling headache, neglecting to mention the other frequent headaches that are often associated with medication overuse. Diaries will also help identify if menstruation is a consistent headache trigger.

Contrasting features of different headache patterns help distinguish most common, chronically recurring headaches (Fig. 5.6). Migraine headaches are intermittent and result in patients needing to curtail work activities. Although migraine is disabling, it usually occurs infrequently, maybe once or twice monthly. Some patients have frequent migraine, at most typically twice weekly. Migraine is not a daily headache. Each episode of migraine typically lasts approximately 6–12 hours.

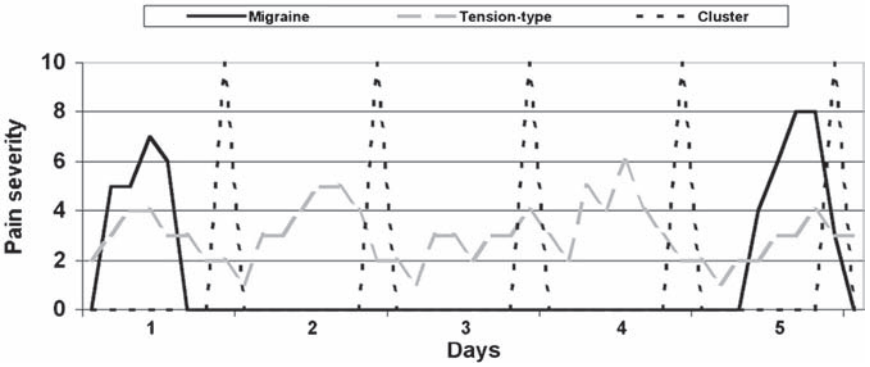


Fig. 5.6 Pattern of common recurring headaches. Some patients will have a combination of migraine and tension-type patterns, experiencing both patterns simultaneously. Post-traumatic headache may resemble migraine or tension-type headache. Medication overuse headache has a daily headache pattern similar to that for tension-type headache. Cluster headaches are characteristically very brief and very intense, and tend to recur predictably during a cluster period.

Tension-type headache, by contrast, is more frequent and long lasting, with milder episodes often lasting all day. Cluster headache is a very short-lasting, high-intensity headache that often occurs at night, approximately 90 minutes after initiating sleep, when dream sleep occurs. Pain is typically unilateral, orbital, or periorbital. Although cluster headache is generally associated with autonomic features, like pupillary changes or discharge from the eye and nostril, few cluster headache patients will note these features in their history, possibly because of the extreme intensity of the pain in the head. By contrast, migraineurs often endorse tearing of the eye and nasal discharge, although these features are very mild in comparison to their occurrence with cluster headache. Therefore, using the presence of autonomic features to distinguish migraine from cluster headache is often counterproductive.

Medication overuse or rebound headache can be difficult to diagnose unless a high index of suspicion is maintained. Medication overuse will not cause headache in a headache-free patient; however, the headache pattern of the chronic headache sufferer will be aggravated by medication overuse. Typically, patients experience a change from intermittent migraine to a daily tension-type headache. Another common scenario is the perpetuation of post-traumatic headache, with frequent headaches persisting longer than expected. Every patient reporting frequent headaches should be repeatedly questioned about medication overuse and required to complete a headache diary to log both headache and medication use. Any acute-care medication (triptans, ergotamine, analgesic or analgesic combinations, opioids, and butalbital combinations) may contribute to medication overuse headache. Patients with benign headache taking any acute-care medication or combination of acute-care medications on a regular basis at least 3 days per week for at least 6 weeks should be diagnosed with probable medication overuse headache. Switching among

acute-care agents on different days does not minimize the risk of medication overuse headache. Patients should not have acute-care medication at least 5 days per week.

Post-traumatic headaches occur within 1 week of a head injury. The head injury should be significant enough to have produced a concussion, which may be experienced as "feeling dazed," "seeing stars," having amnesia for events before or after the accident, or experiencing a brief loss of consciousness. Post-concussive syndrome features often accompany post-traumatic headaches: depressed or irritable mood, memory loss, dizziness or vertigo, and tinnitus. Post-traumatic headache should improve from constant and severe to milder and less frequent over the first 2 weeks. Headaches which fail to improve, worsen, or are associated with progressive post-concussive symptoms should be re-evaluated with imaging studies to rule out subacute pathology, such as subdural hematoma or undiagnosed fracture. Headache features are often consistent with migraine in the early phases of post-traumatic headache and often become milder like tension-type headache when post-traumatic headache persists.

Headache Treatment

Similar treatment may be used to treat migraine, tension-type, and post-traumatic headaches.[23] Most non-medication and medication treatments work equally well for all three types of headache, with the exception of valproate (Depakote), which is more effective for migraine. The first step in headache treatment is identifying the contribution of analgesic overuse. Patients regularly using prescription or over-the-counter acute-care or analgesic medications at least 3 days per week are at risk for developing medication overuse headache. Standard acute-care and preventive therapies are ineffective in patients with concomitant analgesic overuse; therefore, discontinuation of analgesics or triptans and tapering of opioids and butalbital compounds must be completed before patients can expect improvement.

Monitoring the benefits from headache treatment is best accomplished using a daily headache diary. Patients should record headache severity three or four times daily. In this way, reduced headache duration, as well as reduced severity and frequency of headaches, can be identified. Many patients initially experience reduction in only one of these three variables. If headache duration is not monitored, a potentially beneficial treatment could be prematurely discontinued if it initially impacts headache duration only. In addition, identifying the unique features of a patient's headache allows the clinician to individualize treatment recommendations. For example, patients with combined migraine and tension-type headache may be instructed to use acute-care medications only when the headache reaches the level of intensity that is typical of migraine; this restriction will prevent excessive use of acute therapy for mild, daily headaches.

Analgesic-Overuse Headache

Both patients and their doctors must be convinced that analgesic overuse can aggravate chronic headaches. Data clearly show that discontinuation of daily or near-daily acute-care medication with no additional treatment effectively reduces headaches for the majority of patients. In one study, 216 chronic headache patients with medication overuse were initially treated with analgesic medication withdrawal.[24] Headache frequency was assessed while patients were still overusing analgesics (pre-treatment), 2 months after completing medication withdrawal (after withdrawal), and after dismissal from treatment (average time to dismissal = 228 days) (Fig. 5.7). During the first 2 months of treatment, the only therapy was medication withdrawal, with only 7% of patients experiencing headache aggravation and the remainder equally divided between reduction in headache frequency and no change. Patients continuing to experience frequent headaches after the 2-month withdrawal were offered preventive therapy. At dismissal, headaches decreased by an average of 46% ($P < 0.0001$). In addition, patients who had failed to benefit from preventive medications while overusing analgesics experienced an average reduction in headache frequency of 49% after re-trying preventive therapy, demonstrating that analgesic overuse both increases headache frequency and prevents conventional treatments from being effective. Long-term benefits from medication withdrawal were shown in a study of 240 patients with medication overuse headache.[25] When these cases were followed up after a year, 57% reported a ≥50% decrease in headache frequency and no medication overuse.

Initial improvement following analgesic withdrawal typically takes approximately 6–8 weeks. During this time, patients may use non-ibuprofen nonsteroidal anti-inflammatory drugs (NSAIDs) or tramadol for problematic headaches, with little

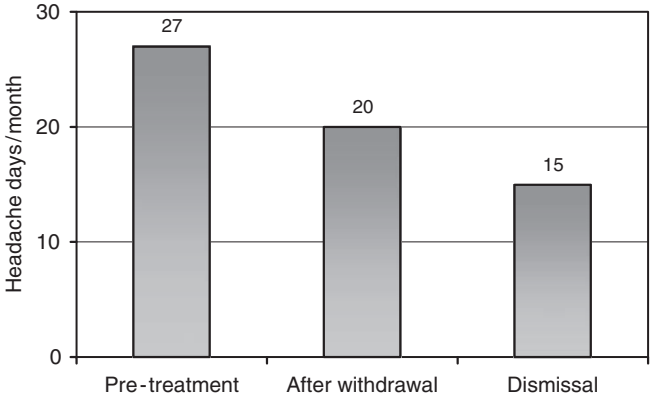


Fig. 5.7 Medication overuse headache: improvement following drug discontinuation (based on Zeeberg[24]).

Box 5.4 Steps for treating medication overuse headache

1. Discontinue analgesics and triptans.
2. Taper opioids, butalbital combinations, and ergotamines by one-half to one pill per week.
3. Prescribe a low-dose, non-ibuprofen nonsteroidal anti-inflammatory drug or tramadol twice daily, with an additional dose permitted once daily for severe pain during the first month after discontinuing analgesics or throughout the tapering period.
4. Re-assess headache pattern 1 month after discontinuing analgesics and triptans or completing drug taper.
5. Treat frequent headache with standard preventive therapy (Fig. 5.10).
6. Allow acute-care medications for infrequent, severe headaches only; maximum: 2 days per week.
7. Maintain headache diary to ensure no return of excessive acute-care medication.

chance of promoting analgesic overuse (Box 5.4). This medication may reduce possible headache aggravation during withdrawal and the psychological anxiety associated with medication abstinence during the withdrawal period. After patients have successfully eliminated acute-care medication for 1 month, standard preventive therapies may be initiated. Preventive therapies will not be effective if used concomitantly with daily acute-care therapies; therefore, therapies that previously failed while the patient was also overusing acute therapy may be tried again.

Common Primary Recurring Headaches (Migraine, Tension-Type, Post-trauma)

The selection of therapy for common headaches requires an initial evaluation of headache severity and frequency (Fig. 5.8). Headaches occurring on no more than 2 days per week may be managed by acute therapy (Fig. 5.9), whereas those

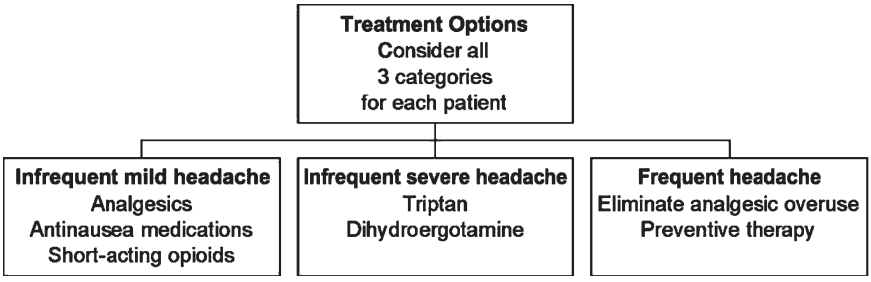


Fig. 5.8 Therapeutic options for migraine, tension-type, and post-trauma headaches.

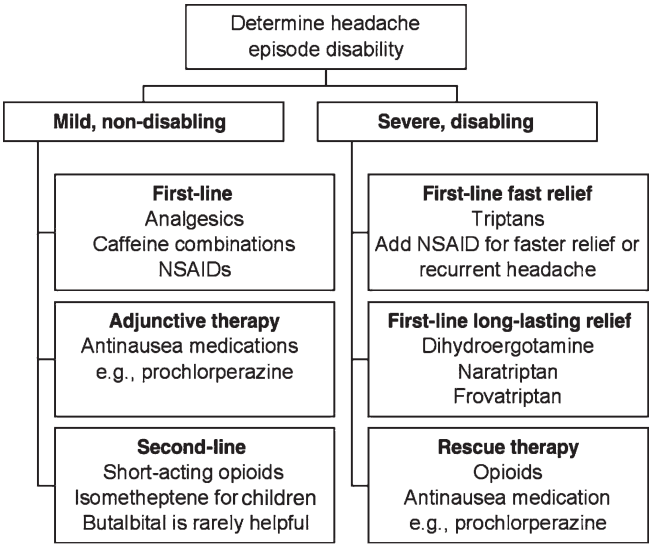


Fig. 5.9 Choosing acute-care medication. Acute therapy is appropriate for infrequent headache (<3 days per week). NSAIDs = nonsteroidal anti-inflammatory drugs.

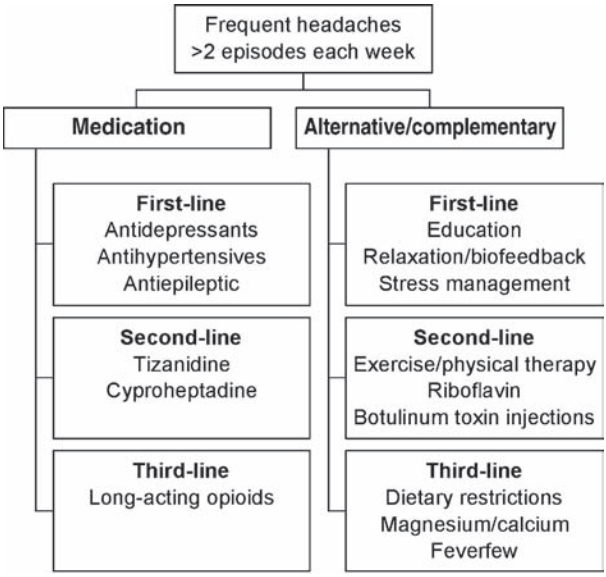


Fig. 5.10 Choosing preventive therapy. Combining medication and alternative therapies maximizes treatment outcome.

occurring more frequently will require preventive therapy (Fig. 5.10). Patients who are not overusing acute-care medication but have frequent mild headaches and infrequent severe headaches (e.g., combined migraine and tension-type headache) may benefit from both preventive and acute therapy.

Aspirin and nonsteroidal anti-inflammatory drugs are more effective than acetaminophen and opioids for reducing mild to moderate severity headache. The addition of 100 mg of caffeine to acute analgesics increases the number of people getting headache relief by 1.5 times.[26] Triptans are particularly beneficial for patients with moderate to severe or disabling attacks. The choice of triptan is based on slight differences in time course of action and formulation preference (Box 5.5). Most patients will respond to at least one of three triptan trials.[27] Migraine episodes with more severe symptoms are less likely to respond to treatment;[28] therefore patients should treat several migraine episodes with a single triptan before abandoning that therapy as ineffective. The combination of a triptan and an analgesic may increase the duration of headache relief.[29] Early clinical trial data show similar good efficacy between a novel oral calcitonin gene-related peptide (CGRP) receptor antagonist [MK-0974; telecagepant] and rizatriptan [Maxalt] or zolimitriptan [Zomig], suggesting a future new class of effective oral, acute migraine treatment.[30,31] Because CGRP receptor antagonists lack direct vasoconstrictor properties, this class of medications may provide a useful alternative for patients unable to use triptans because of cardiovascular risk factors or those failing to achieve adequate response from acute triptan therapy.

Box 5.5 Choosing a Triptan

- Weigh needs for immediate relief against convenience/desirability of oral therapy
  - Fastest relief from injectable or intranasal sumatriptan (Imitrex) or intranasal zolmitriptan (Zomig)
  - Patients typically prefer oral formulations
    - Fast-acting oral triptans include rizatriptan (Maxalt), eletriptan (Relpax), zolmitriptan (Zomig), sumatriptan (Imitrex), almotriptan (Axert)
- Need for sustained relief
  - Add nonsteroidal anti-inflammatory drugs to fast-acting triptan[29]
  - Choose slower acting triptan
    - Naratriptan (Amerge) and frovatriptan (Frova)
- Desire for convenient formulation
  - Orally disintegrating formulations (Maxalt MLT or Zomig ZMT)
- Sumatriptan non-responders usually respond to alternative triptan
  - Only 19% of sumatriptan non-responders fail zolmitriptan and rizatriptan[27]

The selection of preventive therapy is often based on concomitant treatment of comorbid conditions. For example, patients with migraine and hypertension may be treated with a β- or calcium channel blocker, whereas patients with migraine and depression or anxiety may be treated with a tricyclic or selective serotonin reuptake inhibitor antidepressant. The Food and Drug Administration recently announced a warning about increased risk of suicide among patients using some antiepileptic drugs, including those used for chronic headache pain (e.g., gabapentin [Neurontin], pregabalin [Lyrica], topiramate [Topamax], and valproate [Depakote]).[32] Headache reduction can be maximized by combining medication and first-line non-medication therapy (e.g., relaxation and biofeedback).[33]

Cluster Headache

The intensity of each individual cluster headache attack is so severe that therapy must focus on prevention (Box 5.6). In addition, most acute therapies will not

Box 5.6 Treatment of cluster headache

- Episodic cluster (cluster duration ≥7 days, with pain-free period between clusters ≥1 month)
  - Preventive therapy: onset of cluster
    - Discontinuation of nicotine and alcohol during cluster
    - 240–480 mg per day verapamil (Calan, Isoptin) for 6 weeks
    - 2–8 mg per day methysergide (Sansert) for 6 weeks
  - Preventive therapy: cluster at maximum intensity at time of treatment initiation
    - Prednisone 10–60 mg per day for 1 week
  - Rescue therapy
    - 6 mg subcutaneous sumatriptan (Imitrex)
    - 100% O_2 7 L/minute for 10 minutes by face mask
    - Intranasal butorphanol (Stadol NS)
- Chronic cluster (cluster duration >1 year, with any pain-free periods during that year lasting <1 month)
  - Preventive therapy
    - Discontinuation of nicotine and alcohol
    - 240–480 mg per day verapamil (Calan, Isoptin)
    - 250–1,000 mg per day valproic acid (Depakote)
    - 900–1,800 mg per day gabapentin (Neurontin)
  - Rescue therapy
    - 100% O_2 7 L/minute for 10 minutes by face mask

become effective during the course of these brief attacks. Episodic cluster headache is typically treated with preventive therapy for the expected duration of the cluster cycle, usually approximately 6 weeks. Anecdotally, some recalcitrant episodic cluster patients may experience headache prevention from a bedtime dose of a long-acting triptan, such as frovatriptan (Frova).[34] If patients are initially diagnosed when a cluster period has already reached peak severity, treatment with a short course of steroids is usually necessary. Plans should be made at that time, however, for initiation of preventive therapy at the start of the next cluster cycle. Chronic cluster, which has no headache-free periods or only brief ones, is treated with daily, ongoing preventive therapy.

Successful cluster therapy typically results in reduced frequency and duration of headaches. The intensity of each headache episode is often not reduced, however. For this reason, reduction in headache frequency is the main goal of cluster headache therapy.

Headache Patterns in Women

Headache patterns often change in a predictable fashion during the reproductive cycle in women. Estradiol is an important pain modulator, directly influencing neural function through a variety of neurotransmitters important for transmitting pain signals, including endorphins, serotonin, γ-aminobutyric acid (GABA), and dopamine.[35] Generally, estradiol protects against pain, reducing pain perception as estradiol levels rise. Therefore, the pain threshold increases and headache frequency decreases for the majority of women during pregnancy.[36,37] Conversely, when estradiol levels fluctuate or drop from high to low – as occurs during ovulation, menses, the placebo week of oral contraceptives, and after delivery – headache frequency increases. Because estradiol levels fluctuate during the perimenopausal period, headaches tend to worsen while other somatic symptoms of menopause – e.g., hot flushes – occur during early menopause. Headaches may also be aggravated during menopause by estrogen supplementation.[38]

Headache management in women should focus on either minimizing changes in estradiol levels with estrogen supplementation when a decline in estradiol levels is expected or by pharmaceutically manipulating other important neurochemicals. This would mean using antidepressants or triptans to modulate serotonin levels, valproate or gabapentin to modulate GABA, or antinausea medications to modulate dopamine (Boxes 5.7 and 5.8).[39] Consideration should also be given to the risk of adverse effects of medications on the developing fetus when treating headaches during pregnancy (Box 5.9). Most medications that can be used safely during pregnancy can be continued while breastfeeding. Sumatriptan, which is restricted during pregnancy, is considered to be compatible with breastfeeding.[40] (Details on safe headache treatments during pregnancy and lactation are discussed in Chap. 15.)

Box 5.7 Treating menstrual headache: perimenstrual prevention

- Hormone therapy
  - 7-day 100 mg estrogen patch
  - Eliminate placebo week from oral contraceptives for 2 or 3 months
- Acute-care medications
  - Nonsteroidal anti-inflammatory drugs (excluding aspirin or ibuprofen)
  - 2.5 mg naratriptan twice daily
  - 2.5 mg frovatriptan once or twice daily
- Preventive medications
  - β-blocker
  - Antidepressant (excluding fluoxetine)
  - Calcium channel blocker
  - Antiepilepsy drug (valproic acid or gabapentin)
- All medications should be used at the usual dose for 3 days before the expected menstrual period and during first 2–4 days of menses. Do not use unless diary confirms headache occurrence exclusively in association with menses.

Box 5.8 Treating headache during menopause

- Determine if there has been a notable change in headache pattern to warrant additional evaluation
- Adjust estrogen replacement therapy if it aggravates headache
  - Use non-cycling, transdermal route
  - Reduce estrogen dose
  - Change estrogen-replacement product
- Add standard headache-preventive therapy in conjunction with estrogen replacement

Box 5.9 Treating headache during pregnancy

- Eliminate excessive or daily analgesics
- Acute-care treatment (maximum: 2–3 days per week)
  - Acetaminophen
  - Short-acting opioids
  - Antiemetics
- Preventive treatment for frequent headache
  - Medications
    - β-blocker
    - Gabapentin (in early pregnancy; stop in third trimester)
  - Non-medication therapy
    - Relaxation and biofeedback
    - Stress management
    - Discontinuation of nicotine and caffeine
    - Regular meals and sleep

Summary

Chronic headache management begins with a reliable history of headaches to aid the healthcare provider in identifying common headache patterns. Worrisome headaches are generally associated with new headache patterns, pain in the back of the head or neck, aging (>50 years old), or abnormal neurological examination findings.[22] A diary that is used to record both headache activity and medication use can be helpful to the clinician for correctly identifying headache patterns, the contribution of medication overuse to headache, and the relationship of headache to menstruation. Identification and elimination of medication overuse is the first step to successful headache management. Choice of headache therapy depends on headache frequency and disability. Combining medication and non-medication therapies maximizes treatment outcome.

Test Your Knowledge

1. Which of the following statements about medication overuse headache is true?

   a. Medication overuse headache is a sign of drug addiction.
   b. Medication overuse headache only occurs in patients overusing narcotics.
   c. Medication overuse headache does not occur in patients with true head pain.
   d. Medication overuse headache may occur in patients regularly using any acute-care prescription or over-the-counter headache treatment 3 or more days in a week.

2. Features associated with potentially serious headache that requires additional evaluation include:

   a. Posterior head or neck pain
   b. Pain beginning after the age of 50 years
   c. Change in headache pattern
   d. Abnormal neurological examination
   e. All of the above

3. The most common type of chronic headache seen in the primary care office is:

   a. Migraine
   b. Tension-type
   c. Post-traumatic
   d. Cluster

4. Which of the following headaches is experienced as short pain episodes, typically lasting <2 h?

   a. Migraine
   b. Tension-type

c. Post-traumatic
d. Cluster
e. Medication overuse

5. Which of the following medication(s) is(are) first-line treatment for severe migraines?

a. Dihydroergotamine
b. Eletriptan
c. Hydrocodone
d. Metoclopramide
e. A and B
f. All of the above

6. First-line treatment for episodic cluster headache includes:

a. 100% oxygen
b. Injectable sumatriptan
c. Intranasal butorphanol
d. Daily verapamil prevention
e. All of the above

Answers: 1d, 2e, 3a, 4d, 5e, 6d

References

1. Stovner LJ, Hagen K, Jensen R, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. Cephalalgia 2007;27:193–210
2. Khan AA, Khan A, Harezlak J, Tu W, Kroenke K. Somatic symptoms in primary care: etiology and outcome. Psychosomatics 2003;44:471–478
3. Gibbs TS, Fleischer AB, Feldman SR, Sam MC, O'Donovan CA. Health care utilization in patients with migraine: demographics and patterns of care in the ambulatory setting. Headache 2003;43:330–335
4. Hasse LA, Ritchey N, Smith R. Predicting the number of headache visits by type of patient seen in family practice. Headache 2002;42:738–746
5. Tepper SJ, Dahlöf CH, Dowson A, et al. Prevalence and diagnosis of migraine in patients consulting their physician with a complaint of headache: data from the Landmark study. Headache 2004;44:856–864
6. Lipton RB, Stewart WF, Diamond S, Diamond ML, Reed M. Prevalence and burden of migraine in the United States: data from the American Migraine Study II. Headache 2001;41:646–657
7. Manzoni GC. Gender ratio of cluster headache over the years: a possible role of changes in lifestyle. Cephalalgia 1998;18:138–142
8. Black DF, Swanson JW, Stang PE. Decreasing incidence of cluster headache: a population-based study in Olmsted County, Minnesota. Headache 2005;45:220–223
9. Delaney JS, Lacroix VJ, Leclerc S, Johnston KM. Concussions among university football and soccer players. Clin J Sport Med 2002;12:331–338
10. Lance JC, Arciniegas DB. Post-traumatic headache. Curr Treat Options Neurol 2002 4:89–104
11. Packard RC. Posttraumatic headache: permanency and relationship to legal settlement. Headache 1992;32:496–500

12. Berglund A, Alfredsson L, Jensen I, Cassidy JD, Nygren A. The association between exposure to a rear-end collision and future health complaints. J Clin Epidemiol 2001;54:851–856
13. Kolbinson DA, Epstein JB, Burgess JA, Senthilselvan A. Temporomandibular disorders, headaches, and neck pain after motor vehicle accidents: a pilot investigation of persistence and litigation effects. J Prosthet Dent 1997;77:46–53
14. Kolbinson DA, Epstein JB, Burgess JA. Temporomandibular disorders, headaches, and neck pain following motor vehicle accidents and the effect of litigation: review of the literature. J Orofac Pain 1996; 10:101–125
15. Mureriwa J. Head injury and compensation: a preliminary investigation of the postcussional syndrome in Harare. Cent Afr J Med 1990;36:315–318
16. Leonardi M, Steiner TJ, Scher AT, Lipton RB. The global burden of migraine: measuring disability in headache disorders with WHO's Classification of Functioning, Disability and Health (ICF). J Headache Pain 2005;6:429–440
17. Gerth WC, Carides GW, Dasbach EJ, Visser WH, Santanello NC. The multinational impact of migraine symptoms on healthcare utilisation and work loss. Pharmacoeconomics 2001;19:197–206
18. Marcus DA. Identification of headache subjects at risk for psychological distress. Headache 2000;40:373–376
19. Schwartz BS, Stewart WF, Lipton RB. Lost workdays and decreased work effectiveness associated with headache in the workplace. J Occup Environ Med 1997;39:320–327
20. Marcus DA. Headache disability and headache diagnosis. Headache Pain 2003;14:180–185
21. Lipton RB, Bigal ME, Kolodner K, et al. The family impact of migraine: population-based studies in the USA and UK. Cephalalgia 2003;23:429–440
22. Ramirez-Lassepas M, Espinosa CE, Cicero JJ, et al. Predictors of intracranial pathological findings in patients who seek emergency care because of headache. Arch Neurol 1997;54:1506–1509
23. Marcus DA. Migraine and tension-type headache: the questionable validity of current classification systems. Clin J Pain 1992;8:28–36
24. Zeeberg P, Olesen J, Olesen R. Discontinuation of medication overuse in headache patients: recovery of therapeutic responsiveness. Cephalalgia 2006;26:1192–1198
25. Zidverc-Trajkovic J, Pekmezovic T, Jovanovic Z, et al. Medication overuse headache: clinical features predicting treatment outcome at 1-year follow-up. Cephalalgia 2007;27:1219–1225
26. Peroutka SJ, Lyon JA, Swarbrick J, Liption RB, Kolodner K, Goldstein J. Efficacy of diclofenac sodium softgel 100 mg with or without caffeine 100 mg in migraine without aura: a randomized, double-blind, crossover study. Headache 2004;44:136–141
27. Mathew NT, Kailasam J, Gentry P, Chernyshev O. Treatment of nonresponders to oral sumatriptan with zolmitriptan and rizatriptan: a comparative open trial. Headache 2000;40:464–465
28. Diener HC, Dodick DW, Goadsby PJ, et al. Identification of negative predictors of pain-free response to triptans: analysis of the eletriptan database. Cephalalgia 2007;28:35–40
29. Krymchantowski AV, Barbosa JS. Rizatriptan combined with rofecoxib vs. rizatriptan for the acute treatment of migraine: an open label pilot study. Cephalalgia 2002;22:309–312
30. Ho TW, Mannix LK, Fan X, et al. Randomized controlled trial of an oral CGRP receptor antagonist, MK-0974, in acute treatment of migraine. Neurology 2008;70:1304–1312
31. Ho TW, Ferrari MD, Dodick DW, et al. Acute antimigraine efficacy and tolerability of the novel oral CGRP receptor antagonist MK-0974: a phase III clinical trial versus placebo and zolmitriptan. Headache 2008;48:S7–S8
32. http://www.fda.gov/cder/drug/InfoSheets/HCP/antiepilepticsHCP.htm (Accessed February 2008)
33. Holroyd KA, France JL, Cordingley GE, et al. Enhancing the effectiveness of relaxation-thermal biofeedback training with propranolol hydrochloride. J Consult Clin Psychol 1995;63:327–330
34. Siow HC, Pozo-Rosich P, Silberstein SD. Frovatriptan for the treatment of cluster headache. Cephalalgia 2004;24:1045–1048
35. Marcus, DA. Sex hormones and chronic headache. Exp Opin Pharmacother 2001;2:1839–1848

36. Gintzler AR, Bohan MC. Pain thresholds are elevated during pseudopregnancy. Brain Res 1990;507:312–316
37. Sances G, Granella F, Nappi RE, et al. Course of migraine during pregnancy and postpartum: a prospective study. Cephalalgia 2003;23:197–205
38. Facchinetti F, Nappi RE, Granella F, et al. Effects of hormone replacement treatment (HRT) in postmenopausal women with migraine. Cephalalgia 2001;21:452
39. Marcus DA: Focus on primary care: diagnosis and management of headache in women. Obstetrical & Gynecological Survey 1999;54:395–402
40. American Academy of Pediatric Committee on Drugs. The transfer of drugs and other chemicals into human milk. Pediatrics 2001;108:776–789

Chapter 6
Neck and Upper Extremity Pain

Key Chapter Points:

- Chronic neck and upper extremity pain most commonly affect the neck and shoulder.
- Only one in three patients with neck or shoulder pain experiences symptom resolution after one year.
- Long pain duration, previous or additional pain complaints, psychological distress, and coping with worry result in persistent neck and upper extremity pain.
- Pain in the shoulder is mostly caused by overuse in older adults or trauma in young patients.
- Pain in the hand is often caused by cervical radiculopathy, carpal tunnel syndrome, and De Quervain's tenosynovitis.

Key Words Carpal tunnel, Cervical radiculopathy, De Quervain's syndrome, Rotator cuff, Shoulder

Case History

Ms. Hoffmann is a 45-year-old registered nurse who has worked in the busy intensive care unit (ICU) of a city hospital for the past 15 years, with two previous work-related injuries resulting in musculoskeletal back pain. She is otherwise in good health, except for mild anxiety and depression, managed with a low-dose tricyclic antidepressant. Her current injury occurred when she pulled an obese, sedated patient into a bed. At that time, she developed a searing pain in her neck and upper left arm. Physical examination the next day revealed a reduced biceps reflex and numbness in her upper arm. Magnetic resonance imaging revealed a herniated disc at C5/C6. No improvement was reported after 1 week of rest and treatment with prednisone, diazepam (Valium), and hydrocodone (Vicodin). After an uncomplicated discectomy, the pain was reduced to moderate severity, although numbness and sensitivity to touch in the upper arm persisted. An attempt to return to regular duties was unsuccessful because of intense pain experienced when lifting supplies,

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

reaching across patient beds, and repositioning patients. Worry about not being able to adequately care for the patients and re-injuring herself resulted in refusal to continue work until her pain was controlled. Her physician treated her with daily ibuprofen (Motrin), and her pain diminished when she performed reduced activities. Ms. Hoffmann discontinued ibuprofen after 1 month because of gastric upset. Six months later, she was still not working and developed a tendency to hold her arm splinted to her torso to avoid moving it or having anything touch it. Her workers' compensation caseworker suspected symptom magnification because of her prolonged work absence with this injury and recommended a physical capacity evaluation.

Introduction

Neck and upper extremity pain are common complaints in primary care, with symptoms most commonly affecting the shoulder or neck.[1] Neck and upper extremity symptoms can be particularly problematic because pain and disability often persist. A survey of adults seen in 21 general practices for new neck and upper extremity complaints (N = 682) reported persistent symptoms after 6 months in 46%, with much improvement in 29% and complete recovery in 25%.[2] Among patients with jobs (N = 534), one in four reported taking pain-related sick leave within the preceding 6 months. Long-term persistence of symptoms was further highlighted in a study in which unilateral neck and shoulder pain were identified in 11.7% of over 4,000 primary care patients at an initial assessment.[3] A 2-year follow-up revealed that pain persisted in 61% of these patients, with unilateral symptoms in 62% (81% the same side as the original complaint) and bilateral pain in 38%. A five-year longitudinal study of patients reporting nonspecific neck and/or shoulder complaints likewise showed persistence of pain and mild functional impairment, with a similar course for both men and women (Fig. 6.1).[4] Decrease in pain and disability were about twice as great in men (P = 0.03). After 5 years, three out of four men and two out of three women experienced a reduction in pain, with no pain reported in 22% of men and 15% of women. The greatest degree of improvement in both men and women occurred during the first three months of symptoms. Patients reporting chronic pain (symptoms >3 months) were unlikely to experience significant improvement over the next several years. Interestingly, the costs associated with shoulder pain are relatively low. A prospective survey of 587 patients in the Netherlands with a new episode of shoulder pain revealed an average of 2.8 days of sick leave and mean total cost of €689 per patient over 6 months of follow-up.[5]

Ms. Hoffmann's story is typical of many patients with neck pain. Episodes of acute neck pain are quite common, especially among individuals whose work involves heavy lifting (e.g., nurses). Ms. Hoffmann's latest injury symptoms suggest something more than simple muscle pain. Postoperatively, she continued to report symptoms of persistent neuropathic changes that delayed her recovery.

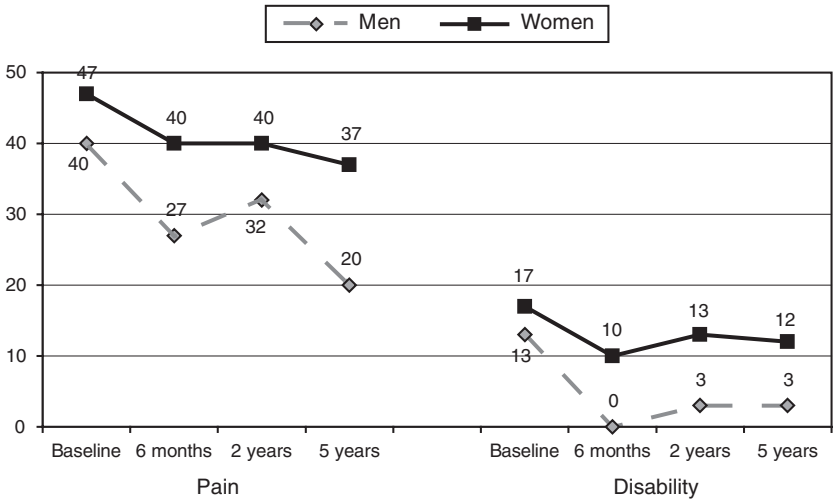


Fig. 6.1 Prognosis of neck and shoulder pain (based on Pernold[4]). Pain and disability are rated on a 100-point scale, with higher numbers representing more severe pain and disability.

Ms. Hoffmann's long employment history suggests that she is a good candidate to return to work; however, the heavy physical activity required in nursing makes this difficult. In Ms. Hoffmann's case, the occupational therapist performing the physical capacity evaluation appropriately noted the signs of neuropathic pain (including abnormal posturing and hypersensitivity to touch) and recommended medical assessment and treatment for the neuropathic component to her pain. Work was restricted to modified, part-time duty in conjunction with a gradual increase in work program. Ms. Hoffmann returned to light duty work, 3 hours daily, while participating in a work-hardening program. Treatment with gabapentin (Neurontin) plus physical therapy, pacing skills, and body mechanics helped reduce her pain and increase her work capabilities. She also met with a pain psychologist to develop positive coping techniques and minimize the impact of anxiety and depression on her return to work. At the conclusion of the program, Ms. Hoffmann was able to resume her daily household routine with confidence, but could not perform the type of lifting necessary in the ICU. She was, however, successfully returned to a full-time modified nursing job in her hospital.

Epidemiology of Neck and Upper Extremity Pain

The neck and upper extremity are the second and third most common sites of musculoskeletal pain after low back pain (Fig. 6.2).[6] In a large population-based survey of 3,664 adults ≥25 years of age, neck, shoulder, or upper extremity pain resulted in limitations to daily life in about one-third and work absence in one-fourth.[6]

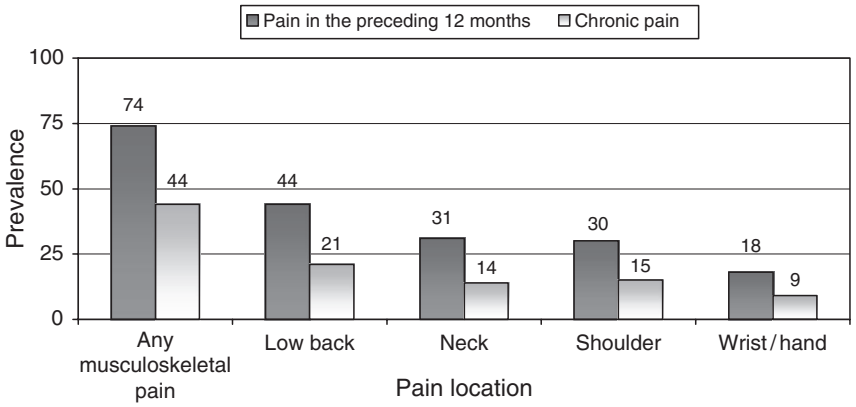


Fig. 6.2 Prevalence of musculoskeletal pain (based on Picavet[6]).

Interestingly, disability due to neck and upper extremity pain was similar to that of people with low back or lower extremity pain.

A survey of general practice patients revealed that new neck and upper extremity complaints resulted in 147 primary care visits for every 1,000 registered patients, with complaints most commonly attributed to the neck and shoulder (Fig. 6.3).[7] Women accounted for 58% of these patients, with a peak incidence between ages 40 and 49. These data estimate that the average general practitioner serving 2,500 patients will have about 366 patient visits annually for neck and upper extremity complaints.

Pain characteristics, comorbid pain complaints, and psychosocial factors predict the chronic nature of neck and upper extremity pain (Box 6.1).[2,8,9] Female gender, perceived high workload, chronic complaints in the previous year, and psychological distress (including anxiety and depression) also predict work absence due to pain.[10,11] Furthermore, persistent neck and upper extremity pain is associated with a worsening

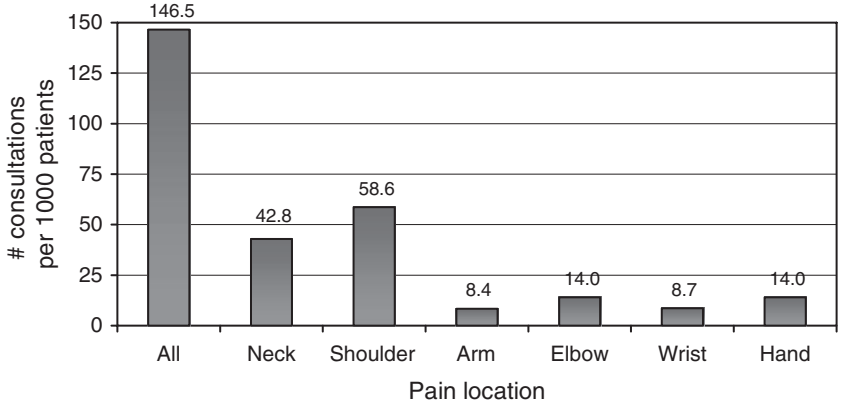


Fig. 6.3 Number of consultations for new neck and upper extremity pain in general practice patients over 1 year (based on Bot[7]).

Box 6.1 Predictors of persistent neck and upper extremity pain (based on Bot[8,9] and Feleus[2])

- Neck/upper extremity pain features
  - Long duration of pain
  - Recurrent pain
  - Pain mainly in the hand or wrist
- Comorbidity
  - Additional musculoskeletal complaints
- Psychosocial factors
  - High somatization
  - Worry
  - Cope by retreating
  - Poor social support

of psychological distress,[12] which may then further impede successful return to work. Consequently, aggressive, early intervention is often necessary to reduce long-term disability, especially in patients like Ms. Hoffmann whose gender, heavy job duties, and psychological distress predict a poor prognosis for returning to work.

Evaluation of Neck and Upper Extremity Pain

Neck and upper extremity pain may be caused by a variety of conditions, usually related to musculoskeletal or neuropathic pain (Table 6.1). Patient assessment should include identification of risk factors for chronic pain and work absence (Box 6.2), as well as characteristics for specific diagnosis. Historical details and examination hallmarks of common diagnoses for neck and upper extremity pain syndrome are detailed in the following sections.

Neck Pain

The physical examination in patients with neck pain with or without associated upper extremity symptoms should include an evaluation of range of motion and neurological assessment of strength, reflexes, and sensation (Box 6.3). Arm swing should be evaluated for symmetry during gait examination. Identification of patterns of motor and sensory loss that suggest cervical radiculopathy should be a major part of the neurological examination (Table 6.2). Figures 6.4 and 6.5 show motor tests for cervical radiculopathy and skin areas served by specific cervical nerves. Patients with radiculopathy typically experience sensory changes, with less common occurrence of motor abnormalities.

Table 6.1 Common causes of neck and upper extremity pain

Pain location	Diagnosis
Neck	Arthritis
	Cervical radiculopathy
	Myofascial pain
Shoulder	Arthritis
	Bursitis
	Myofascial pain
	Rotator cuff tendonitis/tear
Upper extremity	Carpal tunnel syndrome
	Cervical radiculopathy
	De Quervain's tenosynovitis
	Myofascial pain

Box 6.2 Historical evaluation of patients with neck or upper extremity pain

Identify the following historical features that predict pain persistence and disability:

1. Long pain duration
2. Pain that affects the wrist or hand
3. History of previous pain complaints or other musculoskeletal conditions
4. Work duties perceived as physically demanding
5. Anxiety, depression, or excessive worry

Box 6.3 Physical examination of patient with neck or upper extremity pain

1. Musculoskeletal examination
   a. Muscle palpation for tenderness, spasm, and trigger points
   b. Skeletal assessment for posture and range of motion
2. Neurological examination
   a. Strength testing
   b. Reflexes
   c. Sensory examination to touch and pain
   d. Gait – Testing to assess casual movements (arm swing)

Table 6.2 Evaluation of common cervical radiculopathies

Nerve involved	Disc space	Motor loss	Reflex loss	Sensory loss
C5	C4–C5	Biceps	Biceps	Lateral upper arm
C6	C5–C6	Brachioradialis	Biceps	Lateral lower arm
C7	C6–C7	Triceps	Triceps	Middle finger
C8	C7–T1	Finger flexors	none	Medial lower arm

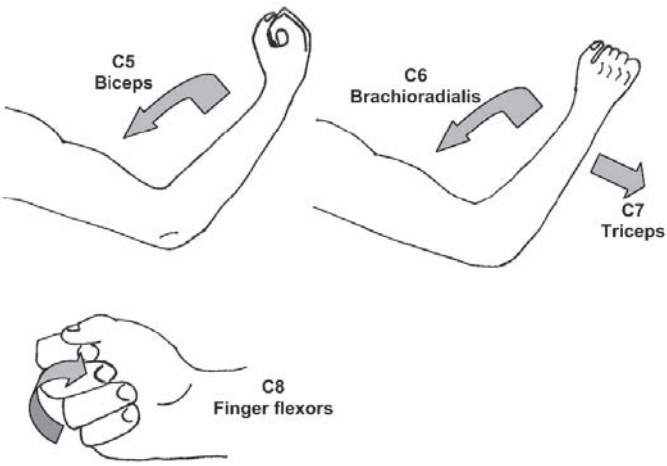


Fig. 6.4 Motor testing for cervical radiculopathy. *Arrows* denote direction of movement required to test specific muscles. Test biceps strength with palm facing up. Test brachioradialis strength with thumb pointed up.

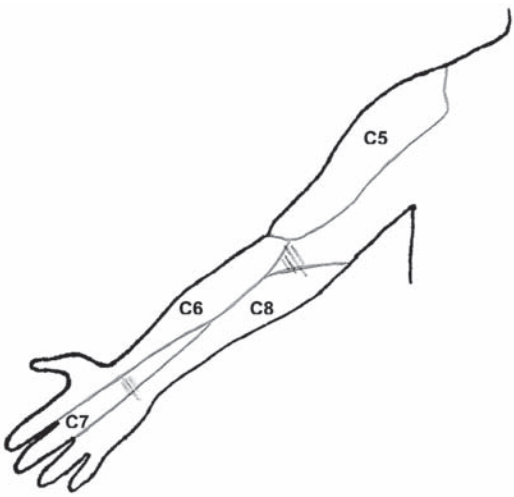


Fig. 6.5 Sensory testing for cervical radiculopathy. Arm viewed from the anterior aspect, with palm facing toward viewer. Skin areas served by specific cervical nerve roots are marked.

Use of Specialized Testing

Plain x-rays with flexion and extension views are helpful in ruling out instability in patients with mechanical pain complaints (e.g., restricted movement or pain occurring during movement) or limited range of motion. Nerve conduction and electromyography testing may be useful for ruling out radiculopathy in patients with a mixed pattern of motor and sensory loss (e.g., reflex loss suggesting one nerve root, while sensory loss suggests another).

While radiographic studies can help confirm or refute clinical diagnosis of suspected mechanical and radicular pain, cervical spine x-rays and magnetic resonance imaging (MRI) scans frequently show false positive results, even in asymptomatic controls. Radiographically-diagnosed degenerative cervical spine disease was determined in 159 asymptomatic adults (aged 20–65 years) at baseline and after 10 years (Fig. 6.6).[13] Abnormalities in the lower spine were seen in about one-third of the patients on lateral cervical spine x-rays at baseline, and up to over half of the patients when x-ray was repeated after 10 years. Although only 15% of subjects experienced neck pain during the ensuing 10 years, progressive degenerative changes were noted in 45% of subjects. Degenerative changes noted at C5–C6 were also typically noted at C6–C7, resulting in reports of multilevel degenerative disease. Degenerative changes are seen most often with advanced age – with abnormal cervical spine x-rays in 70% of women and 95% of men between ages 60 and 65 years.[14]

MRI and computed tomography generally should be reserved for patients with clinical evidence of myelopathy (e.g., bilateral motor and sensory loss) or radiculopathy. MRIs obtained in asymptomatic adults revealed significant radiographic changes at multiple cervical levels (Table 6.3).[15] Abnormalities typically affected the lower cervical levels, with an increased prevalence in patients up to 60 years of

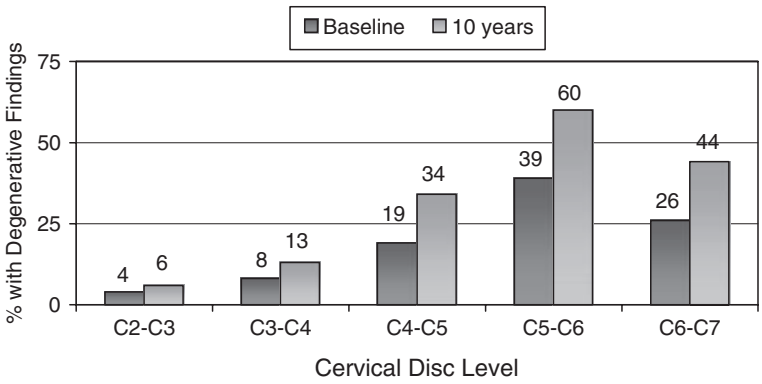


Fig. 6.6 X-ray abnormalities in asymptomatic adults (based on Gore[13]).

Table 6.3 Prevalence of abnormal magnetic resonance imaging findings in asymptomatic adults (based on Ernst 2005)

		Cervical level affected (%)			
Abnormality	Prevalence in normal adults (%)	C3–C4	C4–C5	C5–C6	C6–C7
Annular tear	36.7	11.1	11.1	50.0	27.8
Bulging disc	73.3	19.0	21.4	33.3	26.2
Herniated disc	50.0	27.3	22.7	31.8	18.2

age. In the same survey, mild disc degeneration was seen in half of the controls ≤30 years of age, three-fourths of adults between 31 and 45, and all controls >45 years old. Severe disc degeneration was seen in 17% of controls ≤30 years of age, 8% of adults between the ages of 31 and 45, and 67% of controls >45 years old. Furthermore, a recent study comparing results of independent readings by seven board-certified radiologists of cervical MRIs of patients with diagnosed cervical myelopathy showed inconsistent diagnostic agreement between them, thus strengthening the recommendation that radiographic testing be used to confirm and not establish clinical diagnoses.[16]

Shoulder Pain

Shoulder pain is most commonly caused by overuse in older adults or trauma in young patients (Box 6.4). Pain in the anterior shoulder often results from osteoarthritis of the acromioclavicular or, less commonly, glenohumeral joints or biceps tendonitis. Subacromial bursitis and rotator cuff tendonitis also cause anterior and lateral shoulder pain.

Pain character and physical examination can help distinguish the common causes of shoulder pain (Table 6.4), although diagnostic determination is often difficult. Studies comparing diagnostic agreement among clinicians typically show only poor to moderate agreement regarding patients with shoulder complaints. In one study, 44 patients with shoulder pain were evaluated by three rheumatologists, with diagnostic agreement occurring less than half the time (46%).[17] When the three rheumatologists evaluated the patients together and discussed diagnostic signs and symptoms, agreement improved to 78%. In another study, diagnostic agreement between two experienced physical therapists for 201 patients with shoulder pain was only moderate (60%).[18] Agreement was worse with regard to patients with bilateral, chronic, or severe pain. In addition, clinical tests assessing shoulder function and range of motion are also notoriously unreliable in shoulder pain patients.[19–21] For this reason, most patients with chronic shoulder pain will require radiographic studies in addition to their case history and physical examination (Fig. 6.7). Partial

Box 6.4 Common causes of shoulder pain

- Adhesive capsulitis
- Osteoarthritis glenohumeral or acromioclavicular joint
- Rotator cuff tear
- Rotator cuff tendonitis/impingement syndrome
- Subacromial bursitis
- Tendonitis of biceps or supraspinatus tendons

Table 6.4 Distinguishing features among shoulder pain diagnoses.

Diagnosis	Pain at night	Passive ROM	Crepitus
Osteoarthritis	No	Reduced	Present
Rotator cuff tendonitis/impingement	Yes	Normal	Absent
Rotator cuff tear	Yes	Normal	Absent
Subacromial bursitis	Yes	Reduced	Absent

ROM Range of motion

rotator cuff tears are best assessed with MRI or ultrasound images. A comparison of both techniques against arthroscopic findings in 71 patients with rotator cuff tears showed similar good identification and size measurement for both full and partial tears.[22]

Subacromial Bursitis

Inflammation of the subacromial bursa results in pain in the lateral shoulder and upper arm, aggravated by overhead activities. The pain is generally relieved by rest. The patient typically is able to raise the upper extremity in front of the body or lift the arm backward without pain. Shoulder rotation and abduction (lifting the arm away from the side), however, are characteristically painful in patients with this condition.

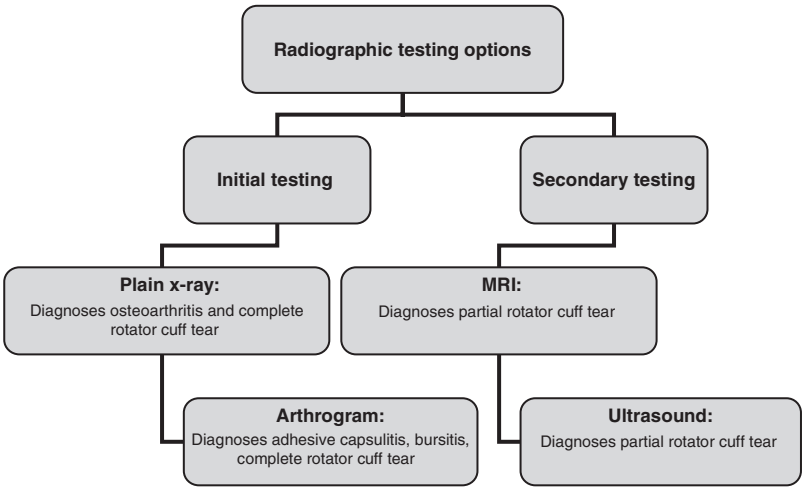


Fig. 6.7 Radiographic testing of shoulder pain.

Rotator Cuff Tendonitis

A prospective, one-year survey of 131 patients presenting to their primary care physicians for shoulder pain identified rotator cuff tendonopathy in 85%.[23] Pain with rotator cuff tendonitis is generally located over the anterior and lateral shoulder, with the condition worsening with overhead activities and at night. Clicking or popping may occur in the affected shoulder.

Inflammation within the rotator cuff is often combined with subacromial bursitis and termed *impingement syndrome*, which can be identified by performing the Hawkins test. The patient bends his elbow to 90° and elevates the flexed arm in front of his body, so that the forearm is parallel to the floor. The examiner then passively internally rotates the upper extremity, moving the patient's hand down and to the side. Impingement results in pain with this maneuver.

Hand Pain

Hand pain may result from musculoskeletal, neurological, or vascular pathology (Table 6.5). Hand pain may occur in isolation, e.g., De Quervain's tenosynovitis and carpal tunnel syndrome, or as part of a more diffuse pain condition, e.g., cervical radiculopathy and rheumatoid arthritis. Sensory dysfunction in the hand can help distinguish pain caused by compressive mononeuropathy or cervical radiculopathy (Fig. 6.8).

88 6 Neck and Upper Extremity Pain

Table 6.5 Common causes of hand pain

Disease category	Diagnoses
Musculoskeletal	Traumatic (e.g., sprain or fracture)
	Arthritic (e.g., rheumatoid arthritis)
	Compressive tenosynovitis (e.g., De Quervain's)
	Ganglion cyst
Neuropathic	Cervical radiculopathy
	Compressive neuropathy (e.g., carpal tunnel syndrome)
	Complex regional pain syndrome
Vascular	Raynaud's syndrome

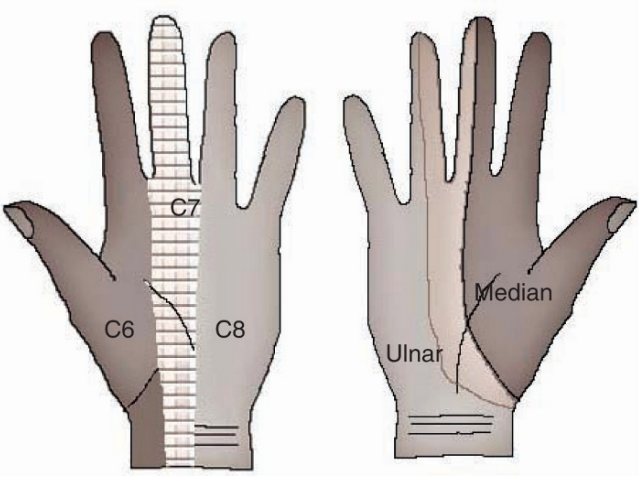


Fig. 6.8 Comparison of sensory loss from radiculopathy vs. peripheral mononeuropathy (Reprinted from Marcus DA. Headache and Chronic Pain Syndromes. The Case-Based Guide to Targeted Assessment and Treatment. Humana Press, Totowa, NJ, 2007.) The left hand shows sensory distribution from cervical roots. The right hand shows sensory areas served by the median and ulnar nerves. Part of the middle and ring fingers may receive sensory supply from either the median or ulnar nerve.

De Quervain's Tenosynovitis

De Quervain's tenosynovitis is a common painful inflammatory condition of the thumb, diagnosed with the Finkelstein test (Fig. 6.9). Tendons of the abductor pollicis longus and extensor pollicis brevis travel into the thumb through a small compartment in the wrist, forming the radial border of the anatomic snuff box. Trauma or repetitive overuse may result in inflammation of the synovial lining, with pain

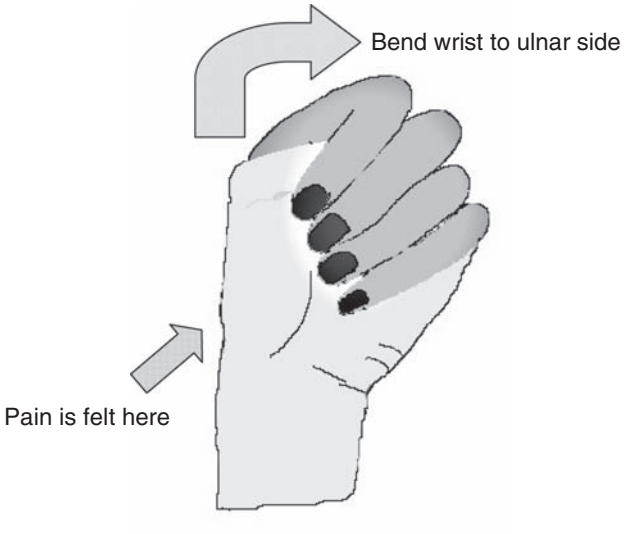


Fig. 6.9 Finkelstein test for De Quervain's tenosynovitis. Finkelstein's test is performed by asking the patient to make a fist, with the thumb placed under the fingers. The examiner then bends the wrist away from the thumb toward the ulnar side. A positive test occurs when the patient reports pain in the wrist at the base of the thumb (reprinted from Marcus DA. Headache and Chronic Pain Syndromes. The Case-Based Guide to Targeted Assessment and Treatment. Humana Press, Totowa, NJ, 2007).

aggravated when grasping, twisting, or pinching. Patients with diabetes, thyroid disease, and rheumatoid arthritis are at increased risk for developing De Quervain's tenosynovitis.

Carpal Tunnel Syndrome

The median nerve reaches the hand through the carpal tunnel in the wrist. It provides sensation to the lateral hand, thumb, and first two fingers and motor function for thumb opposition (Fig. 6.10). Compression within this tunnel due to injury or repetitive use results in hand pain and dysesthesia in the distribution of the median nerve. Symptoms are typically aggravated by compressing or stretching the wrist and sleeping, possibly due to the combination of wrist hyperextension or flexion with sleep and increased swelling of the hand with expected fluid redistribution while lying down. Symptoms may be reproduced or aggravated by percussing the wrist at the carpal tunnel (Tinel's sign) or asking the patient to flex the wrist for one minute (Phalen's test). Wrist percussion and Phalen's testing were evaluated in 112 patients with clinical carpal tunnel syndrome confirmed by nerve conduction studies

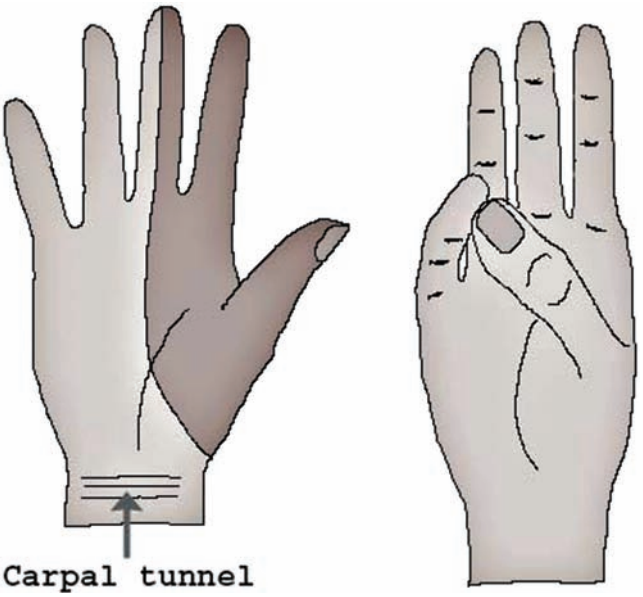


Fig. 6.10 Carpal tunnel syndrome. Area of sensation (*dark gray* in the *left picture*) and motor function (opposition of the thumb in the *right picture*) supplied by the median nerve.

and 50 pain-free controls.[24] The sensitivity and specificity, respectively, were 67% and 68% for Tinel's sign and 85% and 89% for Phalen's test. Interestingly, both tests were negative in 17 patients with confirmed carpal tunnel syndrome (15%). A positive Phalen's test is also associated with increased carpal tunnel syndrome severity, suggesting that follow-up Phalen's testing may help to identify treatment efficacy.[25]

Treatment

Neck and upper extremity pain tend to become chronic in many patients. In general, only about one-third of patients reporting neck or shoulder pain will experience symptom resolution after a year.[26,27] For this reason, treatment is generally necessary to minimize long-term disability.

Patients reporting difficulty in performing daily activities or work tasks, like Ms. Hoffmann, can often benefit from an occupational therapy evaluation. Modifying activity performance and pacing may be particularly helpful in achieving a successful return to work. For example, taking frequent work breaks (whether or not exercises are performed during the break periods) improves recovery from neck pain.[28] Furthermore, psychological pain management training should also be

considered, as psychological distress and negative coping styles predict pain persistence and disability. For example, a study evaluating 342 patients with neck or upper extremity complaints at baseline and after 3 months identified worry as a major factor in predicting work absence.[29] Interestingly, workers required to perform a heavy work load or sit for prolonged periods were more likely to require sick leave only if they also tended to cope with worry. Job factors were unrelated to time off from work among workers with more positive coping styles. This suggests that training in coping techniques may reduce disability associated with neck and upper extremity pain, even among patients with more physically demanding occupations.

Neck Pain

A number of non-medication therapies are used to reduce chronic neck pain. Adequate data are available to support benefit from only acupuncture for short-term pain relief and exercise for long-term benefit.[30–32] Traction and ultrasound appear to be ineffective, while very little data are available to routinely recommend multidisciplinary treatment, behavioral therapy or relaxation, massage, or electrical stimulation.

Treatment algorithms can be used to provide guidelines for empiric management of patients with acute and chronic neck pain (Fig. 6.11). Patients will need to be assessed to determine the appropriateness of each individual therapy recommended.

Cervical Radiculopathy

Cervical radiculopathy may be treated conservatively unless motor or spinal dysfunction is present, in which case surgical evaluation is often necessary. Cervical epidural steroid injections may resolve radiculopathy and improve range of motion in the cervical spine in some patients with persistent pain or patients wishing to avoid surgery.

Cervical radiculopathy patients treated conservatively or with surgery typically experience only modest reduction in neck pain, with better relief from radicular symptoms and disability. In one study, 119 consecutive cervical radiculopathy patients were referred for conservative or surgical treatment, as deemed clinically appropriate (Fig. 6.12).[33] Patients were considered to have improved if they experienced complete symptom resolution or marked improvement. Although arm pain and neurological symptoms improved for patients treated either conservatively or with surgery, neck pain improved in only about one-third to one-fifth of the patients.

While short-term pain relief is higher with surgery, long-term pain reduction has been shown to be similar among patients with cervical radiculopathy without myelopathy randomized to conservative treatment or surgery (Fig. 6.13).[34] In this study,

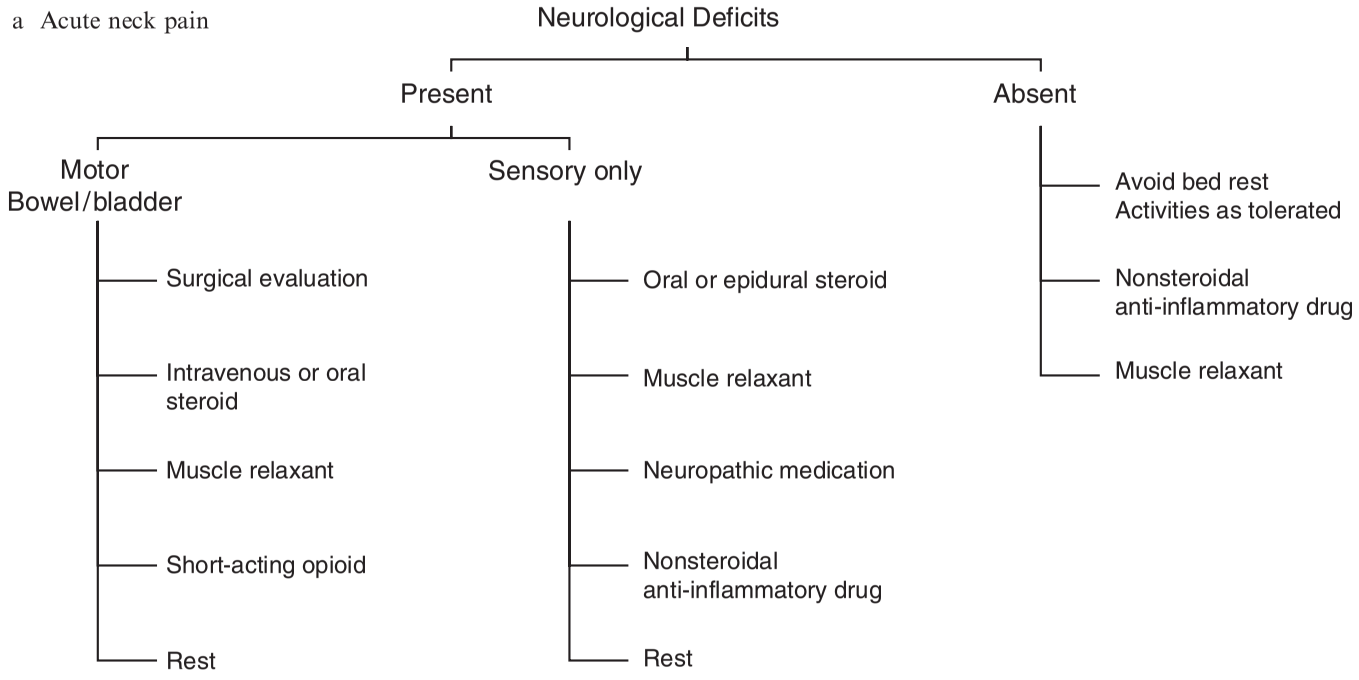


Fig. 6.11 Management of neck pain. Neurological deficits may include signs and symptoms of motor loss (weakness or reduced reflexes), sensory disturbance (numbness, dysesthesia), and/or bowel or bladder dysfunction (constipation, incomplete bladder emptying, incontinence). Sx = symptoms. (**A**) Acute neck pain; (**B**) Chronic neck pain.

b Chronic neck pain

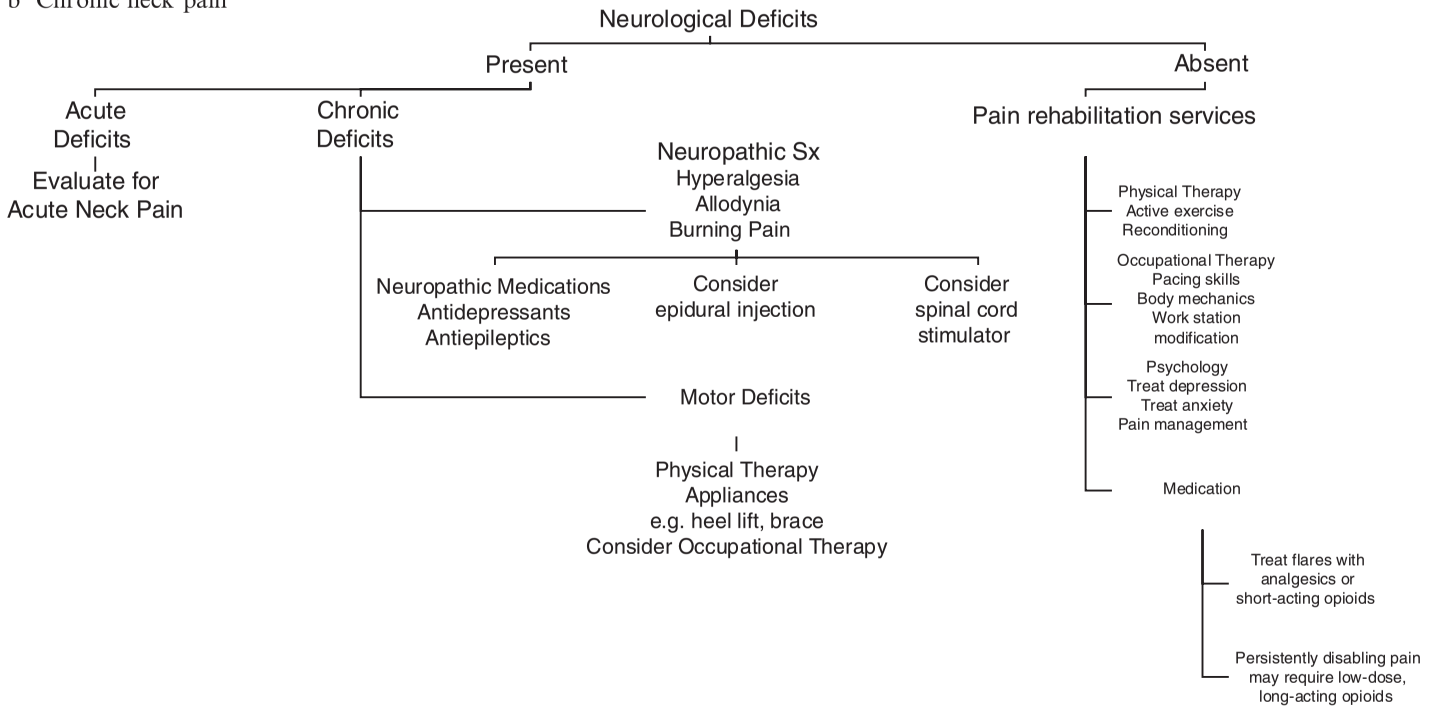


Fig. 6.11 (continued)

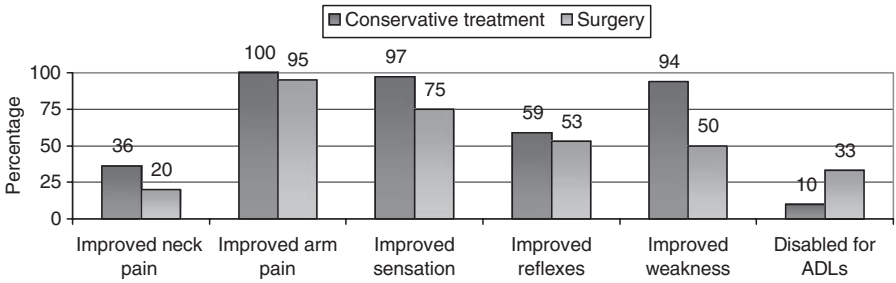


Fig. 6.12 Post-treatment outcome for cervical radiculopathy. ADLs are activities of daily living (based on Heckmann[33]).

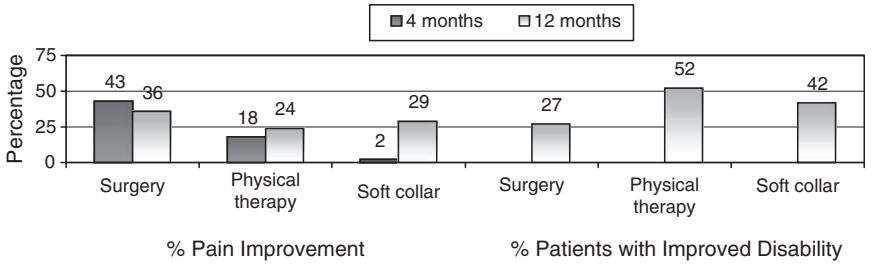


Fig. 6.13 Long-term outcome in patients with cervical radiculopathy randomized to surgical or conservative therapies (based on Persson[34]).

81 patients with cervical radiculopathy without myelopathy were prospectively randomized to receive decompressive surgery, physical therapy (including passive modalities, traction, and stretching and strengthening exercise) for 3 months or use of a soft cervical collar to be worn at least during the daytime for 3 months. Pain was assessed at baseline and 4 and 12 months after treatment initiation. Disability was evaluated after 12 months. Although pain reduction was higher with surgery at the first post-treatment assessment, outcome was similar after 1 year. These data support initial management with conservative measures, as appropriate. This recommendation is further supported by a long-term outcome study for surgical treatment of patients with cervical radiculopathy in which presurgical duration of symptoms did not affect surgical outcome until symptoms had been present for >48 months.[35] This study suggests that using conservative measures as first-line therapy in patients without myelopathy will not generally reduce the success rate from surgery if surgical intervention is later deemed necessary.

Shoulder Pain

Chronic shoulder pain is generally treated with conservative therapy, including nonsteroidal anti-inflammatory drugs (NSAIDs) and physical therapy. Physical therapy should include stretching and strengthening exercises of the rotator cuff, scapula, and deltoid. Exercises have been shown to provide both short- and long-term benefits for patients with shoulder pain.[36] Outcome can be improved by adding mobilization to physical therapy exercises and occupational therapy treatment. In a study following the outcome of 124 rotator cuff tears treated conservatively for an average of 3.4 years, good or excellent improvement occurred in 82%.[37] Conservative therapy was most effective in patients who initially possessed good range of motion and strength.

Corticosteroid injections may be used to supplement conservative therapy. Sonographic guidance with local corticosteroid injections for shoulder pain significantly improves pain reduction and functional improvement.[38] Surgical intervention is typically reserved for disabling impingement or rotator cuff tears failing to respond to conservative treatment.

Hand Pain

Due to significant disability often associated with hand pain, patients with chronic complaints should receive an evaluation and possibly treatment from an occupational therapist. Hand therapy, incorporation of postural corrections, and activity modifications often reduce both pain and disability. Assessment of typical daily activities and work duties, with ergonomic corrections to reduce overuse syndromes, should also be included.

De Quervain's Tenosynovitis

De Quervain's syndrome is generally managed conservatively with NSAIDs, splints, and/or local steroid injections. As expected, improvement is usually greater in patients with initially milder symptoms. A large, retrospective study of 300 patients with De Quervain's syndrome treated conservatively showed NSAIDs plus splints provided complete relief for 88% with initially mild symptoms, 35% with moderate symptoms, and 25% with severe symptoms.[39] Injections relieved symptoms in 100% with mild symptoms, 80% with moderate symptoms, and 76% with severe symptoms. Surgical decompression is rarely needed and typically reserved for patients failing conservative measures.

Carpal Tunnel Syndrome

Carpal tunnel syndrome is initially treated with postural correction and nighttime splints. Local steroid injections may be considered, especially in patients with motor loss. Iontophoresis with corticosteroids can be used as a useful adjunctive treatment in conjunction with postural correction, with topically applied medications delivered by a physical therapist to soft tissues, using electrical current. Thirty carpal tunnel syndrome patients prospectively randomized to receive either corticosteroid iontophoresis every other day for 1 week or a single steroid injection experienced benefit from either treatment, although injection led to superior improvement.[40] Pain reduction after 2 and 8 weeks of treatment, respectively, were 29% and 51% with iontophoresis and 27% and 71% with injection. Between pre-treatment and 8 weeks after therapy, the number of patients experiencing paresthesia decreased from 96% to 35% with iontophoresis and 95% to 15% with steroid injection. Therefore, while local injections are the preferred therapy, iontophoresis may be considered for patients wishing to avoid injections.

Two recent studies compared outcome in carpal tunnel patients who were symptomatic for <1 year and prospectively randomized for treatment with 1–2 steroid injections or surgical decompression. In one study ($N = 50$), improvement in symptoms and nerve conduction occurred in patients with either treatment, although benefits were greater with surgery than after a single steroid injection.[41] In this same study, grip strength improved in patients receiving injections and worsened slightly after surgery. In a similar study ($N = 101$), injections produced better short-term symptomatic relief and comparable long-term results to surgical decompression.[42] In this second study, patients were permitted to receive a second injection after 2 weeks, with 84% receiving two injections. These studies suggest that both injections and surgical decompression effectively relieve carpal tunnel symptoms; however, injections may produce better results when patients are offered a second injection after 2 weeks.

Summary

Musculoskeletal neck and upper extremity pain syndromes occur commonly, with pain resolution occurring after 1 year in only about one in three patients. Chronic neck and upper extremity pain most commonly affect the neck and shoulder. Persistent pain can be predicted by several risk factors, including long pain duration, previous or additional pain complaints, psychological distress, and coping with worry. Most chronic pain syndromes of the neck and upper extremity are diagnosed through history and physical examination, as imaging studies are notoriously unreliable for establishing diagnoses. Neck pain may be caused by musculoskeletal dysfunction or radiculopathy. Shoulder pain is most commonly caused by overuse in older adults or trauma in young patients. Hand pain is often caused by

cervical radiculopathy, carpal tunnel syndrome, and De Quervain's tenosynovitis. Most chronic pain syndromes are managed with conservative treatment, with surgery reserved for patients failing conservative measures or those with neurological or mechanical compromise.

Test Your Knowledge

1. Choose the correct statement(s) concerning the epidemiology of neck and upper extremity pain:

   a. Neck and upper extremity pain expected to resolve usually do so within 3 months.
   b. Neck pain is the most common site of musculoskeletal pain.
   c. The average general practitioner serving 2,500 patients can expect over 350 visits annually for neck and upper extremity complaints.
   d. Disability from neck and upper extremity pain tends to be significantly greater than that from low back pain.
   e. A and B
   f. A and C
   g. All of the above

2. Factors that predict persistence of neck and upper extremity pain include:

   a. Long pain duration
   b. Comorbid musculoskeletal pain in other body regions
   c. Poor social support
   d. Tendency to cope with worrying or retreating
   e. All of the above

3. Plain x-ray evaluations for degenerative cervical spine disease in asymptomatic adults will reveal a false positive result in:

   a. One in twenty
   b. One in ten
   c. One in three
   d. One in two

4. Which of the following pain conditions is reliably diagnosed with MRI?

   a. Bulging disc
   b. Carpal tunnel syndrome
   c. Partial rotator cuff tear
   d. De Quervain's syndrome
   e. A and C
   f. All of the above

5. Which statement(s) regarding cervical radiculopathy is(are) correct?

   a. Surgery typically results in similar improvement for neck pain, radicular pain, and numbness.
   b. Long-term pain relief is greater in patients treated with surgery.
   c. Delaying surgery for several weeks reduces the likelihood of surgical success.
   d. A and B
   e. All of the above
   f. None of the above

6. Effective treatments for chronic shoulder pain include:

   a. NSAIDs
   b. Stretching exercises
   c. Joint immobilization
   d. A and B
   e. All of the above

Answers: 1f, 2e, 3c, 4c, 5f, 6d

References

1. Feleus A, Bierma-Zeinstra SM, Miedema HS, et al. Incidence of non-traumatic complaints of arm, neck and shoulder in general practice. Man Ther, in press
2. Feleus A, Bierma-Zeinstra SA, Miedema HS, et al. Prognostic indicators for non-recovery of non-traumatic complaints at arm, neck and shoulder in general practice – 6 months follow-up. Rheumatology 2007;46:169–176
3. Badcock LJ, Lewis M, Hay EM, Croft PR. Consultation and the outcome of shoulder-neck pain: a cohort study in the population. J Rheumatol 2003;30:2694–2699
4. Pernold G, Mortimer M, Wiktorin C, Tornqvist EW, Vingard. Neck/shoulder disorders in a general population. Natural course an influence of physical exercise: a 5-year follow-up. Spine 2005;30:E363–E368
5. Kuijpers T, van Tulder MW, van der Heijden GJ, Bouter LM, van der Windt DA. Costs of shoulder pain in primary care consulters: a prospective cohort study in The Netherlands. BMC Musculoskelet Disord 2006;7:83
6. Picavet HJ, Schouten JG. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC_3-study. Pain 2003;102:167–178
7. Bot SM, van der Waal JM, Terwee CB, et al. Incidence and prevalence of complaints of the neck and upper extremity in general practice. Ann Rheum Dis 2005;64:118–123
8. Bot SM, van der Wall JM, Terwee CB, et al. Predictors of outcome in neck and shoulder symptoms. A cohort study in general practice. Spine 2005;30:E459–E470
9. Bot SM, van der Wall JM, Terwee CB, et al. Course and prognosis of elbow complaints: a cohort study in general practice. Ann Rheum Dis 2005;64:1331–1336
10. Lötters F, Burdorf A. Prognostic factors for duration of sickness absence due to musculoskeletal disorders. Clin J Pain 2006;22:212–221
11. Kuijpers T, van der Windt DM, van der Heijden GG, et al. A prediction rule for shoulder pain related sick leave: a prospective cohort study. BMC Musculoskelet Disord 2006;7:97

12. Dafner SD, Hilibrand AS, Hanscom BS, et al. Impact of neck and arm pain on overall health status. Spine 2003;28:2030–2035
13. Gore DR. Roentgenographic findings in the cervical spine in asymptomatic persons. A ten-year follow-up. Spine 2001;26:2463–2466
14. Gore DR, Sepic SB, Gardner GM. Roentgenographic findings of the cervical spine in asymptomatic people. Spine 1986;11(6):521–524
15. Ernst CW, Stadnik TW, Peeters E, Breucq C, Osteaux MJ. Prevalence of annular tears and disc herniations on MR images of the cervical spine in symptom free volunteers. Eur J Radiol 2005;55:409–414
16. Braga-Baiak A, Shah Pietrobon R, et al. Intra- and inter-observer reliability of MRI examination of intervertebral disc abnormalities in patients with cervical myelopathy. Eur J Radiol 2008;65:91–98
17. Bamji AN, Erhardt CC, Price TR, Williams PL. The painful shoulder: can consultants agree? Br J Rheumatol 1996;35:1172–1174
18. de Winter AF, Jans MP, Scholten RM, et al. Diagnostic classification of shoulder disorders: interobserver agreement and determinants of disagreement. Ann Rheum Dis 1999;58:272–277
19. Ostor AJ, Richards CA, Prevost AT, Hazleman BL, Speed CA. Interrater reproducibility of clinical tests for rotator cuff lesions. Ann Rheum Dis 2004;63:1288–1292
20. Terwee CB, de Winter AF, Scholten RJ, et al. Interobserver reproducibility of the visual estimation of range of motion of the shoulder. Arch Phys Med Rehabil 2005;86:1356–1361
21. Bertilson BC, Grunnesjö M, Strender LE. Reliability of clinical tests in the assessment of patients with neck/shoulder problems – impact of history. Spine 2003;28:2222–2231
22. Teefey SA, Rubin DA, Middleton WD, et al. Detection and quantification of rotator cuff tears. Comparison of ultrasonographic, magnetic resonance imaging, and arthroscopic findings in seventy-one consecutive cases. J Bone Joint Surg Am 2004;86A:708–716
23. Östör AK, Richards CA, Prevost AT, Speed CA, Hazleman BL. Diagnosis and relation to general health of shoulder disorders presenting to primary care. Rheumatology 2005;44:800–805
24. Bruske J, Bednarski M, Grzelec H, Zyluk A. The usefulness of Phalen test and the Hoffmann-Tinel sign in the diagnosis of carpal tunnel syndrome. Acta Orthop Belg 2002;68:141–145
25. Priganc VW, Henry SM. The relationship among five common carpal tunnel syndrome tests and the severity of carpal tunnel syndrome. J Hand Ther 2003;16:225–236
26. Côté P, Cassidy JD, Carroll LJ, Kristman V. The annual incidence and course of neck pain in the general population: a population-based cohort study. Pain 2004;112:267–273
27. Bot SM, van der Waal JM, Terwee CB, et al. Predictors of outcome in neck and shoulder symptoms. A cohort study in general practice. Spine 2005;30:E459–E470
28. Van den Heuvel SG, de Looze MP, Hildebrandt VH, The KH. Effects of software programs stimulating regular breaks and exercises on work-related neck and upper-limb disorders. Scand J Work Environ Health 2003; 29:106–116
29. Bot SM, Terwee CB, van der Windt DA, et al. Work-related physical and psychosocial risk factors for sick leave in patients with neck and upper extremity complaints. Int Arch Occup Environ Health 2007;80:733–741
30. Nabeta T, Kawakita K. Relief of chronic neck and shoulder pain by manual acupuncture to tender points – a sham-controlled randomized trial. Complement Ther Med 2002;10:217–222
31. Harris GR, Susman JL. Managing musculoskeletal complaints with rehabilitation therapy: summary of the Philadelphia Panel evidence-based clinical practice guidelines on musculoskeletal rehabilitation interventions. J Fam Pract 2002;51:1042–1046
32. Swenson RS. Therapeutic modalities in the management of nonspecific neck pain. Phys Med Rehabil Clin N Am 2003;14:605–627
33. Heckmann JG, Lang CJ, Zobelein I, et al. Herniated cervical intervertebral discs with radiculopathy: an outcome study of conservatively or surgically treated patients. J Spinal Disord 1999;12:396–401

34. Persson LG, Carlsson C, Carlsson JY. Long-lasting cervical radicular pain managed with surgery, physiotherapy, or a cervical collar: a prospective, randomized study. Spine 1997;22:751–758
35. Kadoya S, Iizuka H, Nakamura T. Long-term outcome for surgically treated cervical spondylotic radiculopathy and myelopathy. Neurol Med Chir (Tokyo) 2003;43:228–241
36. Green S, Buchbinder R, Hetrick S. Physiotherapy interventions for shoulder pain. Cochrane Database Syst Rev 2003;2:CD004258
37. Itoi E, Tabata S. Conservative treatment of rotator cuff tears. Clin Orthop Relat Res 1992;275:165–173
38. Naredo E, Cabero F, Beneyto P, et al. A randomized comparative study of short term response to blind injection versus sonographic-guided injection of local corticosteroids in patients with painful shoulder. J Rheumatol 2004;31:308–314
39. Lane LB, Boretz RS, Stuchin SA. Treatment of de Quervain's disease: role of conservative management. J Hand Surg [Br] 2001;26:258–260
40. Gökoğlu F, Findikoğlu G, Yorgancoğlu ZR, et al. Evaluation of iontophoresis and local corticosteroid injection in the treatment of carpal tunnel syndrome. Am J Phys Med Rehabil 2005;84:92–96
41. Hui AF, Song S, Leung CH, et al. A randomized controlled trial of surgery vs steroid injection for carpal tunnel syndrome. Neurology 2005;64:2074–2078
42. Ly-Pen D, Andréu J, de Blas G, Sánchez-Olaso A, Millán I. Surgical decompression versus local steroid injection in carpal tunnel syndrome. A one-year, prospective, randomized, open, controlled clinical trial. Arthritis Rheum 2005;52:612–619

Chapter 7
Back and Lower Extremity Pain

Key Chapter Points:

- Low back pain affects about 60% of adults at some point during their lives and becomes chronic for about one in four patients.
- Most cases of low back pain are caused by nonspecific conditions responding to conservative therapy.
- Thoracic spine pain may occur due to myofascial pain, vertebral fractures, postherpetic neuralgia, and metastatic disease.
- Hip and knee pain commonly occur due to musculoskeletal conditions, such as arthritis and bursitis.
- Common causes of chronic foot pain include plantar fasciitis, Morton's neuroma, tarsal tunnel syndrome, peripheral neuropathy, and peripheral vascular disease.

Key Words Arthritis, Bursitis, Morton's neuroma, Myelopathy, Plantar fasciitis, Radiculopathy, Tarsal tunnel syndrome

Case History

Ms. Herbert is an obese, 53-year-old waitress with pain in her low back and left foot. The back pain has bothered her off and on for the last 2 years, with more constant pain over the last 6 months. She was on sick leave from work for 2 months and returned with continued complaints of pain. The foot pain had started about a month before and she is convinced she has a fractured heel. When she first wakes up in the morning, her back is only moderately painful, but she gets an excruciating foot pain the minute her left foot touches the floor. The first few steps in the morning are unbearable and sometimes she crawls to the bathroom. After walking on her foot for a while, the pain seems to resolve, but returns later in the day when her back pain has flared up at work and she sits down for a break. Once the back feels better and she gets up again, she has that same knife-like pain in her heel. She has been absent from work for the past 2 weeks due to the combination of the back and

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

heel pain. There is visible muscle spasm with an elevated muscle bulk on the left side of her lower spine. This muscle is tender to palpation. Her neurological examination is unremarkable. Forward flexion of the lumbar spine is limited with active motion, with reports of pain. She also reports severe foot pain when her left foot is dorsiflexed, with no pain with plantar flexion or ankle rotation. Her workers' compensation doctor ordered radiographic studies. Plain x-rays showed spondylosis of the lumbar spine and a small left heel spur. Magnetic resonance imaging showed a bulging disc at L3–L4, with a small herniation at L5–S1. She has requested a surgical referral.

Introduction

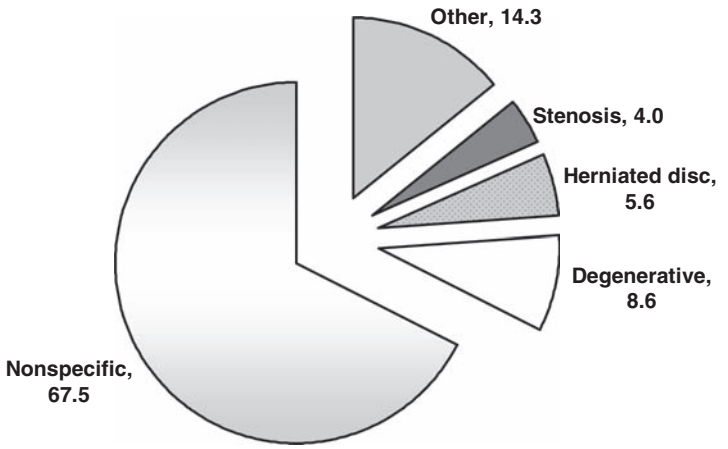
The back and lower extremity are common areas affected by chronic pain. Lower extremity pain may occur in conjunction with back pain (as radicular, referred, or radiating pain) or as isolated musculoskeletal or neuropathic pain. Back pain with or without associated lower extremity pain occurs frequently and is often disabling. Data from national surveys estimate that low back pain during the 3 months preceding the survey occurs in one in four adults ≥18 years old and one in three adults > 45 years old.[1]

In most cases, back pain will not be attributed to a specific etiology. The National Ambulatory Medical Care Survey showed nonspecific back pain to be the most common diagnosis for patients treating with a primary care practitioner (Fig. 7.1).[2] The high prevalence of nonspecific pain has important implications for assessment that will be described in this chapter. Ms. Herbert has two common chronically painful conditions – myofascial low back pain and plantar fasciitis causing foot pain. Her primary care doctor recognized both characteristic conditions and initiated conservative therapy, despite the presence of "abnormal" radiographic studies. Being able to knowledgably explain these conditions to Ms. Herbert and prescribe effective therapy prevented her from undergoing additional unnecessary testing or surgical procedures.

Epidemiology

Two large surveys of adults enrolled in general medical care or in a health insurance plan in Canada and Great Britain reported back pain lasting at least 1 week during the preceding month in almost one in four adults and back pain within the previous 6 months in almost three in four adults (Fig. 7.2).[3,4] Disabling pain was considerably less common. In addition, as seen in Ms. Herbert, three in every four individuals with back pain also reported having pain in other body regions (in order of frequency: the knee, shoulder, and neck),[4] making utilization of the pain drawing particularly beneficial to fully understanding pain symptoms in these patients.

A Patients seen by internists, %



B Patients seen by family or general medical doctors, %

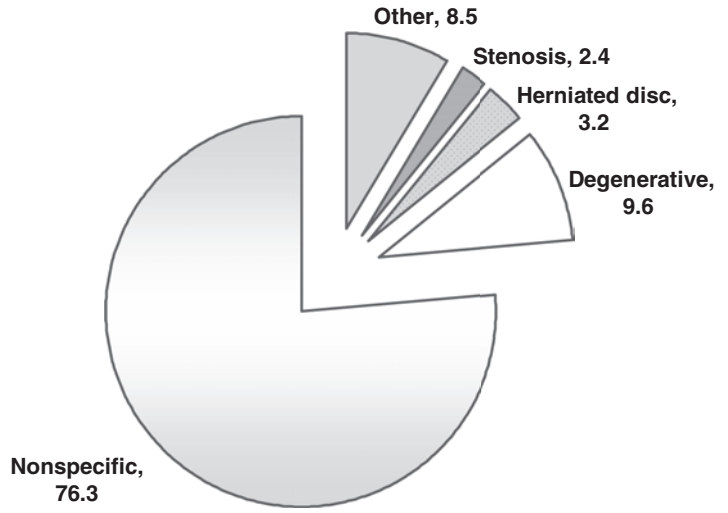


Fig. 7.1 Diagnoses for low back pain seen by the primary care physician (based on Hart[2]): (**A**) Patients seen by internists, %; (**B**) Patients seen by family or general medical doctor, %.

Low back pain is the most common chronic pain, affecting about 59% of adults at some point during their lives.[5] In most cases, episodes of acute back pain resolve with conservative, symptomatic treatment. In one study, acute back pain resolved within 1.5 months in 61% of adults treated with usual care by their primary practitioners

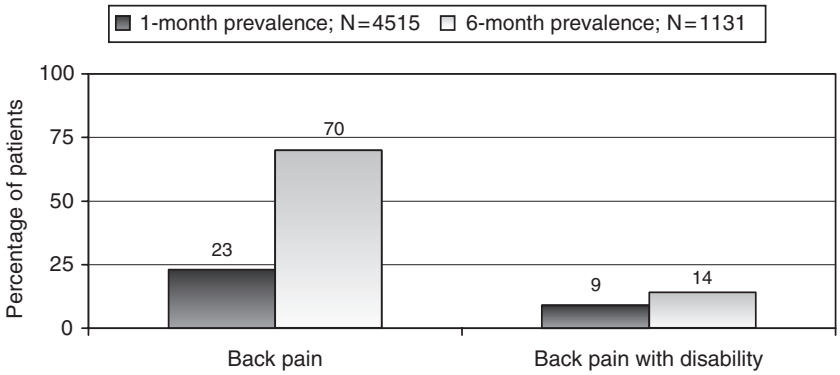


Fig. 7.2 Prevalence of back pain in general medical patients (based on Côté et al.[3], Webb et al.[4])

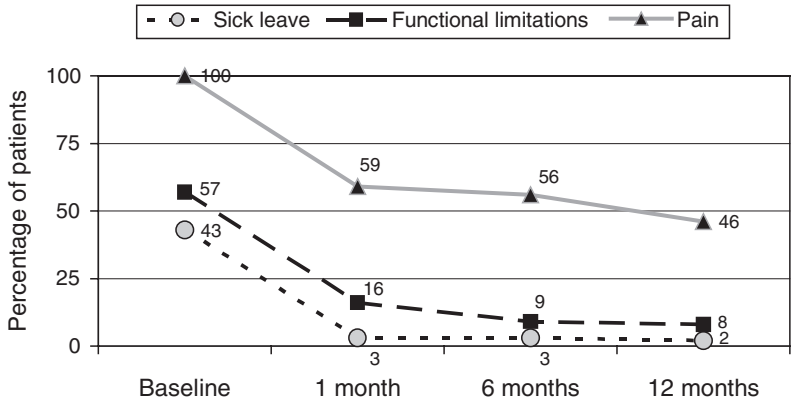


Fig. 7.3 Long-term prognosis of acute low back pain (based on Schiøttz-Christensen et al.[7]).

or rheumatologists.[6] Back pain that persists beyond the acute period, however, often persists long-term. A prospective survey of 503 Danish adults consulting a general practitioner for acute low back pain revealed that, despite returning to work, nearly half of these patients continued to report pain or functional limitations 1 year after the onset of their back pain (Fig. 7.3).[7] Similarly, surveys conducted in Great Britain revealed a persistence of symptoms 12 months after first consultation to a primary care provider by 42–75% of patients.[8,9]

Predictors of Chronic Low Back Pain

Adult patients seeing a primary care doctor for new onset acute low back pain of <3 weeks duration were followed weekly for the first month and then assessed at

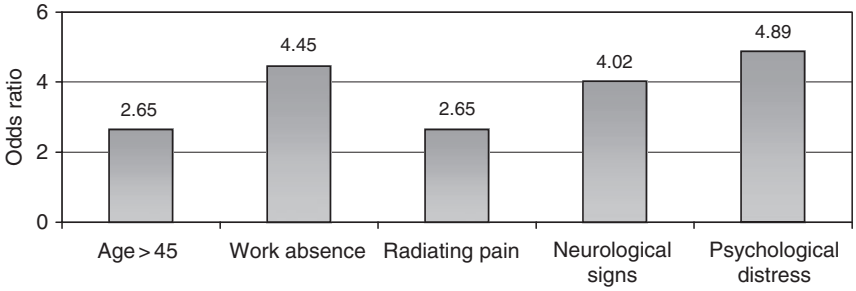


Fig. 7.4 Predictors of non-recovery from acute back pain after 3 months (based on Grotle et al.[10]). Work absence was defined as losing ≥4 days in the preceding month. Neurological signs were associated with the development of chronic pain when two or more of the following were abnormal: straight leg raise, knee or ankle reflex, sensation, and strength in the thigh or foot.

3 months.[10] Most episodes of acute back pain resolved, with the greatest reduction in pain occurring during the first 3 weeks. Pain severity decreased by an average of 58% after 3 months, with a 53% decrease realized during the first 3 weeks of acute pain. Pain became chronic for about one in four patients. Persistent back pain was predicted by patient demographics, physical examination findings, and psychological distress (Fig. 7.4). Several patient, work, and psychological features have been identified as predictors of an increased risk for chronic back pain following an acute injury (*see* Box 7.1).[11–14] Patients with these features may require earlier and more aggressive intervention to prevent persistence of pain and disability.

Occupation is another important risk factor for chronic back pain, with 37% of low back pain attributable to occupational factors.[15] For example, patients with acute low back pain were evaluated for persistent pain after 3 months, with recovery in 54% with work-related pain vs. 73% with pain unrelated to work.[16] Jobs requiring heavy physical work and prolonged standing increase the risk of persistent low back pain (*see* Table 7.1).

Successful return to work after absenteeism from low back pain can be predicted by a number of factors (*see* Box 7.2).[17] Ms. Herbert has several risk factors for poor likelihood of returning to work: pain-related disability, older age, female gender, obesity, and heavy work duties. Although most patients who develop back pain will return to work, problematic pain often persists and requires additional treatment. For example, an evaluation of 283 patients with work-related low back pain within the past 3 months that required temporary time off from work assessed different measures of recovery.[18] While return to full-time duties occurred in almost all patients, significant disability and persistent pain remained in the majority, suggesting the need for additional treatment (Fig. 7.5). Consequently, while achieving a successful return to work is an important treatment outcome measure, it must be evaluated in the context of other efficacy measures, including pain severity and disability for household activities, which may continue to be impaired in patients who have returned to work.

Box 7.1 Predictors of chronic low back pain (based on Grotle et al.[11], Grotle et al.[12], van der Windt et al.[14], Webster et al.[13])

- Pain characteristics
  - Pain limits ambulation
  - Neurological deficits
  - Early treatment with opioids
- Comorbidity
  - Sleep disturbance
- Psychosocial factors
  - Depression
  - Anxiety
  - Distress
  - Catastrophizing
  - Somatization
- Work variables
  - Sick leave used for acute back pain

Table 7.1 Relative risk of low back pain based on occupation (based on Punnett et al.[15])

Occupation	Relative risk of low back pain
Managers Professionals	1.0
Clerical workers Sales workers	1.4
Automobile mechanics Carpenters Construction workers Drivers Manual laborers Plumbers	2.4
Baggage handlers Custodians Nurses and other hospital workers Warehouse and stock workers Waiters/waitresses	2.5
Farmers	3.6

Box 7.2 Predictors of work absence for back pain (based on Streenstra et al.[17])

- Pain characteristics
  - Radiating pain
  - Pain-related disability
- Patient features
  - Older age (especially >51 years old)
  - Female gender
  - Overweight
  - Poor general health
- Psychosocial factors
  - Poor social support
  - Social isolation
- Work factors
  - Heavy work
  - Driving >75% of work hours
  - Lack of support from co-workers or supervisor
  - Availability of high level of compensation for work absence

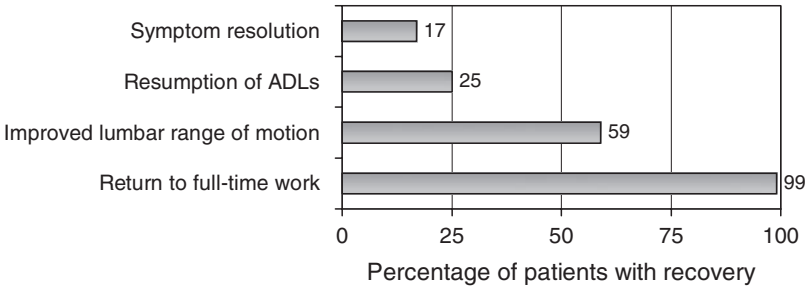


Fig. 7.5 Different outcome measures of recovery (based on Ferguson et al.[18]). ADL = activities of daily living.

Evaluation of Back and Lower Extremity Pain

Back and lower extremity pain may be caused by a variety of conditions, most commonly related to musculoskeletal or neurological abnormalities (*see* Table 7.2). Other medical conditions, including vascular, gastrointestinal, and gynecological pathology, may also result in back pain; therefore the physical examination must include a general medical screening, as well as abdominal and gynecologic evaluations.

Table 7.2 Common causes of back pain and lower extremity pain

Pain location	Diagnosis
Thoracic spine	Metastatic neoplasm
	Myofascial pain
	Osteoporosis with vertebral fracture
	Postherpetic neuralgia
Lumbar spine	Arthritis/Degenerative disease
	Lumbar radiculopathy
	Spinal stenosis
Hip	Arthritis
	Bursitis
Knee	Arthritis
	Bursitis
	Patellofemoral syndrome
Foot	Arthritis
	Morton's neuroma
	Neuropathy
	Plantar fasciitis
	Tarsal tunnel syndrome
	Vascular disease

Thoracic Pain

Historical features can help distinguish common thoracic pain syndromes (*see* Table 7.3). Landmarks to identify thoracic dermatomes are the nipples for T4 and the umbilicus for T10. A full discussion of myofascial pain is provided in Chap. 11. Postherpetic neuralgia is detailed in Chap. 10.

Table 7.3 Distinguishing common causes of thoracic pain

Condition	History and symptoms	Examination signs
Osteoporosis/vertebral fracture	Risk factors for osteoporosis: postmenopausal, low weight, inactive	Reduced active and passive range of motion. Point tenderness over vertebral body. Normal neurological examination
	Bone disease or trauma	
	Prior vertebral fracture	
Postherpetic neuralgia	Zoster	Scarring from earlier zoster.
	Unilateral dermatomal symptoms	Dermatomal area of numbness/hypersensitivity
Metastatic disease	Bilateral band or girdle of pain	Sensory level of numbness.
	Neurological symptoms	Bilateral hyper-reflexia in lower extremities
Myofascial pain	Nondermatomal distribution of pain	Muscle spasm, tenderness, and trigger points. Normal neurological examination

Vertebral fractures may be caused by osteoporosis, osteomalacia, hyperparathyroidism, hyperthyroidism, myeloma, metastatic cancer, infection, and local trauma. Osteoporosis affects about one in three postmenopausal women and one in ten men ≥50 years old.[19] Secondary osteoporosis may also occur with a variety of medical conditions, including endocrine, renal, gastric, and connective tissue disorders. Early life factors that predispose women to osteoporosis include prolonged amenorrhea, physical inactivity, low dietary calcium and vitamin D, smoking, and excessive alcohol use. Osteoporosis was estimated to produce 9 million new fractures in adults ≥50 years old in 2000.[20] Risk factors for first osteoporotic vertebral fracture in women ≥65 years old include older age, previous non-spine fracture, low bone mineral density (BMD), low body weight, smoking, low milk consumption with pregnancy, physical inactivity, history of falling, and regular use of aluminum-containing antacids.[21] Using estrogen supplementation decreases fracture risk. Risk is also influenced by ethnicity. After controlling for BMD, weight, and other risk factors, a survey of nearly 200,000 American women from five ethnic groups found the highest fracture risk in Caucasian and Hispanic women followed by Native Americans, African Americans, and Asian Americans.[22] Previous fractures, especially fractures associated with minimal trauma, suggest increased risk for low bone mass or osteoporosis.

The National Osteoporosis Foundation recommends obtaining BMD testing for all women ≥65 years of age and younger postmenopausal women with osteoporosis risk factors.[23] Risk factors include older age, personal and family histories of adult fractures, thin stature, prolonged amenorrhea or early menopause, smoking, excessive alcohol consumption, low dietary calcium, minimal weight-bearing exercise, and certain medications (e.g., glucocorticoids, thyroid medications, anticonvulsants, aluminum-containing antacids, gonadotropin releasing hormone, methotrexate, cyclosporine, heparin, and cholestyramine). A BMD T-score <2.5 standard deviations below the BMD for healthy young women is consistent with osteoporosis.

Bony metastases to the thoracic spine should be considered in all patients presenting with thoracic pain, especially when the pain is bilateral and experienced as a band or girdle of pain. Spinal metastases occur most frequently in patients with lung, prostate, or breast cancer. Due to the vascular distribution around the spine, most spinal metastases occur in the thoracic region. Back pain is often the initial complaint, with later development of neurological symptoms suggesting nerve root or spinal cord compression. A high index of suspicion is essential to prevent spinal cord compression or cauda equine syndrome, with resultant loss of ambulatory independence. A prospective, observational study of 319 patients with malignant spinal cord compression reported localized back pain and/or spinal nerve root pain in 94% of the patients, typically experienced as a band around the chest or abdomen.[24] Pain was generally described as severe and progressive, with bilateral pain in two of three patients. Pain was precipitated in about 40% of the patients by coughing, bending, and/or sneezing. One of the most significant findings from this study was the frequent and devastating delay in diagnosing malignant spinal disease. Patients typically waited for about 3 weeks before reporting the pain to their doctors, who typically did not diagnose their pain condition until about 3 months after the onset of symptoms. At the time of diagnosis, only 18% of patients were still ambulating independently. Once patients lost ambulation, it was rarely regained.

Lumbar Pain

Low back pain may occur in isolation or in conjunction with lower extremity pain. Associated lower extremity pain may suggest neurological pain, such as radiculopathy. Signs and symptoms help differentiate among common causes of back pain (*see* Table 7.4). Neurological symptoms or deficits suggest the need for additional evaluations.

Table 7.4 Distinguishing characteristics of common low back pain syndromes

Diagnosis	Features
Myofascial pain	Restricted lumbar range of motion with active testing; good passive motion
	Muscle spasm and trigger points present
	Normal neurological examination
Mechanical pain	Pain worsens with activity
	Restricted lumbar range of motion with active AND passive testing
	Normal neurological examination
Radiculopathy	Dermatomal distribution of pain and numbness
	Motor/sensory loss on neurological examination
Spinal stenosis	Bilateral pain and cramping with walking and relief with sitting
	Aggravation with lumbar extension (bending backward, walking downhill)
	Relief with lumbar flexion (stooping forward)
	Normal neurological examination between pain episodes

Patient history should include identification of factors that predict the chronic nature of back pain and disability (*see* Box 7.3). The physical examination should include an evaluation of range of motion and neurological signs of strength,

Box 7.3 Historical evaluation of patient with back pain

Identify the following historical features that predict pain persistence and disability:

1. Pain has already resulted in work absence
2. Neurological symptoms are present, including radiating pain
3. Walking is restricted
4. Sleep is disturbed
5. General health is poor or excess weight is present
6. Psychological distress, depression, or anxiety is present
7. Work is considered heavy or entails substantial lifting, pushing, pulling, standing, or prolonged driving
8. Support network within work and at home is limited

reflexes, and sensation (*see* Box 7.4). Lower extremity dermatomes are depicted in Fig. 7.6. Identification of specific patterns of motor and sensory dysfunction can determine the presence of specific radiculopathies (*see* Table 7.5).

Box 7.4 Physical examination of patient with lumbar pain

1. Musculoskeletal examination
   (a) Muscle palpation for tenderness, spasm, and trigger points
   (b) Skeletal assessment for posture and range of motion (both active and passive)
2. Neurological examination
   (a) Strength testing
   (b) Reflexes
   (c) Sensory examination to touch and pin
   (d) Gait testing to assess casual movements and strength

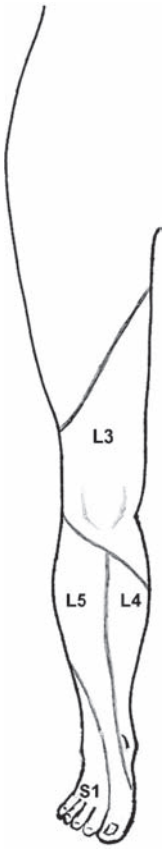


Fig. 7.6 Sensory testing for lumbar radiculopathy. Skin areas served by specific lumbar nerve roots are marked.

Table 7.5 Evaluation for common lumbar radiculopathies

Nerve involved	Disc space	Motor loss	Reflex loss	Sensory loss
L3	L2–L3	Knee extension	Knee reflex	Anterior medial thigh
L4	L3–L4	Knee extension	Knee reflex	Medial lower leg
L5	L4–L5	Foot dorsiflexion: walking on heels	None	Lateral lower leg and great toe
S1	L5–S1	Foot plantar flexion: walking on toes	Ankle jerk	Lateral foot and sole

Use of Specialized Testing for Back Pain

Plain x-rays with flexion and extension can help identify mechanical causes of back pain, suggested by restriction in both active and passive motion of the lumbar spine. Abnormalities seen on x-ray may include spondylosis, spondylolysis, and spondylolisthesis. *Spondylosis* is a degeneration of vertebral disc spaces, typically occurring in patients with osteoarthritis. *Spondylolysis* is separation of the pars interarticularis, recognized as the neck of the Scottie dog on an oblique x-ray of the lumbar spine. Spondylolysis may result in abnormal forward movement of one of the vertebrae or s*pondylolisthesis*, typically affecting L5 in children and L4 in adults. Spondylolisthesis is graded from 1 to 4, depending on the amount of slippage, with grades 1 and 2 typically managed with physical therapy and grades 3 and 4 possibly resulting in neural impingement and the need for surgical correction. Pediatric spondylolisthesis is usually congenital, while adult changes often occur with osteoarthritis. Spondylolisthesis may also occur due to a stress fracture, trauma, or bone disease. Less commonly, restrictions in joint motion may be caused by inflammatory spondyloarthropathy, such as ankylosing spondylitis. Patients with spondyloarthritides often have blood tests showing elevation of inflammatory markers, like C-reactive protein, anemia of chronic disease, and the absence of rheumatoid factor. While x-ray changes may be dramatic, radiographic changes typically occur 5–10 years after the disease is clinically apparent.

Nerve conduction and electromyographic testing (EMG) can help clarify specific neural abnormalities in patients with unclear or mixed patterns of neurological dysfunction on examination. Neither radiographic nor EMG testing is particularly beneficial for identifying clinically significant abnormalities. Among patients with low back pain or spinal stenosis, the presence of abnormalities on EMG or magnetic resonance imaging (MRI) does not predict the clinical presentation of either pain or disability.[25] EMG testing more effectively differentiates clinically symptomatic from asymptomatic patients compared with MRI.[26] MRI and computed tomography (CT) generally should be reserved for patients with clinical evidence for myelopathy (e.g., bilateral motor and sensory loss), radiculopathy, or spinal stenosis (e.g., pain with walking or a tendency to adopt forward lumbar flexion while walking). In a prospective, observational survey following 200 patients for the development of low back pain with clinical assessments and MRI over 5 years, clinically significant MRI findings occurred only in those patients with primary radicular complaints.[27]

Table 7.6 Spine MRI abnormalities in asymptomatic adults (based on Boden et al.[29], Jensen et al.[28], Wood et al.[30])

Abnormality	Prevalence in normal adults (%)
Thoracic spine	
Degenerative changes	56
Disc bulge	53
Disc herniation	37
Annular tear	58
Spinal cord deformation	29
Scheuermann endplate irregularities or kyphosis	38
Lumbar spine	
Disc bulge	52
Disc herniation	24
Stenosis	4

MRI scans of asymptomatic adult controls often show radiographically significant changes in the thoracic and lumbar spine (*see* Table 7.6).[28–30] As expected, the prevalence of radiographic abnormalities increases with age. Young individuals, however, also may have a wide variety of asymptomatic abnormalities identified on routine screening. A small study of 33 young tennis players ranging in age from 16 to 23 years old with no history of back pain identified MRI abnormalities in 85%, including facet arthropathy (69.7%), synovial cysts (30.3%), disc degeneration (39.4%), disc herniation (39.4%), and pars injury (27.3%).[31] This study highlights the need to interpret radiographic abnormalities with caution and in conjunction with clinical signs and symptoms. Furthermore, MRI abnormalities in asymptomatic adults do not predict the later development of clinical low back pain symptoms.[32] In addition, a 5-year prospective study concluded that most new changes seen on MRI obtained within 12 weeks of developing serious low back pain were progressive degenerative changes, unrelated to the clinical symptoms.[33]

Spine abnormalities unrelated to clinical symptomatology are similarly identified with CT scanning. In a group of 52 controls, 35% had abnormal lumbar studies, with the percentage of abnormalities increasing to 50% after the age of 40.[34] In those controls younger than 40, 20% had CT scans that revealed herniated discs.

Selecting Candidates for Imaging Studies

Imaging studies should not be routinely performed in patients with back pain, but reserved for patients in whom specific pathology is being evaluated. Negative effects of routine radiographic testing were highlighted in a recent, randomized study of 421 patients (seeking treatment with general practioners) with low back pain of at least 6 weeks duration (median duration = 10 weeks).[35] Outcome was

compared in those patients randomized to receive lumbar spine x-rays in conjunction with usual care and patients randomized to receive usual care without x-rays. No serious spinal pathology was identified on any of the x-rays. In most cases, x-rays showed discovertebral degeneration or a normal spine. When assessed after 3 months, those patients randomized to receive an x-ray were more likely to report persistent pain (odds ratio = 1.56) and require additional consultations with the general practitioner (odds ratio = 2.72). Although 80% of participants stated a desire to receive an x-ray, those actually having radiographic testing did not report more reassurance or less worrying than those not receiving x-rays. Therefore, routine x-rays in patients with back pain does not reduce the patient's fears and results in greater workload for the general practitioner and a greater likelihood of persistent pain.

Thoracic Spine Pain

Patients with band-like or dermatomal thoracic pain with no history of zoster often require imaging studies to rule out structural pathology. Point tenderness over the thoracic spine suggests the need for x-rays to rule out fractures. Vertebral fractures may be caused by osteoporosis, osteomalacia, hyperparathyroidism, hyperthyroidism, myeloma, metastatic cancer, infection, and local trauma. MRI is an effective tool to differentiate benign from malignant vertebral fractures. Normal T1-weighted signal with no gadolinium enhancement suggests benign fracture,[36,37] while involvement of multiple vertebra, gadolinium enhancement, epidural compression, or paraspinal soft tissue masses suggests malignant fracture.[38]

Lumbar Spine Pain

According to recent recommendations from the American College of Physicians and American Pain Society, diagnostic testing beyond a history and physical examination should not be routinely performed in patients with nonspecific, chronic low back pain.[39] Patients with acute low back pain may need imaging studies if they have a history of trauma, infection, or cancer or their examination reveals a neurological deficit. Plain x-rays, including assessment with flexion and extension, are useful to evaluate possible mechanical factors. CT or MRI testing is best reserved for patients with a strong clinical suspicion of myelopathy or radiculopathy.

Chronic Hip Pain

Chronic pain in the hip often accompanies low back pain. Pain localized to the hip commonly affects the greater trochanter. New onset of trochanteric pain affects about two cases per 1,000 patients in primary care, annually, with most cases

persisting > 5 years.[40] Pain over the greater trochanter may be caused by arthritis or bursitis. Inflammation of the trochanteric bursae (trochanteric bursitis) results in pain in the lateral hip, possibly radiating to the thigh. This pain may be aggravated by palpation of the greater trochanter, climbing steps, rising from a chair, or prolonged standing. Trochanteric bursitis may occur due to trauma, overuse, or arthritis. Chronic sacroiliitis or lumbar radiculopathy often mimic true degenerative hip pain, with MRI showing relatively normal hip joint anatomy in these patients.

Chronic Knee Pain

Injuries to the ligaments, tendons, and meniscus in the knee often result in acute knee pain, while chronic knee pain is typically caused by bony changes from rheumatoid or osteoarthritis and patellofemoral syndrome. Patellofemoral syndrome causes pain behind or around the patella, with aggravation with prolonged sitting, walking down steps or hills and weight-bearing impact exercise, like running. Patellofemoral syndrome should be distinguished from patellar tendonitis, which is associated with pain and focal tenderness over the patellar tendon below the knee cap. Patellofemoral syndrome typically affects younger adults and is one of the most common sports-related chronic pain complaints, affecting about 20% of adolescents and young adults.[41] Patients >50 years old with knee pain should have radiographic evaluations to ensure the absence of symptomatic arthritis.

Fluid-filled bursae surround the joint and help reduce friction with joint movement, with inflammation (bursitis) often resulting in acute or subacute knee pain. The most commonly affected bursa is the pre-patella bursa above the kneecap, typically affected by activities that require excessive kneeling, like gardening and housework. Pre-patellar bursitis also occurs commonly in a variety of occupations that involve frequent or excessive kneeling, including carpet laying, plumbing, mining, and roofing.

Chronic Foot Pain

In patients with painful feet, common causes of chronic foot pain need to be ruled out. Unique pain locations and symptoms help to distinguish common foot pain syndromes from peripheral neuropathy (*see* Table 7.7 and Fig. 7.7.) Morton's neuroma produces a unilateral pain in the ball of the foot with weight bearing. Plantar fasciitis creates an excruciating pain that occurs in one or both feet after taking the first steps on rising from bed or a prolonged sitting position. Tarsal tunnel syndrome produces a diffuse pain over the medial ankle and sole, caused by compression of the tibial nerve. The tibial nerve travels behind the medial malleolus, immediately posterior to the tibial artery. Both travel into the foot beneath the flexor retinaculum, a fibrous band between the medial malleolus and the calcaneous. Nerve impingement in the tarsal tunnel is similar, although less common, than compression of the median nerve in the carpal tunnel of the wrist. Nerve conduction

Table 7.7 Common causes of painful feet

Condition	Pain location	Response to walking	Typical symptoms
Morton's neuroma	Ball of the foot	Pain with each weight-bearing step	Tingling and electric shock around the 2nd–4th metatarsals and toes during weight bearing. Feeling like you're "walking on a marble." Pain in the ball of the foot is worsened with walking
Peripheral neuropathy	Bilateral, burning pain located over areas covered by socks. Early symptoms are more distal	Aggravated by touch. Walking may worsen or relieve	Symmetrical sensory loss and/or dysesthesia in a stocking distribution
Peripheral vascular disease	Diffuse cold feet at rest. Diffuse pain occurs with exercise	Exercise produces ache, cramp, or muscle fatigue	Cold, discolored feet at rest. Pain with walking
Plantar fasciitis	Excruciating heel pain	Maximum severity with first morning step or after prolonged sitting. Improves with walking	Painful heel and posterior sole, especially on waking and first walking on foot. Pain is relieved by "walking it off." Pain occurs with foot dorsiflexion
Tarsal tunnel syndrome	Vague pain and numbness over the medial ankle, heel, sole and arch	Aggravated by walking	Diffuse ankle and foot pain, worsened with activity. Electric shock pain with percussing the flexor retinaculum posterior to medial malleolus

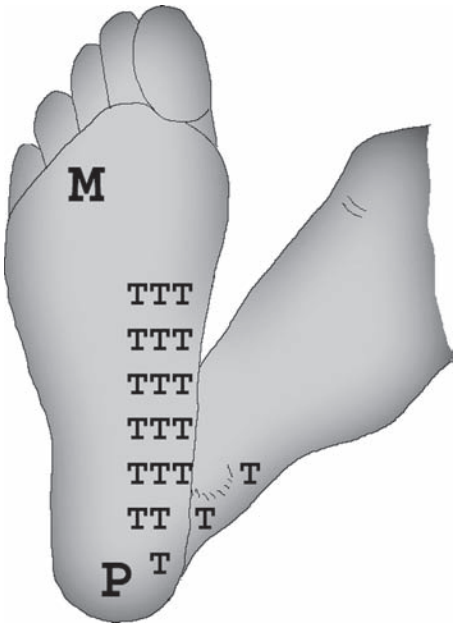


Fig. 7.7 Location of common unilateral foot pain syndromes M, Morton's neuroma ; P, plantar fasciitis ; T, tarsal tunnel syndrome.

and electromyographic testing are typically reserved for patients with atypical symptoms for whom mononeuropathy (such as radiculopathy or compressive neuropathy) or peripheral neuropathy is suspected.

Treatment

Back Pain

Thoracic Pain

Disease-specific treatments may be used to treat spinal metastases, osteoporosis, and postherpetic neuralgia. Spinal metastases from either breast or prostate cancer are treated with radiation, hormone therapy, chemotherapy, and bisphosphonates to inhibit osteolytic activity of bony metastases.[42,43] Biphosphonates are also recommended for the prevention and treatment of bone loss in breast cancer patients who are at high risk for osteoporosis, due to hormonal therapy, chemotherapy, and treatment-induced premature ovarian failure.[44] The treatment of postherpetic neuralgia is described in Chap. 10.

Effective therapies for osteoporosis include exercise (e.g., Tai Chi and weight-bearing exercise using weighted vests[45,46]), mineral and vitamin supplementation, estrogen or selective estrogen receptor modulators (e.g., raloxifene [Evista]), calcitonin, and bisphosphonates (e.g., alendronate [Fosamax], risedronate [Actonel], ibandronate [Boniva] and zoledronate [Zometa]). Strontium ranelate [Protelos or Protos] also decreases bone resorption, stimulates bone formation, and has demonstrated efficacy for reducing vertebral and non-vertebral fractures in postmenopausal women with osteoporosis.[47] Bisphosphonates are recommended as first-line drug therapy due to their effective prevention of vertebral and non-vertebral fractures.[48] Individuals at risk for osteoporosis should be supplemented with 700–800 mg of calcium plus 400–800 IU vitamin D,[49] since a survey of over 1,500 women receiving screening mammograms reported adequate calcium and vitamin D intake in only 30% of pre-menopausal and 25% of postmenopausal women.[50] Calcium citrate is better absorbed than calcium carbonate. Nasal calcitonin also helps decrease the risk of vertebral fracture and pain.

Vertebral fractures can be effectively prevented and/or treated with a variety of medications, including oral bisphosphonates, oral selective estrogen receptor modulators (raloxifene), and subcutaneous recombinant parathyroid hormone (teriparatide [Forteo]).[51] Clinical trials demonstrating efficacy with each of these therapies treated patients with additional calcium and/or vitamin D supplementation. Among these treatments, bisphosphonates also significantly reduced the risk for non-vertebral fractures. Teriparatide is typically reserved for patients with severe osteoporosis and risk of fracture or patients with glucocorticoid-induced osteoporosis requiring long-term steroid treatment.[52] Teriparatide is not used concomitantly with bisphosphonates and is not recommended for use for more than 2 years, when

therapy is often switched to a bisphosphonate. A 3-year study evaluated the occurrence of new vertebral fractures in 1,802 ambulatory, postmenopausal women with a prior fracture who were supplemented with calcium and treated with 5 mg risedronate or placebo daily.[53] Women treated with risedronate experienced a 44% reduction in the risk for new fractures compared with those treated with a placebo. A comparative study evaluating efficacy and cost of osteoporosis treatment in high-risk patients with low BMD and a prior history of vertebral fracture showed risedronate to be more effective and less expensive than alendronate and raloxifene.[54]

Lumbar Pain

The American College of Physicians and the American Pain Society recently published evidence-based consensus guidelines for the diagnosis and treatment of low back pain (*see* Box 7.5).[55] Recommending activity maintenance as tolerated

Box 7.5 Low back pain recommendations from the American College of Physicians and the American Pain Society (based on Chou et al.[39])

- Patients should undergo a focused history and physical examination to determine diagnostic category
  - Radiculopathy
  - Spinal stenosis
  - Other specific cause
  - Nonspecific low back pain
- Diagnostic testing, including imaging studies, should be reserved for patients with severe or progressive neurological deficits or patients in whom a serious, specific illness is suspected.
  - Imaging studies should be performed in patients with suspected radiculopathy or spinal stenosis ONLY if they are candidates for surgery or epidural injections.
- Patients should receive information about expected course of low back pain.
- Patients should be instructed to remain active and practice self-care (continue usual activities, use superficial heat, and read pain-related literature).
- First-line medications are usually acetaminophen and nonsteroidal anti-inflammatory drugs.
- Patients failing to recover with self-care may need additional therapy
  - For acute pain: spinal manipulation
  - For subacute or chronic pain: multidisciplinary pain rehabilitation, exercise therapy, acupuncture, massage, manipulation, yoga, cognitive-behavioral therapy, or progressive relaxation

Table 7.8 Efficacy of complementary and alternative treatments for low back pain (based on van Tulder et al.[57])

Therapy	Acute back pain	Chronic back pain
Acupuncture	Ineffective	Effective
Massage	Ineffective	Effective
Manipulation	Effective	Effective
Herbals		
Devil's claw (50 mg harpagophytum procumbens)	Effective[a]	Inadequate data
Salix alba (240 mg)	Effective[a]	Inadequate data
Capsicum frutescens (11 mg)	Effective	Inadequate data

[a]Efficacy comparable to rofecoxib [Vioxx]

was further supported by a randomized controlled trial, in which 281 ambulatory patients with acute low back pain were randomized to 4 days of bed rest or advised to continue normal activities.[56] Pain intensity, functional disability, and lumbar range of motion were similar in both groups when reassessed after 1 week, 1 month, and 3 months. A variety of alternative and complementary treatments have also demonstrated efficacy for low back pain (*see* Table 7.8).[57]

Acute Back Pain Treatment

Patients with acute back pain require evaluation to identify conditions warranting specific therapy (Fig. 7.8). Many episodes of acute back pain resolve spontaneously or improve significantly without specific medical intervention, supporting focusing treatment on symptomatic therapy to aid in reducing disability. Studies show that patients improve best after acute injury when they reduce activities to as tolerated and allow healing to occur, compared with patients who are treated with either complete bed rest or acute physical therapy.[58–60] A survey of 281 adults with acute back pain reported similar outcomes when treated with bed rest or activities as tolerated, suggesting little need for most patients to restrict work activities.[61] Malmivaara and colleagues selected 165 patients with acute back pain or a brief exacerbation of chronic back pain and randomized them to treatment with 2 days of bed rest, mobilizing exercises, or ordinary activities as tolerated. Both the extent and speed of improvement were greatest for the ordinary activity group and worst in the bed rest group. These findings suggest that neither brief bed rest nor light exercise should be prescribed for acute back pain. Rather, acute back pain should be managed with medical evaluation and brief education to avoid even short-term bed rest and maintain activities as tolerated.

Opioids should be limited for patients with acute low back pain, especially as pain will often respond similarly to simple analgesics and will usually lessen in severity. A retrospective review of data collected on 8,443 workers' compensation clients with new onset, disabling low back pain identified early opioid use as a

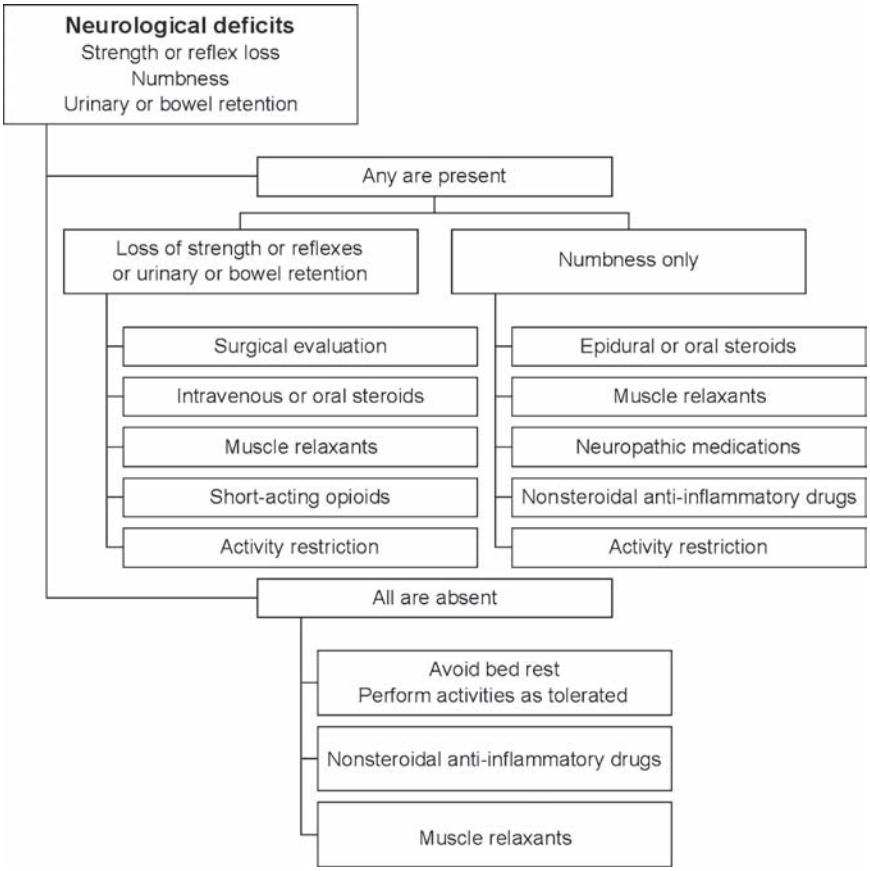


Fig. 7.8 Management of acute lumbar pain.

strong predictor of chronicity and disability.[13] In this sample, 21% of claimants received at least one opioid prescription during their first 15 days of symptoms. After adjusting for possible confounding factors (including low back injury severity), recipients of early opioid prescriptions had a longer duration of pain symptoms, higher disability, greater medication usage, and increased risk for surgery. While study design limits the strength of interpretation of these data, the authors concluded that opioid treatment in acute low back pain appeared to be counterproductive to recovery.

Chronic Back Pain Treatment

Interdisciplinary treatment, utilizing coordinated care from multiple disciplines including active physical therapy with behavioral interventions, is the most effective method of achieving long-term pain relief and the ability to resume normal activities (Fig. 7.9).[62,63] In general, reduction in disability and improvement in function

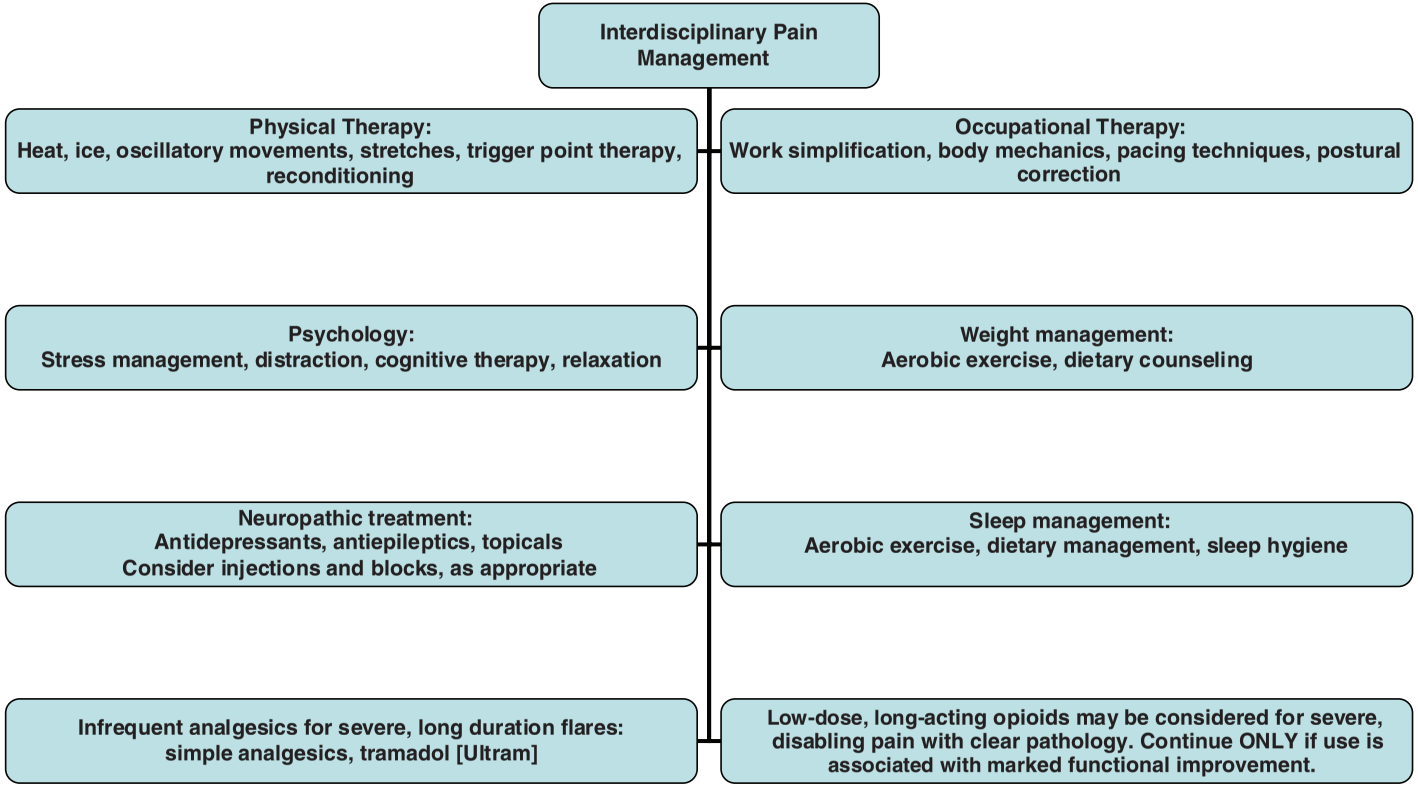


Fig. 7.9 Chronic back pain management.

precede substantial pain relief. Patients with myofascial dysfunction and restricted spine mobility will require targeted physical therapy. Occupational therapy may also be beneficial. Patients with ankylosing spondylitis may require anti-inflammatory therapy (e.g., nonsteroidal anti-inflammatory drugs and tumor necrosis factor alpha antagonists). Patients with neuropathic pain (numbness, dysesthesia, hyperalgesia, burning pain) may benefit from neuropathic treatment. (Additional information about treatment for neuropathic symptoms can be found in Chap. 10.)

Opioids may be used judiciously to manage severe, infrequent flares or in low doses for recalcitrant, constant, disabling pain. (More complete coverage of recommendations for the use of opioids appears in Chap. 19.) Opioids provide limited effectiveness for chronic back pain, with misuse/abuse behaviors reported in up to 24% of patients.[64] A meta-analysis of pooled data from comparative studies with opioids in chronic back pain patients showed no significant difference in pain reduction with opioids compared with non-opioid analgesics or placebo. Consequently, short-term opioids may be used infrequently for severe, long-lasting pain flares. Long-acting or sustained-release opioids should be reserved for compliant, motivated patients with recalcitrant, disabling pain that has failed to respond adequately to trials with alternative therapy. Low-doses should be utilized, with frequent reassessment for compliance, efficacy, and tolerability. Opioids should generally only be continued in patients successfully achieving substantial functional improvement with treatment.

Nerve blocks are reserved for adjunctive therapy in patients with clearly identified nerve root irritation, such as chronic radiculopathy or spinal stenosis. In general, facet joint, epidural, and trigger point injections have limited efficacy for chronic low back pain.[65] Efficacy with injections can be improved by using fluoroscopic guidance in addition to anatomical landmarks.[66]

Surgical discectomy provides effective relief for carefully selected patients with sciatica from herniated discs that have failed to respond to conservative therapy. Surgical outcome is best in patients with associated lower extremity pain and clear neurological deficits. Patients with motor deficits or bowel/bladder disturbance typically require early surgical intervention. Patients with numbness often respond to conservative therapy. Delaying surgery with conservative therapy in patients without myelopathy does not affect outcome in patients eventually requiring surgical treatment.[67]

Work and Chronic Back Pain

Most of the costs associated with low back pain are incurred from lost wage payments rather than medical costs, which represent a minor burden. In three studies, 75–93% of the cost of back pain could be attributed to indirect costs (e.g., work absenteeism and disability) and only 7–25% to medical expenses.[68–70] Therefore, reducing the cost of care should focus primarily on facilitating the return to work, rather than reducing medical treatment expenses. Interestingly, both patient and clinician expectations about likely disability affect the return to work

process. A prospective study showed that, even before treatment, the presence of negative expectations about return to work by either patient or clinician was associated with a longer work absence.[71]

Early return to work results in both economic and symptomatic benefits for back pain patients. Symptomatic benefits from working were evaluated in a study in which pain, depression, and disability were evaluated in 200 patients with chronic back pain.[72] Although baseline demographics and injury variables were similar between working and non-working patients, all measures of symptomatology were superior in working patients. Litigation tended to increase patient perceptions of pain severity and disability; however, these effects were mitigated if the patients were working.

Chronic Knee Pain

Knee pain related to arthritis should be treated as other arthritic conditions (*see* Chap. 9). Weight reduction helps reduce mechanical stresses on knees and should be included in an exercise program targeting the knee. Trochanteric bursitis treatment typically includes rest, measures to reduce inflammation (such as ice and anti-inflammatory drugs), physical therapy, and possibly local corticosteroid injections. Posture abnormalities that may aggravate trochanteric bursitis should be corrected, such as insertion of shoe inserts to correct leg length discrepancies.

Patellofemoral syndrome is generally treated conservatively, with avoidance of high-impact activities. Aerobic conditioning should include low-impact exercise, such as swimming or using an elliptical machine. Therapeutic exercises should include quadriceps strengthening and stretching of the iliotibial band, hip, hamstring, and calf. Ice and anti-inflammatory medications may be helpful. Arch supports and orthotics may also reduce patellar pain. Running shoes should be switched every 300 miles or 500 km after resuming impact sports. Patellar bracing and taping are typically not beneficial.

Chronic Foot Pain

Chronic foot pain treatment is targeted to pathology for specific diagnoses (*see* Table 7.9). In most cases, patients will require long-term treatment to avoid foot pain recurrence. Proper foot wear, stretching exercises, and limiting foot overuse are helpful to reduce recurrence of unilateral foot pain syndromes.

Summary

Back and lower extremity pain are commonly seen in primary care. Low back pain affects about 60% of adults at some point during their lives, with pain becoming chronic in about one in four patients. Most cases of low back pain are caused by

Table 7.9 Treatment of foot pain

Diagnosis	Treatment
Plantar fasciitis	Stretching with foot dorsiflexion
Tarsal tunnel syndrome	Orthotics, NSAIDs, stretching exercises for calf muscles, local steroid injections into the flexor retinaculum, surgical nerve release
Morton's neuroma	Change to comfortable, roomy shoes, orthotics, NSAIDs, local steroid injections
Peripheral neuropathy	Antidepressants, antiepileptic drugs
Peripheral vascular disease	Reduce vascular risk factors: smoking, hypertension, and high cholesterol
	Consider antiplatelets, cilostazol [Pletal] 50–100 mg twice daily, revascularization surgery

NSAID Nonsteroidal anti-inflammatory drug

nonspecific conditions responding to conservative therapy. Patients with significant risk factors for chronic pain or prolonged disability should receive more aggressive rehabilitative therapy. Although work-duty limitations may be needed for patients with physically demanding jobs, complete work restriction is generally not effective in reducing pain symptoms and can result in prolonged disability. Hip and knee pain commonly occur due to musculoskeletal conditions, such as arthritis and bursitis. Common causes of chronic foot pain include plantar fasciitis, Morton's neuroma, tarsal tunnel syndrome, peripheral neuropathy, and peripheral vascular disease.

Test your Knowledge

1. Choose the correct statement(s) about back pain:

   (a) Low back pain during the preceding 3 months affects about one in four adults.
   (b) Acute low back pain becomes chronic in nearly half of all patients.
   (c) Acute low back pain shows the greatest improvement within the first 3 weeks.
   (d) Acute low back pain should be treated with 2 weeks of bed rest to maximize recovery.
   (e) A and C.
   (f) All of the above.

2. Which occupations are associated with a high risk for chronic neck or back pain?

   (a) Farm workers
   (b) Housekeepers/custodians
   (c) Nurses and nurses aides
   (d) Waitresses
   (e) A, B and D
   (f) All of the above

3. Which characteristic(s) predict a higher likelihood of developing chronic back pain?

   (a) Sleep disturbance
   (b) Psychological distress
   (c) Neurological deficits
   (d) Early treatment with opioids
   (e) A, B and C
   (f) All of the above

4. Choose the correct statement(s) about thoracic pain:

   (a) Osteoporosis affects about one in six postmenopausal women and infrequently results in vertebral fractures.
   (b) Patients with band-like pain should be evaluated for possible metastatic disease.
   (c) The thoracic spine is an unusual location for vertebral metastases.
   (d) Metastatic thoracic spine disease does not require specific therapy until neurological deficits develop.
   (e) A and B.
   (f) All of the above.

5. Effective treatments for patellofemoral syndrome include:

   (a) Limiting high-impact activities
   (b) Quadriceps strengthening
   (c) Patellar bracing and taping
   (d) A and B
   (e) All of the above
   (f) None of the above

6. Appropriate treatments of plantar fasciitis include:

   (a) Rest
   (b) Immobilization
   (c) Low-dose opioids
   (d) A and B
   (e) All of the above
   (f) None of the above

Answers: 1e, 2f, 3f, 4b, 5d, 6f

References

1. Deyo RA, Mirza SK, Martin BI. Back pain prevalence and visit rates. Estimates from US national surveys, 2002. Spine 2006;31:2724–2727
2. Hart LG, Deyo RA, Cherkin DC. Physician office visits for low back pain. Frequency, clinical evaluation, and treatment patterns from a US national survey. Spine 1995;20:11–19

3. Côté P, Cassidy JD, Carroll L. The treatment of neck and low back pain. Who seeks care? Who goes where? Medical Care 2001;39:956–967
4. Webb R, Brammah T, Lunt M, et al. Prevalence and predictors of intense, chronic, and disabling neck and back pain in the UK general population. Spine 2003;28:1195–1202
5. Waxman R, Tennant A, Helliwell P. A prospective follow-up study of low back pain in the community. Spine 2000;15:2085–2090
6. Valat J, Goulippe P, Rozenberg S, Urbinelli R, Allaert F. Acute low back pain: predictive index of chronicity from a cohort of 2487 subjects. Joint Bone Spine 2000;67:456–461
7. Schiøttz-Christensen B, Nielsen GL, Hansen VK, Sørensen HT, Olesen F. Long-term prognosis of acute low back pain in patients seen in general practice: a 1-year prospective follow-up study. Fam Pract 1999;16:223–232
8. Croft PR, Macfarlane GJ, Papageogiou AC, et al. Outcome of low back pain in general practice: a prospective study. BMJ 1998;316:1356–1359
9. Thomas E, Silman AJ, Croft PR, et al. Predicting who develops chronic low back pain in primary care: a prospective study. BMJ 1999;318:1662–1667
10. Grotle M, Brox JI, Veierød MB, et al. Clinical course and prognostic factors in acute low back pain. Patients consulting primary care for the first time. Spine 2005;30:976–982
11. Grotle M, Vøllestad NK, Brox JI. Screening for yellow flags in first-time acute low back pain: reliability and validity of a Norwegian version of the Acute Low Back Pain Screening Questionnaire. Clin J Pain 2006;22:458–467
12. Grotle M, Brox JI, Glomsrød B, Lønn JH, Vøllestad NK. Prognostic factors in first-time care seekers due to acute low back pain. Eur J Pain 2007;11:290–298
13. Webster BS, Verma SK, Gatchel RJ. Relationship between early opioid prescribing for acute occupational low back pain and disability duration, medical costs, subsequent surgery and late opioid use. Spine 2007;32:2127–2132
14. Van der Windt DA, Kuijpers T, Jellema P, van der Heijden GJ, Bouter LM. Do psychological factors predict outcome in both low-back pain and shoulder pain? Ann Rheum Dis 2007;66:313–319
15. Punnett L, Prüss-Üstün A, Nelson DI. Estimating the global burden of low back pain attributable to combined occupational exposures. Am J Ind Med 2005;48:459–469
16. Ferguson SA, Marras WS, Gupta P. Longitudinal quantitative measures of the natural course of low back pain recovery. Spine 2000;15:1950–1956
17. Streenstra IA, Verbeek JH, Heymans MW, Bongers PM. Prognostic factors for duration of sick leave in patients sick listed with acute low back pain: a systematic review of the literature. Occup Environ Med 2005;62:851–860
18. Ferguson SA, Marras WS, Burr DL. Differences among outcome measures in occupational low back pain. J Occup Rehabil 2005;15:329–341
19. Reginster J, Burlet N. Osteoporosis: a still increasing prevalence. Bone 2006;38(suppl 1):S4–S9
20. Johnell O, Kania JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int 2006;17:1726–1733
21. Nevitt MC, Cummings SR, Stone KL, et al. Risk factors for a first-incident radiographic vertebral fracture in women > or = 65 years of age: the study of osteoporotic fractures. J Bone Miner Res 2005;20:131–140
22. Barrett-Connor E, Siris ES, Wehren LE, et al. Osteoporosis and fracture risk in women of different ethnic groups. J Bone Miner Res 2005;20:185–194
23. http://www.nof.org/osteoporosis/bonemass.htm. Accessed February 2008
24. Levack P, Graham J, Collie D, et al. Don't wait for a sensory level – listen to the symptoms: a prospective audit of the delays in diagnosis of malignant cord compression. Clin Oncol 2002;14:472–480
25. Haig AJ, Tong HC, Yamakawa KS, et al. Predictors of pain and function in persons with spinal stenosis, low back pain, and no back pain. Spine 2006;31:2950–2957
26. Haig AJ, Geisser ME, Tong HC, et al. Electromyographic and magnetic resonance imaging to predict lumbar stenosis, low-back pain, and no back symptoms. J Bone Joint Surg 2007;89A:358–366

27. Carragee E, Alamin T, Cheng I, et al. Are first-time episodes of serious LBP associated with new MRI findings? Spine J 2006;6:624–635
28. Jensen MC, Brant-Zawadzki MN, Obuchowski N, et al. Magnetic resonance imaging of the lumbar spine in people without back pain. NEJM 1994;331:69–73
29. Boden SD, Davis DO, Dina TS, Patronas NJ, Wiesel SW. Abnormal magnetic resonance scans of the lumbar spine in asymptomatic subjects. A prospective investigation. J Bone Joint Surg 1990;72:403–408
30. Wood KB, Garvey TA, Gundry C, Heithoff KB. Magnetic resonance imaging of the thoracic spine. Evaluation of asymptomatic individuals. J Bone Joint Surg Am 1995;77:1631–1638
31. Alyas F, Turner M, Connell D. MRI findings in the lumbar spines of asymptomatic, adolescent, elite tennis players. Br J Sports Med 2007;41:836–841
32. Borenstein DG, O-Mara JW, Boden SD, et al. The value of magnetic resonance imaging of the lumbar spine to predict low-back pain in asymptomatic subjects: a seven-year follow-up study. J Bone Joint Surg Am 2001'83A:1306–1311
33. Carragee E, Alamin T, Cheng I, et al. Are first-time episodes of serious LBP associated with new MRI findings? Spine J 2006;6:624–635
34. Wiesel SW, Tsourmas N, Feffer HL, Citrin CM, Patronas N. A study of computer-assisted tomography. I. The incidence of positive CAT scans in an asymptomatic group of patients. Spine 1984;9:549–551
35. Kendrick D, Fielding K, Bentley E, et al. The role of radiography in primary care patients with low back pain of at least 6 weeks duration: a randomized (unblinded) controlled trial. Health Technology Assessment 2001;5: executive summary. Available at http://www.ncchta.org/pdfexecs/summ530.pdf (Accessed February 2008)
36. Cuenod CA, Laredo JD, Chevret S, et al. Acute vertebral collapse due to osteoporosis or malignancy: appearance on unenhanced and gadolinium-enhanced MR images. Radiology 1996;199:541–549
37. Tan DY, Tsou IY, Chee TS. Differentiation of malignant vertebral collapse from osteoporotic and other benign causes using magnetic resonance imaging. Ann Acad Med Singapore 2002;31:8–14
38. Fu TS, Chen LH, Liao JC, et al. Magnetic resonance imaging characteristics of benign and malignant vertebral fractures. Chang Gung Med J 2004;27:808–815
39. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. Ann Intern Med 2007;147:478–491
40. Lievense A, Bierma-Zeinstra S, Schouten, et al. Prognosis of trochanteric pain in primary care. Br J Gen Pract 2005;55:199–204
41. Tallay A, Kynsburg A, Toth S, et al. Prevalence of patellofemoral syndrome. Evaluation of the role of biomechanical malalignments and the role of sports activity. Orv Hetil 2004;145:2093–2101
42. Lipton A. Management of bone metastases in breast cancer. Curr Treat Options Oncol 2005;6:161–171
43. Pinski J, Dorff TB. Prostate cancer metastases to bone: pathophysiology, pain management, and the promise of targeted therapy. Eur J Cancer 2005;41:932–940
44. Brown JE, Neville-Webbe H, Coleman RE. The role of bisphosphonates in breast and prostate cancers. Endocrine-Relat Cancer 2004;11:207–224
45. Chan K, Qin L, Lau M, et al. A randomized, prospective study of the effects of Tai Chi Chun exercise on bone mineral density in postmenopausal women. Arch Phys Med Rehabil 2004;85:717–722
46. Snow CM, Shaw JM, Winters KM, Witzke KA. Long-term exercise using weighted vests prevents hip bone loss in postmenopausal women. J Gerontol A Biol Sci Med Sci 2000;55:M489–M491
47. Tournis S, Economopoulos D, Lyritis GP. Strontium ranelate. A novel treatment in postmenopausal osteoporosis. Ann N Y Acad Sci 2006;1092:403–407
48. North American Menopause Society. Management of osteoporosis in postmenopausal women: 2006 position statement. Menopause 2006;13:340–367
49. Gennari C. Calcium and vitamin D nutrition and bone disease of the elderly. Public Health Nutr 2001;4:547–559

50. Bérubé S, Diorio C, Mâsse B, et al. Vitamin D and calcium intakes from food or supplements and mammographic breast density. Cancer Epidemiol Biomarkers Pre 2005;14:1653–1659
51. Lippuner K. Medical treatment of vertebral osteoporosis. Eur Spine J 2003;12(suppl 2): S132–S141
52. Hodsman AB, Bauer CD, Dempster DW, et al. Parathyroid hormone and teriparatide for the treatment of osteoporosis: a review of the evidence and suggested guidelines for its use. Endocr Rev 2005;26:688–703
53. Kanis JA, Barton IP, Johnell O. Risedronate decreases fracture risk in patients selected solely on the basis of prior vertebral fracture. Osteoporos Int 2005;16:475–482
54. Brecht JG, Kruse HP, Mohrke W, Oestreich A, Huppertz E. Health-economic comparison of three recommended drugs for the treatment of osteoporosis. Int J Clin Pharmacol Res 2004;24:1–10
55. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. Ann Intern Med 2007;147:478–491
56. Rozenberg S, Delval C, Rezvani Y, et al. Bed rest or normal activity for patients with acute low back pain: a randomized controlled trial. Spine 2002;27:1487–1493
57. Van Tulder MW, Furlan AD, Gagnier JJ. Complementary and alternative therapies for low back pain. Best Pract Res Clin Rheumatol 2005;19:639–654
58. Malmivaara A, Hakkinen U, Aro T, et al. The treatment of acute low back pain-bed rest, exercises, or ordinary activity? NEJM 1995;332:351–355
59. Faas A, Chavannes AW, van Eijk JT, Gubbels JW. A randomized, placebo-controlled trial of exercise therapy inpatients with acute low back pain. Spine 1993;18:1388–1395
60. Faas A, van Eijk JT, Chavannes AW, Gubbels JW. A randomized trial of exercise therapy in patients with acute low back pain. Efficacy on sickness absence. Spine 1995;20:941–947
61. Rozenberg S, Delval C, Rezvani Y, et al. Bed rest or normal activity for patients with acute low back pain: a randomized controlled trial. Spine 2002;27:1487–1493
62. van Geen J, Edelaar MA, Janssen M, van Eijk JM. The long-term effect of multidisciplinary back training. A systematic review. Spine 2007;32:249–255
63. Hoffman BM, Papas RK, Chatkoff DK, Kerns RD. Meta-analysis of psychological interventions for chronic low back pain. Health Psychology 2007;26:1–9
64. Martell BA, O'Connor PG, Kerns RD, et al. Systematic review: opioid treatment for chronic back pain: prevalence, efficacy, and association with addiction. Ann Intern Med 2007;146:116–127
65. van Tulder MW, Koes B, Seitsalo S, Malmivaara A. Outcome of invasive treatment modalities on back pain and sciatica: an evidence-based review. Eur Spine J 2006;15(suppl 1):S82–S92
66. Hansen HC. Is fluoroscopy necessary for sacroiliac joint injections? Pain Physician 2003;6(2):155–158
67. Buttermann GR. Treatment of lumbar disc herniation: epidural steroid injection compared with discectomy. A prospective, randomized study. J Bone Joint Surg Am 2004;86-A:670–679
68. Van Tulder MW, Koes Bw, Bouter LM. A cost-of-illness study of back pain in the Netherlands. Pain 1995;62:233–240
69. Maniadakis N, Gray A. The economic burden of back pain in the UK. Pain 2000; 84:95–103
70. Seferlis T, Lindholm L, Nemeth G. Cost-minimisation analysis of three conservative treatment programmes in 180 patients sick-listed for low low-back. Scand J Prim Health Care 2000;18:53–67
71. Kapoor S, Shaw WS, Pransky G, Patterson W. Initial patient and clinician expectations of return to work after acute onset work-related low back pain. J Occup Environ Med 2006;48:1173–1180
72. Suter PB. Employment and litigation: improved by work, assisted by verdict. Pain 2002; 1000:249–257

Chapter 8
Abdominal Pain

Key Chapter Points:

- Abdominal pain may be caused by readily identified pathology or may occur as a chronic condition without correctable pathology. Chronic abdominal pain is typically diagnosed in patients with a stable pain history for at least 3 months who lack symptoms and signs of other types of pathology (e.g., fever, significant weight loss, or anemia).
- Functional abdominal pain disorders, such as irritable bowel syndrome, are not part of a psychological syndrome.
- Although psychological distress is more common in patients with functional abdominal pain disorders, emotional distress does not occur at an elevated rate in individuals with the same disorders who are not seeking medical care. Therefore, psychological distress is a marker of treatment-seeking behavior rather than abdominal pain.
- Historical reports of symptoms and physical examination signs can help distinguish causes of chronic abdominal pain.
- Chronic abdominal pain is generally managed with both medication and non-medication pain management strategies.

Key Words Abuse, Alcohol, Irritable Bowel Syndrome, Myofascial, Pancreatitis

Case History

Ms. Stewart is an attractive, slender, 30-year-old professional who complains of recurrent bouts of abdominal pain, bloating, and diarrhea occurring over the last 6 years. The abdominal pain improves after bowel movements; however, despite having diarrhea, she always feels like her bowel movements are incomplete. She describes painful, loose, watery stools occurring approximately four to five times a day about twice a week. She has never had bowel accidents at night. She has never noticed blood in her stools, although they sometimes contain mucus. She was previously diagnosed with lactose intolerance because of some bloating episodes after drinking milk. Although she avoids milk and cheese, she eats ice cream without

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

problems. She has no other medical symptoms and her weight is stable. She is currently not using any medications for her digestive symptoms. She has never seen a psychiatrist for depression or anxiety. When her primary care physician asks if she was ever the victim of sexual abuse, her lip begins to quiver and tears fill her eyes, but she won't provide any specific information. Physical examination shows mild, diffuse belly tenderness with no masses or enlarged organs. Laboratory testing shows a normal blood count and electrolytes and is negative for stool guaiac or stool ova and parasites. A previous sigmoidoscopy revealed only small external hemorrhoids. Ms. Stewart is treated with a low-fat diet and is referred for a psychological evaluation to rule out depression.

Introduction

Abdominal pain is often caused by readily identified pathology, such as gastritis or ulcer disease, gallbladder disease, or inflammatory bowel disease. Abdominal pain, especially in the absence of identified structural pathology, is often equated with psychological or somatization disorders. A recent survey of perceptions of general practitioners and specialists demonstrated that general practitioners are significantly more likely to believe that functional bowel disorders are the result of psychological disorders, whereas specialists are more likely to assume that patients with this condition have a real but as yet unidentified etiology ($P < 0.001$) (Fig. 8.1).[1]

Ms. Stewart provides a typical history of irritable bowel syndrome (IBS), a common cause of chronic abdominal pain, especially in women. Although the literature describes a link between psychological distress and abuse history with IBS, most gastroenterologists agree that the gastrointestinal (GI) symptoms are not a manifestation of psychopathology. Indeed, psychological distress and abuse history occur commonly in all patients with chronic pain (see Chap. 18). In Ms.

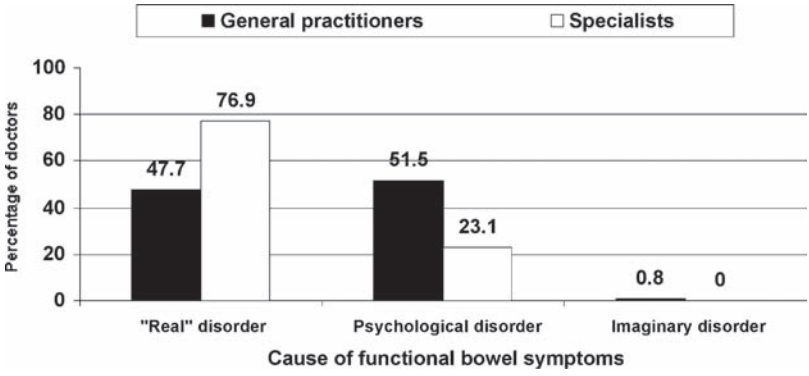


Fig. 8.1 Attitudes of physicians toward functional bowel disorders (based on Gladman and Gorard[1]).

Stewart's case, the treating physician appropriately ensured the absence of identifiable organic disease. The absence of testing abnormalities, however, is not synonymous with the absence of pathology or a psychologically-based disorder.

This chapter addresses some of the common syndromes of chronic abdominal pain. It is essential to remember that a diagnosis of chronic abdominal pain is only made in patients with a stable pain history for at least 3 months who lack symptoms and signs of other types of pathology, including fever, significant weight loss, and anemia. This important point was recently highlighted in a letter describing a woman with fever, diarrhea, and progressive abdominal pain over approximately 1 week.[2] Her condition was labeled "chronic abdominal pain," and she subsequently died with undiagnosed mesenteric ischemia. The author postulated that the chronic pain diagnosis restricted the ordering of tests that typically would have been completed in a patient with progressive, subacute abdominal pain.

Epidemiology

Abdominal pain is among the most common pain complaints seen by primary care practitioners. The 2000 National Ambulatory Medical Care Survey identified abdominal pain as one of the top reasons for seeking an outpatient physician visit, ranking as the twelfth most common complaint.[3] Abdominal pain accounts for 5% of all pain complaints made to general practitioners.[4]

Persistent abdominal pain occurs in a significant minority of patients. A population-based community survey in the United Kingdom identified persistent abdominal pain (pain episodes during the preceding month lasting at least 24 hours) in 7.7% of adults, with a greater prevalence in women compared with men (9.3 vs. 5.6%; $P < 0.01$).[5] A total of 1,501 adults without abdominal pain were followed prospectively for 12 months. New abdominal pain developed in 69 people (4.6%), with no gender differences noted in the development of new pain.

Irritable Bowel Syndrome

IBS describes the combination of recurrent lower abdominal pain and change in bowel habits in patients without identified structural or biochemical pathology. The diagnosis of IBS has been standardized with the development of the Rome criteria, which were revised in 2006 (*see* Box 8.1).[6] Patients may be sub-classified into IBS with constipation (IBS-C), with diarrhea (IBS-D), or mixed (IBS-M). IBS-M is comparable to the Rome II category of alternating IBS. Ms. Stewart meets Rome III criteria, reporting a chronic history of abdominal pain associated with diarrhea and relieved by bowel movements. She also reports feelings of incomplete evacuation, mucus in stool, and bloating.

Box 8.1 Rome III criteria for diagnosis of irritable bowel syndrome

- Onset of abdominal pain for at least 6 months before diagnosis
- Abdominal pain fulfilling the following criteria for the last 3 months
  - Symptoms at least 3 days per month
  - At least two of the following:
    - Improvement with defecation
    - Pain onset associated with change in stool frequency
    - Pain onset associated with change in stool appearance

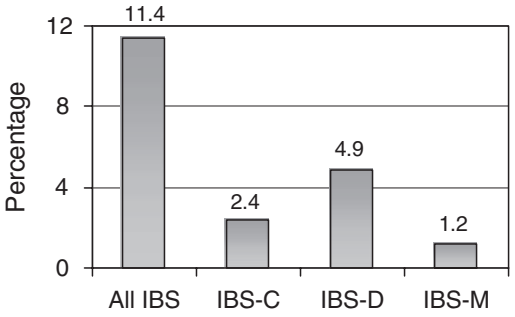


Fig. 8.2 Prevalence of irritable bowel syndrome (based on Halder et al.[7]). IBS = irritable bowel syndrome; C = with constipation; D = with diarrhea; M = mixed.

A recent population-based survey in the United States identified IBS in 11.4%, with Rome categories shown in Fig. 8.2.[7] During a 12-year longitudinal follow-up, symptoms remained unchanged for 20% of patients, changed to different symptoms for 40%, and resolved for 40%. An international, community-based survey of more than 40,000 individuals similarly identified 11.5% with IBS, with a female to male ratio of 1.7:1.[8] In this sample, IBS symptoms occurred on an average of 7 days per month with an average of two episodes daily, each lasting approximately 1 hour (Fig. 8.3). The majority of patients with IBS reported a variety of GI symptoms (Table 8.1). Patients reporting onset after 50 years of age had constitutional symptoms (e.g., unintentional weight loss or fever), severe diarrhea, bloody stools, family history of GI malignancy, or an abnormal physical examination requiring additional evaluation. In addition to pain and GI symptoms, individuals with IBS have significant disability, including reduced productivity and increased frequency of medical visits (Fig. 8.4).

Myofascial Abdominal Wall Pain

Myofascial pain, which is related to tight muscle bands and muscular trigger points, may also affect abdominal muscles. (See Chap. 11 for a full discussion of myofascial pain

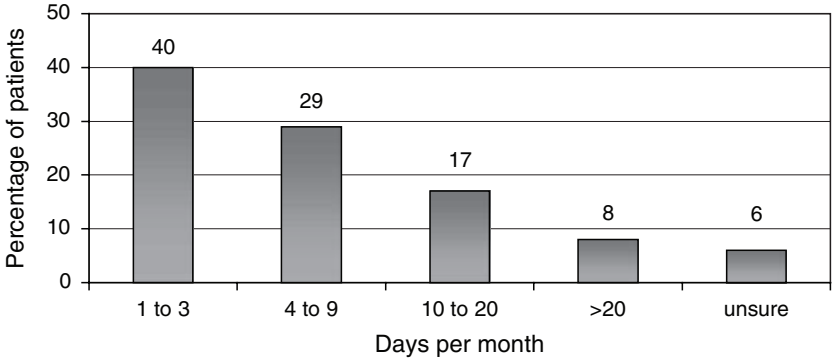


Fig. 8.3 Frequency of symptoms in irritable bowel syndrome (based on Hungin et al.[8]).

Table 8.1 Common symptoms in irritable bowel syndrome (based on Hungin et al.[8])

Symptom	Prevalence (%)
Abdominal pain	88
Bloating	80
Trapped wind	66
Tiredness	60
Diarrhea	59
Tightness of clothing	58
Constipation	53
Heartburn	47

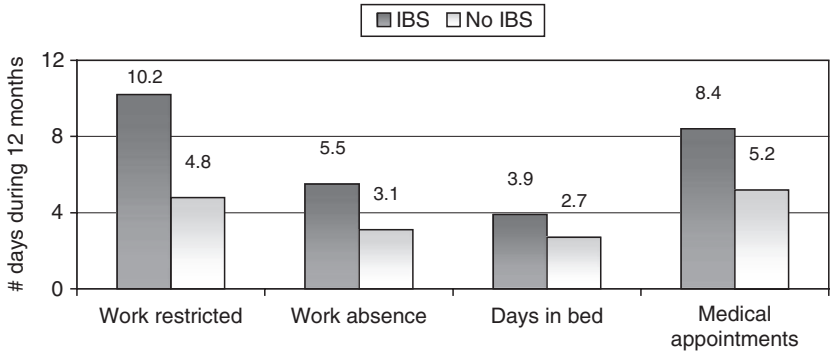


Fig. 8.4 Impact from irritable bowel syndrome (IBS). Comparison of disability in a community survey of individuals with IBS and without IBS (no IBS) (based on Hungin et al.[8]).

and its treatment.) Chronic abdominal pain caused by tight and tender abdominal muscles (e.g., rectus abdominis, pyramidalis, obliques, and transversus abdominus) occurs in a significant minority of patients with chronic abdominal pain and is commonly overlooked. Myofascial pain was determined to be the cause of pain in 26% of patients diagnosed with chronic abdominal pain not related to underlying visceral pathology.[9]

Chronic Pancreatitis

The incidence of chronic pancreatitis in Western countries is about six cases per 100,000 people.[10] Two systems have recently been proposed to categorize chronic pancreatitis (*see* Table 8.2). The TIGAR-O system focuses on disease etiology,[11] while the newly developed M-ANNHEIM system assesses cumulative impact from multiple risk factors, as well as clinical stage and disease severity.[12] A recent survey of chronic pancreatitis patients treated by gastroenterologists provided information about the prevalence of diagnostic categories and associated symptoms (*see* Table 8.3).[13] Alcoholism accounts for most cases of chronic pancreatitis, with the risk for chronic pancreatitis increasing linearly in relation to the amount of alcohol consumed. It is important to remember, however, that approximately 20% of all cases are not alcohol-related.

Table 8.2 Chronic pancreatitis classification systems (based on Etemad and Whitcomb[11], Schneider et al.[12])

TIGAR-O	M-ANNHEIM
Toxic-metabolic (primarily alcohol)	Multiple risk factors
Idiopathic	Alcohol consumption
Genetic (e.g., cystic fibrosis)	Nicotine consumption
Autoimmune (e.g., inflammatory bowel disease, Sjögren's, primary biliary cirrhosis)	Nutritional factors
	Hereditary factors
Recurrent severe acute pancreatitis	Efferent pancreatic duct factors
Obstructive	Immunological factors
	Miscellaneous and metabolic factors
	Clinical staging
	Asymptomatic
	Symptomatic
	No pancreatic insufficiency
	Partial pancreatic insufficiency
	Full pancreatic insufficiency
	Painless (burnout)
	Severity scoring (A-E)
	Pain
	Surgical intervention
	Exocrine insufficiency
	Endocrine insufficiency
	Abnormalities on imaging
	Severe organ complications

M-ANNHEIM severity scoring: A=minor, B=increased, C=advanced, D=marked, E=exacerbated

Evaluation

As with all types of chronic pain, the physician needs to ensure the absence of correctable, organic pathology during the initial history taking and physical examination in patients with abdominal pain. Patients with subacute symptoms, symptoms

Table 8.3 Epidemiology of chronic pancreatitis (based on Lévy et al.[13])

Characteristic	Percentage
Etiology	
Alcoholism	84
Hereditary	1
Cystic fibrosis	1
Idiopathic	9
Other	6
Signs, symptoms, complications	
Chronic abdominal pain	53
Acute pancreatitis episodes	67
Pseudocysts	40
Biliary tract obstruction	21
Diabetes	32
Pancreatic exocrine insufficiency	36

related to eating, associated medical symptoms or signs (e.g., change in skin or stool color, bloody stools, organomegaly, or abdominal masses), constitutional symptoms (e.g., weight loss, fatigue, or fever), or a family history of GI cancer warrant a more detailed evaluation.

In addition to a general abdominal examination, patients with abdominal pain require a digital rectal examination and female patients require a thorough pelvic examination. Patients reporting abdominal pain should also receive a neurological examination to identify bands of sensory loss or dysethesia in the abdomen (to rule out local nerve entrapment syndromes, thoracic spine disease, or postherpetic neuralgia) and changes in strength, reflexes, and sensation in the lower extremities (to rule out spinal disease). A neurological examination is particularly important because the midthoracic spine is a vascular watershed area, with a predilection for metastatic disease. Patients suspected of having thoracic pathology that is not well localized may be evaluated using sagittal magnetic resonance imaging, which demonstrates multiple thoracic levels.

Irritable Bowel Syndrome

Young patients with IBS symptoms without associated symptoms (*see* Box 8.2), such as Ms. Stewart, require a minimal amount of testing (*see* Box 8.3).[14,15] Screening for thyroid disease and lactose intolerance is best reserved for patients with specific symptoms of these conditions, such as fatigue and weight change (thyroid disease) and intolerance to milk products, including ice cream (lactose intolerance). Patients aged 50 years and older warrant additional screening with a colonoscopy and thyroid function testing. Abdominal ultrasound is generally not helpful.

Box 8.2 Associated symptoms and history in patients with suggested IBS that warrant more detailed evaluation (based on Olden[14])

- ≥10 pound weight loss (unintentional)
- Bloody stools
- Fever – recent use of antibiotics
- Nocturnal diarrhea
- Family history of colon cancer

Box 8.3 Diagnostic evaluation for patients with symptoms of IBS (based on Olden[14])

- Test stools for
  - Blood
  - Ova and parasites
- Laboratory testing
  - Complete blood count
  - Chemistry panel
  - Erythrocyte sedimentation rate
  - Add thyroid function testing if ≥50 years old
- GI procedures
  - <50 years old: flexible sigmoidoscopy
  - Include biopsy to rule out inflammatory disease or microscopic colitis if diarrhea is a symptom
  - ≥50 years old: additionally, colonoscopy to screen for cancer

Myofascial Pain

Evaluation of myofascial pain is covered elsewhere in this book (see Chap. 11). Several questions are useful to differentiate patients with musculoskeletal causes of abdominal pain from those with non-musculoskeletal pain (*see* Box 8.4).[16] On examination, tender, tight muscle bands causing myofascial pain are best identified in the activated muscle. Patients with abdominal pain that is not associated with bowel symptoms or eating should be examined while lying flat. They should be asked to elevate the head and shoulders a few inches off of the examination table to induce abdominal muscle tensing. Aggravation of pain and abdominal tenderness with this maneuver is typical in patients with muscular pain (positive Carnett's sign). Carnett's sign is useful for distinguishing myofascial and visceral pain (Fig. 8.5).[17,18] Examining the tensed belly while the patient maintains this position

Box 8.4 Questions to help distinguish musculoskeletal etiologies from other causes of chronic abdominal pain (based on Sparkes et al.[16])

Patients responding positively to the first set of questions AND negatively to the second set are likely to have a musculoskeletal cause for their chronic abdominal pain:

- If the following questions are answered "yes," musculoskeletal pain is likely
  - Is pain worsened by coughing, sneezing, or taking a deep breath?
  - Is pain aggravated by change in posture, such as getting out of bed or a chair, bending, turning over in bed, or lifting?
- If the following questions are answered "no," musculoskeletal pain is likely
  - Has there been a recent change in your bowel habits?
  - Does eating aggravate your pain?
  - Have you lost weight unintentionally since your pain started?

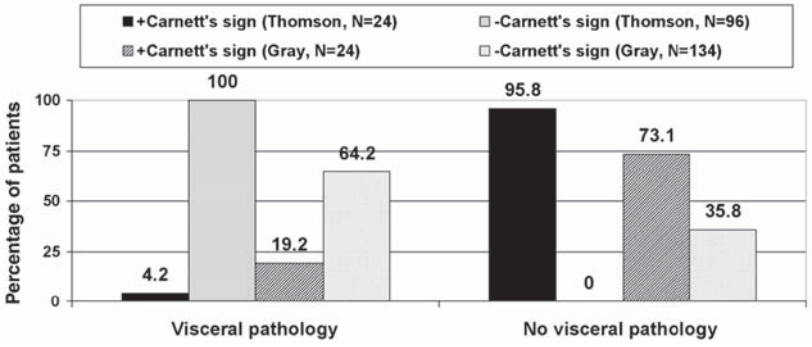


Fig. 8.5 Diagnostic function of Carnett's sign. A positive Carnett's sign was used to distinguish visceral and non-visceral (functional) causes of abdominal pain in 120 emergency department patients with acute abdominal pain (based on Thomson and Francis[17]) and 158 hospital admissions for abdominal pain (based on Gray et al.[18]).

can reveal tender muscles and trigger points in the abdominal muscles, such as the rectus abdominis muscles (Fig. 8.6), as well as painful abdominal hernias.

Chronic Pancreatitis

Patients with chronic pancreatitis experience constant and severe midepigastric pain that may radiate to the back. The pain is often aggravated by food or alcohol

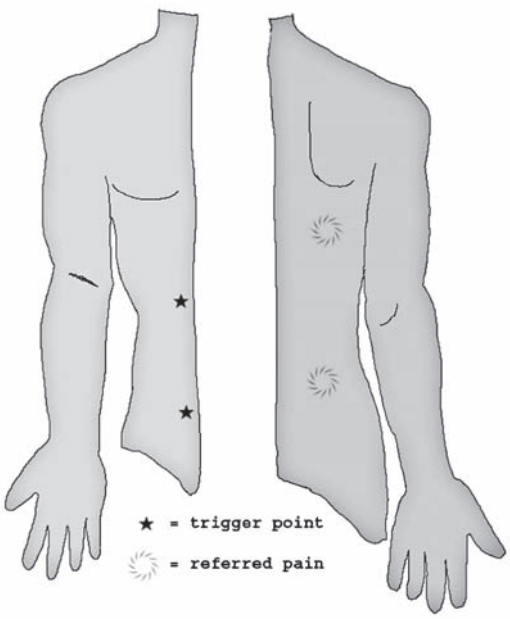


Fig. 8.6 Myofascial abdominal wall pain: rectus abdominis trigger points and referral pattern.

and is associated with steatorrhea, malabsorption, and weight loss. Contrast-enhanced computed tomography is the recommended initial imaging study.[19] Characteristic calcifications in the pancreatic ducts may be seen on abdominal x-rays or computed tomography. Magnetic resonance cholangiopancreatography and endoscopic ultrasonography provide similar diagnostic ability to endoscopic retrograde cholangiopancreatography, with substantially lower complication rates.[19] Patients with chronic pancreatitis should be evaluated for signs of poor pancreatic function, including weight loss, steatorrhea, and glucose intolerance, in addition to abdominal pain. Due to the increased risk for developing pancreatic cancer, chronic pancreatitis patients reporting change in pain, constitutional symptoms (e.g., weight loss), or jaundice will require additional evaluation.

Psychological Factors

A large, prospective survey of individuals with abdominal pain identified psychological distress as an important predictor of new abdominal pain.[5] Patients without abdominal pain who had the highest levels of psychological distress were three times more likely to develop abdominal pain within the following 12 months compared with individuals without psychological distress. Anxiety doubled the risk for abdominal pain. This study suggests that patients with abdominal pain will be more likely to have comorbid psychological distress compared with patients

without pain. Furthermore, a recent literature review identified chronic abdominal pain as an independent risk factor for suicide, increasing the need to routinely screen abdominal pain patients for mood disturbance and suicidal ideation.[20]

Childhood abuse has also been linked with the development of chronic abdominal pain in adulthood, especially pain related to functional GI disorders, such as IBS. A survey of 226 consecutive GI outpatients identified a history of physical or sexual abuse in approximately one-third of patients with either functional or organic GI disease.[21] A similar study of 206 female gastroenterology clinic patients identified a greater prevalence of both sexual and physical abuse, respectively, in patients with functional disorders (53 and 13%) vs. patients with organic disorders (37 and 2%).[22] Interestingly, the treating physician was aware of abuse in only 17% of patients. Hobbis and colleagues questioned adults with IBS, Crohn's disease, or non-GI disease about the incidence of abuse during childhood and adulthood and found that the prevalence of childhood and adult experiences of sexual abuse (17–28%) or physical abuse (49–61%) was similar in all groups.[23] Although a history of abuse itself does not necessarily predict the occurrence or type of abdominal pain, symptom severity and comorbid somatic complaints are higher in GI patients with more significant histories of abuse.[24,25] For this reason, gentle questioning about abuse is appropriate for patients with abdominal pain.

It is important to remember that, as with all types of chronic pain, patients seeking treatment for chronic abdominal pain have a higher prevalence of psychological distress. This does not, however, confirm a suspicion that the pain symptoms are a sign of or caused by psychological distress. Drossman and colleagues compared psychological tests for patients with IBS, individuals with IBS who had not sought medical treatment (non-patients with IBS), and pain-free controls.[26] Although psychological distress was significantly higher in patients with IBS, it was not greater in non-patients with IBS compared with pain-free controls. A similar study revealed an increased rate of psychological abnormalities in patients with fibromyalgia compared with individuals with fibromyalgia who had not sought medical care.[27] These studies suggest that psychological distress influences treatment-seeking behaviors, driving patients to initiate self-care. These data refute the hypothesis that chronic pain complaints are themselves symptoms of psychological distress. It is important to determine a history of abuse, depression, and anxiety in the case of Ms. Stewart and similar patients. Although these factors are not likely to cause chronic abdominal pain, they are linked to more severe symptoms and suggest the need for more aggressive therapy.

Treatment

The same principles used to manage other types of non-malignant chronic pain apply to chronic abdominal pain. As with chronic pain in general, patients with chronic abdominal pain typically benefit from both medication- and non-medication-based

pain management therapies. In a large, multicenter trial in which patients with functional bowel disorders were randomized to non-pharmacological (cognitive-behavioral therapy [CBT] vs. education) and pharmacological (desipramine 150 mg per day vs. placebo) therapy or placebo (Fig. 8.7), the responses to CBT and desipramine were similar.[28]

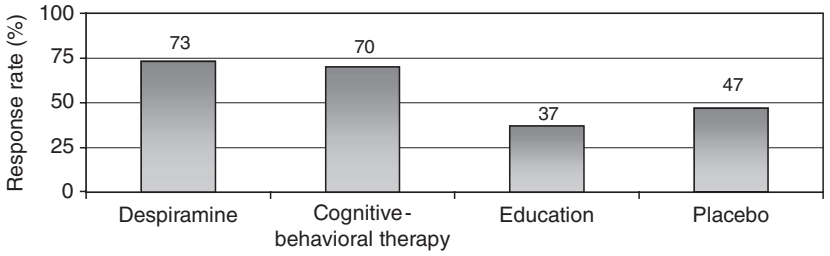


Fig. 8.7 Treatment of functional bowel disorders (based on Drossman et al.[28]).

Irritable Bowel Syndrome

Therapy for IBS targets individual symptoms. A variety of effective medications are available, although most treat diarrhea or constipation rather than global IBS symptoms (*see* Table 8.4).[10,15,29] The $5HT_4$ agonist tegaserod [Zelnorm] was recently withdrawn from the market in the United States and Canada, due to an increased risk of cardiovascular events. The full $5HT_4$ agonist/partial $5HT_3$ antagonist renzapride has shown promise in Phase III clinical trials for treating IBS-C in women.[30]

Table 8.4 Medication Therapy for Irritable Bowel Syndrome (IBS) (based on Holten[15], Spanier[10], Videlock and Chang[29])

Medication	Condition improved	Significant side effects
5HT receptor agents		
$5HT_3$ antagonist alosetron [Lotronex]	Global IBS symptoms in women with diarrhea	Constipation
Antidepressants		
Tricyclic	Abdominal pain	Constipation
SSRI	Abdominal pain	Better tolerated than tricyclics
GI		
Loperamide	Diarrhea	Constipation
Fiber/bulking agents	Constipation	Bloating
Oral cromolyn sodium	Diarrhea	Constipation
Chloride channel activator Lubiprostone [Amitiza]	Constipation	Nausea, diarrhea, headache

5HT Serotonin, *SSRI* Selective serotonin reuptake inhibitor

Effective alternative therapy includes traditional Chinese medicine, relaxation training, CBT, and peppermint oil.[10,15] Elimination diets and the use of probiotics (such as lactobacillus or yogurt) are generally not beneficial. Psychological treatment may be particularly important for this population. A recent survey of IBS patients identified anxiety in 50% and depression in 12%[31]. Including treatment targeted to relieve psychological distress may be particularly important since GI distress is associated with higher levels of daily stress and psychological distress.[32]

Myofascial Abdominal Wall Pain

Patients with myofascial abdominal wall pain should be treated using modalities similar to those used in patients with other myofascial pain syndromes. Abdominal stretching exercises, physical therapy, and trigger-point injections may all be beneficial. (For a complete review of myofascial pain treatment, see Chap. 11.)

Chronic Pancreatitis

Treatment for patients with chronic pancreatitis focuses on minimizing future pancreatic damage (e.g., by avoiding alcohol and nicotine) and symptoms of pain and abnormal exocrine and endocrine function (*see* Table 8.5). Chronic pancreatitis pain tends to be severe and typically requires opioid analgesics. The use of opioids may be particularly challenging in patients with alcohol-related chronic pancreatitis because of the risk for medication misuse and abuse (see Chaps. 3 and 19). Pancreatic enzymes and other agents may also reduce pain severity. In a recent large, randomized study, investigators found an improvement rate of more than 50% in patients with chronic pancreatitis treated with the cholecystokinin

Table 8.5 Treatment of chronic pancreatitis

Condition to treat	Treatment
All chronic pancreatitis symptoms	Abstinence from alcohol Nicotine cessation Low-fat, small meals
Pain	Non-enteric coated pancreatic enzymes (including a bedtime dose)
	Analgesics
	Somatostatin analogue octreotide [Sandostatin]
	Cholecytokinin antagonist loxiglumide[a]
Steatorrhea	Pancreatic enzymes
Glucose intolerance	Insulin

[a]Currently unavailable in the United States

A-receptor antagonist loxiglumide 600 mg per day (currently not available in the United States).[33] Pancreatic surgery and celiac plexus blocks or neurolysis are not recommended for most patients with chronic pancreatitis.

Patients with poor exocrine function, manifested by steatorrhea and weight loss, should be treated with a low-fat diet and pancreatic enzyme supplementation. Patients with poor endocrine function and glucose intolerance typically require insulin therapy.

Patients should be counseled to discontinue alcohol and nicotine use. A retrospective evaluation of 934 patients with chronic, alcoholic pancreatitis linked smoking to earlier onset symptoms and the development of pancreatic calcifications and diabetes, independent of alcohol consumption.[34] Smoking was also linked to increased risk for pancreatic calcifications and diabetes in 83 patients with idiopathic, non-alcoholic pancreatitis.[35] Fortunately, smoking cessation during the early stages of chronic pancreatitis reduces the risk for developing pancreatic calcifications. In a long-term follow-up study, smokers with chronic pancreatitis who discontinued smoking had the same risk for developing calcifications as those who had never smoked. Risk was nearly doubled among smokers, regardless of the number of cigarettes smoked daily.[36]

Summary

Abdominal pain may be caused by a readily identified pathology (e.g., gastritis, ulcer disease, or inflammation) or present as a chronic pain complaint without correctable pathology. Chronic abdominal pain is typically diagnosed in patients with a stable pain history for at least 3 months who lack symptoms and signs of other pathology (e.g., fever, significant weight loss, or anemia). Although blood tests and radiographs often fail to identify obvious abnormalities in patients with chronic abdominal pain, functional abdominal pain disorders (e.g., IBS) are not psychological syndromes. Measures of psychological distress are indeed higher in patients with functional abdominal pain disorders; however, the rate of psychological distress is not elevated in individuals with these disorders who are not seeking medical care. Therefore, psychological distress is a marker of treatment-seeking behavior rather than abdominal pain.

Historical reports of symptoms (changes in bowel habits, occurrence of bloating, and pain with lifting or change in posture) and physical examination signs (e.g., Carnett's sign of myofascial pain) can help the clinician distinguish the causes of chronic abdominal pain. In general, most types of chronic abdominal pain can be managed with both medication and non-medication pain management strategies. Treatment strategies, however, are often specific to individual pain diagnostic categories (e.g., serotonin receptor agents or antidepressants for IBS, trigger-point injection for myofascial pain, and enzyme supplementation and analgesics for chronic pancreatitis).

Test Your Knowledge

1. Which of the following symptom(s) is/are common in patients with musculoskeletal abdominal pain?

   (a) Pain aggravated by lifting
   (b) Pain aggravated by eating
   (c) Pain while coughing or taking deep breaths
   (d) A and C
   (e) All of the above

2. Rome III diagnostic criteria for irritable bowel syndrome include:

   (a) Pain occurring during the last 12 or more weeks
   (b) Pain relieved by bowel movements
   (c) Change in bowel frequency when pain began
   (d) Change in stool appearance when pain began
   (e) All of the above

3. Medications used to treat diarrhea in patients with irritable bowel syndrome include:

   (a) Alosetron
   (b) Loperamide
   (c) Oral cromolyn sodium
   (d) All of the above

4. Which of the following tests is considered the preferred initial imaging study in patients with a probable diagnosis of chronic pancreatitis?

   (a) Contrast-enhanced computed tomography
   (b) Magnetic resonance cholangiopancreatography
   (c) Endoscopic ultrasonography
   (d) Endoscopic retrograde cholangiopancreatography

5. Which of the following is not a routine therapy for chronic pancreatitis?

   (a) Abstinence from alcohol
   (b) Pancreatic enzymes
   (c) Opioid analgesics
   (d) Celiac plexus neurolysis

6. Choose the correct statement about psychological distress in chronic abdominal pain:

   (a) Functional abdominal pain is usually caused by repressed depression, anxiety, or conflicts about sexual abuse.
   (b) Patients with chronic abdominal pain have an increased risk of suicide.
   (c) One in five patients with irritable bowel syndrome can be appropriately diagnosed with borderline personality disorder.

(d) Chronic pancreatitis is complicated by bipolar disorder for one in three patients.
(e) All of the above
(f) None of the above

Answers: 1d, 2e, 3d, 4a, 5d, 6b

References

1. Gladman LM, Gorard DA. General practitioner and hospital specialist attitudes to functional gastrointestinal disorders. Aliment Pharmacol Ther 2003;17:651–654
2. Jones MP. Death by diagnosis. Ann Intern Med 2001;135:307
3. Cherry DW, Woodwell DA. National Ambulatory Medical Care Survey: 2000 summary. Adv Data 2002;5:1–32
4. Hasselström J, Liu-Palmgren J, Rasjö-Wrååk G. Prevalence of pain in general practice. Eur J Pain 2002;6:375–385
5. Halder SS, McBeth J, Silman AJ, Thompson DG, Macfarlane GJ. Psychosocial risk factors for the onset of abdominal pain. Results from a large prospective population-based study. Int J Epidemiol 2002;31:1219–1225
6. Rome III. Rome Foundation website: http://www.romecriteria.org/ (Accessed March 2008)
7. Halder SL, Locke GR, Schleck CD, et al. Natural history of functional gastrointestinal disorders: a 12-year longitudinal population-based study. Gastroenterology 2007;133:799–807
8. Hungin AS, Whorwell PJ, Tack J, Mearin F. The prevalence, patterns and impact of irritable bowel syndrome: an international survey of 40,000 subjects. Aliment Pharmacol Ther 2003;17:643–650
9. McGarrity TJ, Peters DJ, Thompson C, McGarrity SJ. Outcome of patients with chronic abdominal pain referred to chronic pain clinic. Am J Gastroenterol 2000;95:1812–1816
10. Spanier BM. Epidemiology, aetiology and outcome of acute and chronic pancreatitis: an update. Best Pract Res Clin Gastroenterol 2008;22:45–63
11. Etemad B, Whitcomb DC. Chronic pancreatitis: diagnosis, classification, and new genetic developments. Gastroenterology 2001;682–707
12. Schneider A, Löhr JM, Singer MV. The M-ANNHEIM classification of chronic pancreatitis: introduction of a unifying classification system based on a review of previous classifications of the disease. J Gastroenterol 2007;42:101–119
13. Lévy P, Barthet M, Mollard BR, Amouretti M, Marion-Audibert A, Dyard F. Estimation of the prevalence and incidence of chronic pancreatitis and its complications. A prospective survey in adults attending gastroenterologists in France. Gastroenterol Clin Biol 2006;30:838–844
14. Olden KW. The challenge of diagnosing irritable bowel syndrome. Rev Gastroenterol Dis 2003;3(suppl 3):S3–S11
15. Holten KB. Irritable bowel syndrome: minimize testing, let symptoms guide treatment. J Fam Pract 2003;52:942–949
16. Sparkes V, Prevost AT, Hunter JO. Derivation and identification of questions that act as predictors of abdominal pain of musculoskeletal origin. Eur J Gastroenterol Hepatol 2003;15:1021–1027
17. Thomson H, Francis DM. Abdominal-wall tenderness: a useful sign in the acute abdomen. Lancet 1977;2:1053–1054
18. Gray DW, Dixon JM, Seabrook G, Collin J. Is abdominal wall tenderness a useful sign in the diagnosis of non-specific abdominal pain? Ann R Coll Surg Engl 1988;70:233–234
19. Nair RJ, Lawler L, Miller MR. Chronic pancreatitis. Am Fam Physician 2007;76:1679–1688
20. Spiegel B, Schoenfeld P, Naliboff B. System atic review: the prevalence of suicidal behaviour in patients with chronic abdominal pain and irritable bowel syndrome. Aliment Pharmacol Ther 2007;26:183–193

21. Baccini F, Pallotta N, Calabrese E, Pezzotti P, Corazziari E. Prevalence of sexual and physical abuse and its relationship with symptom manifestations in patients with chronic organic and functional gastrointestinal disorders. Dig Liver Dis 2003;35:256–261
22. Drossman DA. Sexual and physical abuse and gastrointestinal illness. Scand J Gastroenterol Suppl 1995;208:90–96
23. Hobbis IA, Turpin G, Read NW. A re-examination of the relationship between abuse experience and functional bowel disorders. Scand J Gastroenterol 2002;4:423–430
24. Leserman J, Li Z, Drossman DA, Hu YJ. Selected symptoms associated with sexual and physical abuse history among female patients with gastrointestinal disorders: the impact on subsequent health care visits. Psychol Med 1998;28:417–425
25. Drossman DA. Do psychosocial factors define symptom severity and patient status in irritable bowel syndrome? Am J Med 1999;107 (Suppl 5A):41S–50S
26. Drossman DA, McKee DC, Sandler RS, et al. Psychosocial factors in the irritable bowel syndrome. A multivariate study of patients and nonpatients with irritable bowel syndrome. Gastroenterology 1998;95:701–708
27. Aaron LA, Bradley LA, Alarcon GS, et al. Psychiatric diagnoses in patients with fibromyalgia are related to health care-seeking behavior rather than to illness. Arthritis Rheum 1996;39:436–445
28. Drossman DA, Toner BB, Whitehead WE, et al. Cognitive-behavioral therapy versus education and desipramine versus placebo for moderate to severe functional bowel disorders. Gastroenterology 2003;125:19–31
29. Videlock EJ, Chang L. Irritable bowel syndrome: current approach to symptoms, evaluation, and treatment. Gastroenterol Clin N Am 2007;36:665–685
30. George AM, Meyers NL, Hickling RI. Clinical trial: renzapride therapy for constipation-predominant irritable bowel syndrome – a multicentre, randomized, placebo-controlled, double-blind study in primary healthcare setting. Aliment Pharmacol Ther 2008;27(9):830–837
31. Mikocka-Walus A, Turnbull D, Moulding N, et al. Psychological comorbidity and complexity of gastrointestinal symptoms in clinically diagnosed irritable bowel syndrome patients. J Gastroenterol Hepatol, in press
32. Hertig VL, Cain KC, Jarrett ME, Burr RL, Heitkemper MM. Daily stress and gastrointestinal symptoms in women with irritable bowel syndrome. Nurs Res 2007;56:399–406
33. Shiratori K, Takeuchi T, Satake K, Matsuno S. Clinical evaluation of oral administration of a cholecystokinin-A receptor antagonist (loxiglumide) to patients with acute, painful attacks of chronic pancreatitis: a multicenter dose-response study in Japan. Pancreas 2002;25:e1–e5
34. Maisonneuve P, Lowenfels AB, Müllhaupt B, et al. Cigarette smoking accelerates progression of alcoholic chronic pancreatitis. Gut 2005;54:510–514
35. Maisonneuve P, Frulloni L, Müllhaupt B, et al. Impact of smoking on patients with idiopathic chronic pancreatitis. Pancreas 2006;33:163–168
36. Talamini G, Bassi C, Falconi M, et al. Smoking cessation at the clinical onset of chronic pancreatitis and risk of pancreatic calcifications. Pancreas 2007;35:320–326

Chapter 9
Arthritis

Key Chapter Points:

- Arthritis is a common cause of chronic joint pain, with prevalence increasing with age.
- The most common type of chronic arthritis is degenerative osteoarthritis (OA).
- Patients with OA are treated with symptomatic therapy and rehabilitation.
- Rheumatoid arthritis (RA) therapy requires specific disease-modifying drugs that are often prescribed after consultation with a rheumatologist.
- Aerobic exercise is important for reducing pain and maintaining function in both OA and RA.

Key Words Disease-modifying antirheumatic drugs, Inflammation, Joint, Rheumatoid

Case History

Mr. Harris is a 68-year-old retired construction worker. He has had a very active life, playing football through high school and college and continuing to play in amateur leagues during the early years of his work life. He came to his doctor with a chief complaint of right knee pain, which has been increasing progressively over the last 8 years. An earlier evaluation revealed a positive rheumatoid factor, and he was diagnosed with rheumatoid arthritis. This was managed with nonsteroidal anti-inflammatory drugs and steroids. Although he experienced pain reduction with the anti-inflammatory analgesics, he developed severe gastritis and needed to discontinue therapy. He was referred to a rheumatologist for more aggressive treatment, but was fearful of the side effects of methotrexate, which he had read about on the Internet. He decided to discontinue all exercise programs and began sedentary activities. During this time, he sprained his ankle twice after stepping off curbs and had recurrent attacks of low back sprain after carrying small loads, such as groceries or laundry. Mr. Harris subsequently tried to resume his previous

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

jogging program without success. At this new consultation, Mr. Harris reports that his knee is most bothersome after prolonged sitting or after jogging for about 15 minutes. He additionally reports stiffness in both hands and in his left hip. He also gets right knee pain when he first gets up in the morning, although this goes away after he "works it out" with range of motion exercises and a few minutes of walking. On examination, Mr. Harris is slow to get out of his chair and reports feeling "stiff" after sitting in the waiting room for 1 hour. Examination of the knee shows slight bony deformity with no inflammation of the joint. Passive range of motion is slightly reduced with joint crepitus. No joint instability is identified. Radiographs of the knee show narrowing of the joint space and the presence of osteophytes. His primary care physician makes a diagnosis of osteoarthritis and treats him with acetaminophen. He also enrolls Mr. Harris in an arthritis pool therapy program at the local YMCA and recommends a bicycling program as well. Two months later, Mr. Harris reports improvement in both pain and activity tolerance.

Introduction

Arthritic pain is one of the most common pain categories seen in primary care. Data from the National Ambulatory Medical Care and National Hospital Ambulatory Medical Care surveys estimate an average of 3.8 ambulatory visits per person annually.[1] Among those visits, arthritic conditions rank as the fourth most commonly assigned diagnosis (*see* Table 9.1). A separate survey of 1,432 primary care patients with pain disclosed a musculoskeletal condition for 2 out of every 3 patients reporting pain.[2] Among these patients, the most common individual musculoskeletal category was an arthritic condition, affecting one in four patients with musculoskeletal pain.

Table 9.1 Top ten diagnoses assigned for ambulatory care visits (based on Schappert and Burt[1])

Diagnosis	Number of visits annually (in 1000s)
All visits	1,077,583
Essential hypertension	45,256
Well-child check	39,627
Acute upper respiratory infection	36,909
Arthritic condition	**29,444**
Diabetes	29,089
Spine disorder	26,491
Rheumatism other than back	22,444
General medical examination	21,492
Normal pregnancy	20,166
Otitis media/eustachian tube disorder	19,514

Mr. Harris shows characteristic features of osteoarthritis (OA), the most common form of arthritis in adults. OA typically affects the large, weight-bearing joints in a non-symmetrical fashion, with the knee frequently affected. Interestingly, rheumatoid

factor testing is not specific for rheumatoid arthritis (RA); in fact, it may be positive in patients with OA and negative in RA, particularly during the early stages of the disease. Mr. Harris' primary care physician (PCP) treated him appropriately with a well-tolerated analgesic. Anti-inflammatory medications are not the first choice for patients with OA because it is not an inflammatory condition.

Distinguishing between degenerative and inflammatory arthritis is essential in patients with chronic joint complaints. Disease pathology, pattern of joint involvement, and recommended treatments are dissimilar for degenerative and inflammatory arthritis. In addition, maintaining good condition of supportive tissues around joints is essential for minimizing new pain complaints and maintaining good functioning. Although the OA identified in Mr. Harris is probably the result of years of joint overuse, too much rest for the joints will not improve symptoms. As he discovered, excess rest increases the risk for injury from minor trauma because of a lack of the normal protection of the joint that is provided by strong and flexible muscles, tendons, and ligaments.

Epidemiology

In a national survey of 212,510 adults ≥18 years old in the United States, arthritis or chronic joint pain, ache, stiffness, or swelling was found to affect one in three adults (Fig. 9.1).[3] Using the data from the National Ambulatory Medical Care Survey/National Hospital Medical Care Survey, the most commonly diagnosed individual arthritic conditions are OA and RA, with OA about twice as common as RA.[4] In addition, most ambulatory visits for arthritis are made to primary care health providers (53%), with only 16% made to rheumatologists.[4]

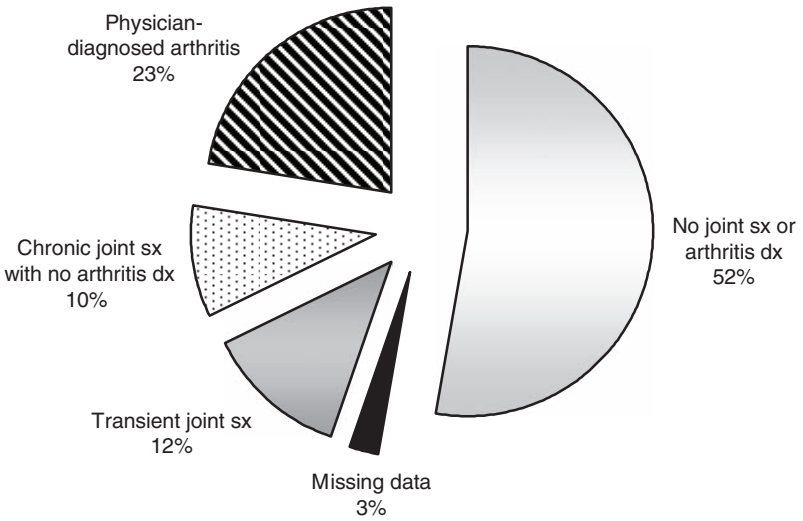


Fig. 9.1 Prevalence of joint pain (based on Feinglass et al.[5]). Dx = diagnosis; sx = symptoms.

OA most commonly affects the hand, knee, and hip.[5] Hand OA occurs in about 10–30% of young adults and in about 75% of adults between 60–70 years old. Knee OA is less common, but still affects one in three adults ≥75 years old. Hip OA affects 3–5% of seniors. Advancing age, female gender, obesity, and frequent joint stress from occupation or other activities may all increase risk for developing symptomatic OA.

RA affects about 1% of people worldwide, with a female preponderance of about 2.5:1.[6,7] Risk factors for developing RA include both genetic and environmental factors. Estrogen, cigarette use, diet, and occupation have all been linked to RA risk.[8] Overall mortality is increased twofold in adults with RA compared with the general population.[9] Risk is greatest in the first 5 years after the initial hospitalization for RA. In general, causes of death are similar for patients with RA and the general population, although death occurs prematurely in RA patients. Causes of death with increased risk in RA patients include lung and hematologic cancers, cardiovascular disease, respiratory infections, chronic obstructive pulmonary disease, and renal failure.

Economic Impact of Arthritis

Estimates of annual medical expenditures for patients with arthritis and other rheumatic conditions in the United States in 2003 averaged almost $7,000 per patient.[10] In addition, adults of working age with arthritis or other rheumatic conditions earned an average of over $3,600 less than individuals without these conditions. A Canadian study evaluating costs of RA in 2002 (converted to US$) estimated a total average annual cost of $9,760–23,739 per patient, with $8,573 attributed to direct costs.[11] A separate study evaluating employed adults showed increases in unemployment, work absenteeism, and work effort needed to maintain the work performance among adults with RA.[12]

Costs are high even early in the disease. Söderlin and colleagues evaluated the direct and indirect costs of arthritis in Sweden from the onset of disease through 6 months of follow-up and determined that the median cost per patient was $3,362 ($4,385 for RA).[13] A separate Swedish study reported that indirect costs exceeded direct costs by a factor of 2.3 during the first year after the diagnosis of RA, with 63% of patients reporting work disability.[14] In a similar study conducted in the United States in patients with RA during the first year of their disease, investigators reported an average of $200 per month for the cost of direct care and $281 per month towards indirect costs.[15] The average number of days of activity lost each month because of RA symptoms was 3.8 ± 7.7.

Arthritis Evaluation

The evaluation of chronic arthritis focuses on distinguishing between degenerative and inflammatory arthritis. This distinction relies primarily on historical data. For example, OA generally affects weight-bearing joints in an asymmetric fashion, whereas RA affects small joints symmetrically (Fig. 9.2). Radiographs can also be

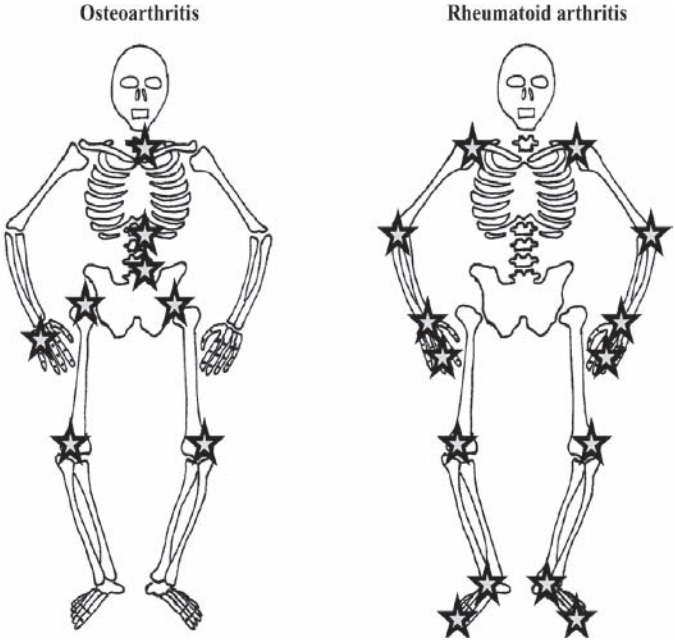


Fig. 9.2 Typical patterns of joint involvement. *Stars* denote joints typically involved in each type of arthritis. Osteoarthritis typically affects overused and large weight-bearing joints. Joint involvement is often asymmetrical. Rheumatoid arthritis typically produces symmetrical inflammatory changes in small joints.

used to help distinguish OA from RA. OA is associated with the development of osteophytes and cartilage erosion (Fig. 9.3a, b). RA is associated with inflammatory changes and reduced cartilage; bony erosion may also be present, especially with disease progression (Fig. 9.3a, c).

Gormley and colleagues developed specific criteria to distinguish inflammatory joint disease from non-inflammatory arthritis (see Box 9.1).[16] These criteria were provided to PCPs and nurses to serve as diagnostic guidelines for identifying inflammatory joint disease. Patients identified by non-rheumatologists with any of the criteria in Box 9.1 were referred to a rheumatologist to confirm early inflammatory disease. Utilization of these screening criteria by general practitioners or rheumatology nurses resulted in excellent agreement between non-rheumatologists and rheumatologists for the diagnosis of inflammatory disease (Cohen's $\kappa = 0.77$ for general practitioners and 0.79 for nurses). Of the features used in the guidelines, historical reports of significant joint stiffness in the morning or after rest and identification of joint swelling on examination most significantly discriminated between inflammatory and non-inflammatory joint disease.

The American College of Rheumatology (ACR) recommends referrals to a rheumatologist or other physicians familiar with the diagnosis and treatment of arthritis for all patients with newly diagnosed or suspected RA or when it is difficult to distinguish between the diagnosis of degenerative and inflammatory arthritis.[17]

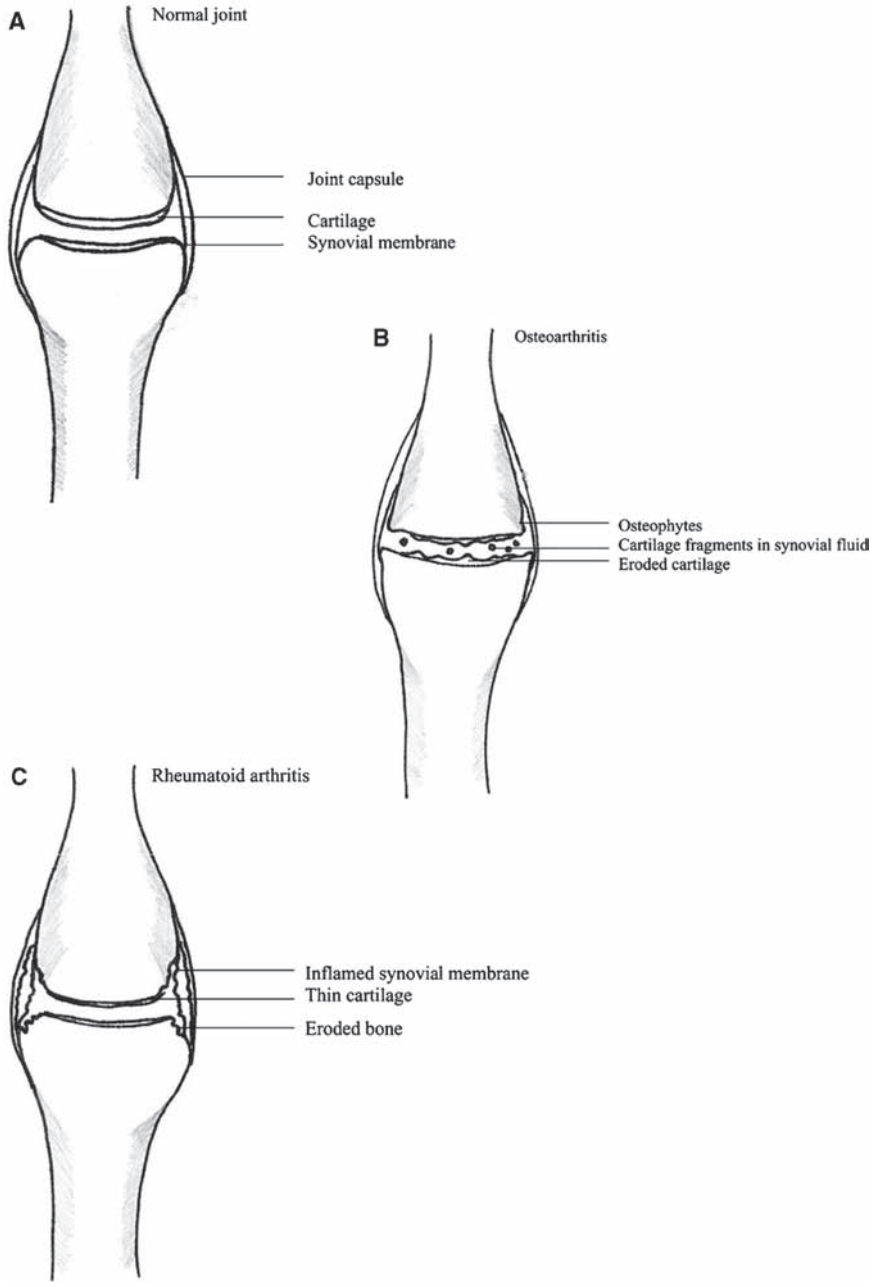


Fig. 9.3 Joint changes with arthritis.

Box 9.1 Clinical features suggesting inflammatory arthritis (based on Gormley et al.[16])

- Historical features
  - Pain and/or swelling in several joints
  - Significant joint stiffness in the morning or after rest
  - Progressive loss of joint function
  - Symmetrical joint involvement
  - Good response to nonsteroidal anti-inflammatory drugs
- Physical examination features
  - Joint inflammation (swelling, warmth, tenderness)
  - Restricted range of motion in the joints

This recommendation is supported by data showing that RA care directed by a specialist results in superior functional status and pain reduction.[18] This is particularly important in the early stages of RA, because joint erosion is already evident in 13% of patients with RA at their initial assessment and subsequent erosion can be minimized by aggressive, disease-modifying RA treatment.[19] RA may also be associated with significant systemic complications – including cardiac, renal, ocular, and pulmonary complications – as well as vasculitis. Rheumatologist consultation will also include an evaluation for systemic features of RA.

Figure 9.4 can be used in the clinic for patients reporting chronic joint pain to help establish symptom chronicity, pain location, and the presence of historical symptoms of degenerative vs. inflammatory arthritis. Some symptoms, such as joint pain and morning stiffness, are reported in both OA and RA, although morning stiffness tends to be prolonged in RA. RA patients with multisystem complaints should be evaluated by a rheumatologist. Figure 9.5 provides completed joint assessment sheets and diagnoses for three typical arthritis patients.

Arthritis Diagnosis

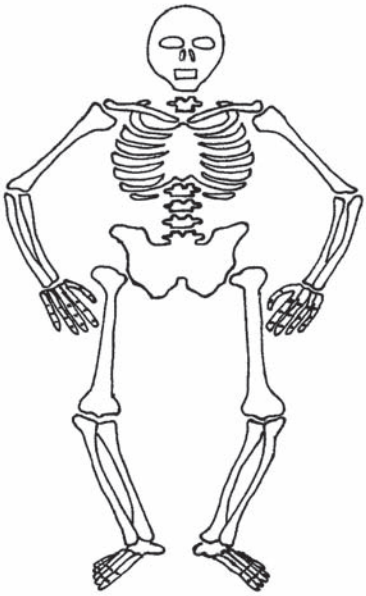
A diagnosis in patients with symptoms suggesting arthritis begins with a determination of whether the symptoms are acute or chronic before considering a diagnosis of whether it is OA or RA.

Osteoarthritis

OA is a non-inflammatory joint condition. Pain typically worsens with activity or weight bearing and improves with rest. Morning stiffness is often reported. The physical

Please complete the following questions:

1. **Mark all areas on the figure where you typically experience pain with an X.**



2. **How long have you had these pain complaints? _____**

3. **Circle the best description for your pain:**
   NEW PROBLEM PROGRESSIVELY WORSENING STABLE IMPROVING

4. **Check any problems you experience with your pain**
   - ❑ **JOINT SWELLING**
   - ❑ **PROLONGED MORNING STIFFNESS**
   - ❑ **PROLONGED STIFFNESS AFTER REST**
   - ❑ **REDUCED JOINT MOVEMENT**
   - ❑ **PAIN IN THE SAME JOINTS ON BOTH SIDES OF THE BODY**
   - ❑ **GOOD PAIN RELIEF WITH IBUPROFEN OR NAPROXEN**

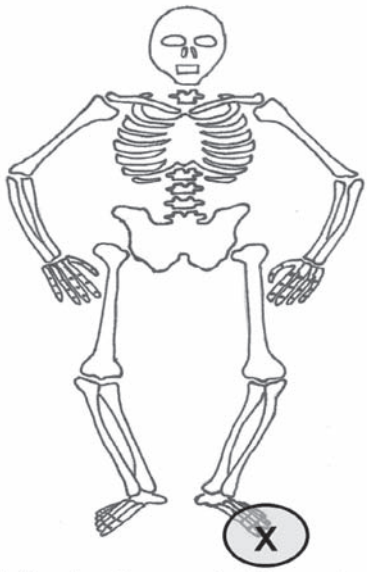
5. **Check any other body areas that are causing problems:**
   - ❑ **Heart or chest pain**
   - ❑ **Lungs or shortness of breath**
   - ❑ **Kidneys**
   - ❑ **Swollen legs (other than at the joints)**
   - ❑ **Eye**
   - ❑ **Skin**

Fig. 9.4 Assessment sheet for patients reporting joint pain. Patients with chronic or worsening pain may have degenerative or inflammatory arthritis. Placement of marks on drawing will help determine the location of affected joints to distinguish the asymmetrical large (weight-bearing) joint involvement of degenerative arthritis from the symmetrical small-joint involvement of inflammatory arthritis. Patients reporting symptoms described in Question 4 should be examined for the possibility of inflammatory arthritis.

A Diagnosis: acute arthritis – gout

Please complete the following questions:

1. Mark all areas on the figure where you typically experience pain with an 'X.'



2. How long have you had these pain complaints? 1 day

3. Circle the best description for your pain:

NEW PROBLEM PROGRESSIVELY WORSENING STABLE IMPROVING

4. Check any problems you experience with your pain

- X JOINT SWELLING
- ❑ PROLONGED MORNING STIFFNESS
- ❑ PROLONGED STIFFNESS AFTER REST
- X REDUCED JOINT MOVEMENT
- ❑ PAIN IN THE SAME JOINTS ON BOTH SIDES OF THE BODY
- ❑ GOOD PAIN RELIEF WITH IBUPROFEN OR NAPROXEN

5. Check any other body areas that are causing problems:

- ❑ Heart or chest pain
- ❑ Lungs or shortness of breath
- ❑ Kidneys
- ❑ Swollen legs (other than at the joints)
- ❑ Eye
- ❑ Skin

Fig. 9.5 Completed patient assessment sheets.

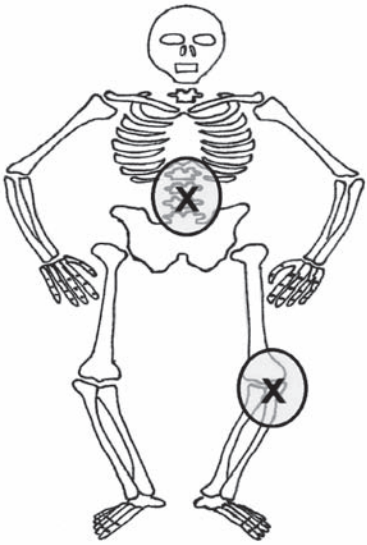
examination typically reveals joint tenderness, bony enlargement, crepitus on motion, and a restricted range of motion. Diagnostic criteria are shown in Box 9.2.

OA must be distinguished from both inflammatory arthritis and nonarthritic conditions (e.g., bursitis). Patients with a questionable diagnosis or normal radiograph findings should be referred to a rheumatologist for a definitive diagnosis.

B Diagnosis: chronic arthritis – OA

Please complete the following questions:

1. Mark all areas on the figure where you typically experience pain with an 'X.



2. How long have you had these pain complaints? 5 years

3. Circle the best description for your pain:

NEW PROBLEM PROGRESSIVELY WORSENING STABLE IMPROVING

4. Check any problems you experience with your pain

- ❑ JOINT SWELLING
- ❑ PROLONGED MORNING STIFFNESS
- ❑ PROLONGED STIFFNESS AFTER REST
- ❑ REDUCED JOINT MOVEMENT
- ❑ PAIN IN THE SAME JOINTS ON BOTH SIDES OF THE BODY
- ❑ GOOD PAIN RELIEF WITH IBUPROFEN OR NAPROXEN

5. Check any other body areas that are causing problems:

- ❑ Heart or chest pain
- ❑ Lungs or shortness of breath
- ❑ Kidneys
- ❑ Swollen legs (other than at the joints)
- ❑ Eye
- ❑ Skin

Fig. 9.5 (continued)

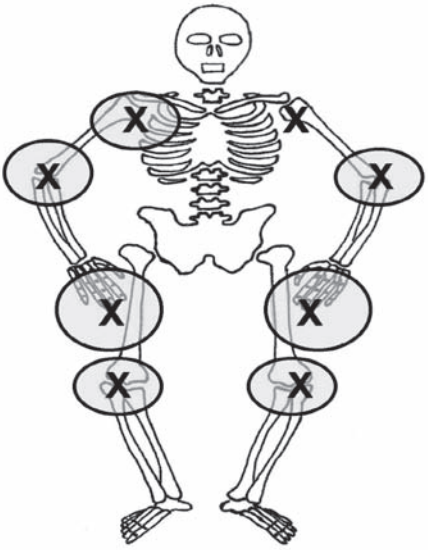
Rheumatoid Arthritis

RA is a symmetric, inflammatory arthritis of the small joints. Because RA affects joints, as well as other organ systems, a multisystem evaluation is recommended by the ACR (see Box 9.3). Additionally, the severity of symptoms must be recorded

C Diagnosis: chronic arthritis – RA

Please complete the following questions:

1. Mark all areas on the figure where you typically experience pain with an 'X.'



2. How long have you had these pain complaints? 6 years

3. Circle the best description for your pain:

NEW PROBLEM PROGRESSIVELY WORSENING STABLE IMPROVING

4. Check any problems you experience with your pain

- ☒ JOINT SWELLING
- ☒ PROLONGED MORNING STIFFNESS
- ☒ PROLONGED STIFFNESS AFTER REST
- ☒ REDUCED JOINT MOVEMENT
- ☒ PAIN IN THE SAME JOINTS ON BOTH SIDES OF THE BODY
- ☐ GOOD PAIN RELIEF WITH IBUPROFEN OR NAPROXEN

5. Check any other body areas that are causing problems:

- ☒ Heart or chest pain
- ☐ Lungs or shortness of breath
- ☐ Kidneys
- ☐ Swollen legs (other than at the joints)
- ☐ Eye
- ☐ Skin

Fig. 9.5 (continued)

Box 9.2 Diagnostic features of osteoarthritis

- Joint pain
- Morning stiffness
- Joint changes on radiographs
- Crepitus with joint movement

Box 9.3 Evaluation of rheumatoid arthritis (based on American College of Rheumatology Subcommittee Guidelines[17])

Step 1. Evaluate and diagnose:

1. Establish a diagnosis.
2. Consider making a referral to a rheumatologist if diagnosis is questionable
3. Document disease severity
   (a) Record severity of pain, morning stiffness, fatigue, and disability
   (b) Count number of swollen and tender joints
   (c) Record joint deformity or restricted motion
   (d) Record systemic symptoms
4. Perform baseline laboratory tests
   (a) Erythrocyte sedimentation rate or C-reactive protein
   (b) Rheumatoid factor
   (c) Complete blood count
   (d) Electrolytes, creatinine, and liver function tests
   (e) Urinalysis
   (f) Stool guaiac
   (g) Synovial fluid analysis to rule out other conditions
   (h) Radiographs of affected joints, as well as hands and feet

Step 2. Initiate treatment:

1. Patient education
2. Begin disease-modifying antirheumatic drug within 3 months
3. Consider nonsteroidal anti-inflammatory drugs
4. Consider local or low-dose systemic steroids
5. Refer to physical/occupational therapy

Step 3. Assess benefit of therapy. Prolonged morning stiffness or fatigue or signs of inflammation suggest ineffective treatment and need for treatment modification:

1. Record severity of pain, morning stiffness, fatigue, and disability
2. Count number of swollen and tender joints
3. Record joint deformity or restricted motion
4. Periodically reassess laboratory inflammatory markers and radiographs

Step 4. Inadequate response after 3 months of maximal therapy necessitates rheumatology referral:

1. Change disease-modifying antirheumatic drug
2. Consider addition of methotrexate or other therapies

Table 9.2 Frequency of implementing ACR guidelines at rheumatology visits (based on Kitamura et al.[20])

Recommended assessment	Percentage completed
Recommended for every visit	
Number of tender joints	95
Number of swollen joints	95
Joint pain	69
Functional status	48
Morning stiffness	46
Fatigue	33
Recommended for periodic assessment	
Joint damage	54
Inflammatory markers	48
Radiograph	10

initially and at each subsequent visit to identify and document the efficacy of the disease-modifying agents. A Canadian study recently evaluated the frequency with which rheumatologists at an academic center followed ACR guidelines (*see* Table 9.2).[20] No rheumatologist assessed every ACR item. In general, guidelines were followed better for new patient visits compared with follow-ups.

Patients with RA need to have pre-treatment assessments of blood work (including routine hematology and chemistry tests and inflammatory markers [erythrocyte sedimentation rate or C-reactive protein]). The rheumatoid factor (RF) autoantibody can be detected in about 60–80% of patients with RA.[21] Disease specificity for RA is low (66%), with positive titers present in a variety of autoimmune diseases (e.g., Sjögren's syndrome) and nonautoimmune conditions (e.g., OA). RF, therefore, should not be used as a general screening tool for all patients with arthritis, but should be reserved for those with a clinical diagnosis of probable RA. In addition, RF titers may be low in early RA. Antibodies to cyclic citrullinated peptide (anti-CCP) compared with RF show similar sensitivity for diagnosing RA, although specificity is higher with anti-CCP.[22] Patients also need synovial fluid analysis to rule out other conditions and radiographs of affected joints, as well as hands and feet.

Arthritis Treatment

Arthritis therapy involves the use of both pharmacological and non-pharmacological approaches. The pharmacological approach uses medications designed to reduce symptoms in OA patients and to modify disease-specific entities in RA patients. Non-pharmacological therapy includes both pain management and active exercise. Exercise is essential for improving joint flexibility and the strength of surrounding muscles. Good conditioning of surrounding tendons, ligaments, and muscles offers

important protection of at-risk joints. Additionally, aerobic exercise with minimal impact on weight-bearing joints, such as swimming and bicycling, reduces arthritis pain and improves joint function. Efforts to severely restrict normal activities and rehabilitative exercise actually increase the risk for subsequent injury.

Medications

In arthritis therapy, medications are used to complement, but not replace, non-pharmacological treatment. Nonsteroidal anti-inflammatory drugs (NSAIDs) have been the mainstay of arthritis therapy. However, a meta-analysis of studies evaluating anti-inflammatory agents documented significant risks associated with the use of NSAIDs.[23] The relative risk for an upper gastrointestinal (GI) bleed was 3.8 in NSAID users, and the risk correlated with the drug dose, age of the patient, and a history of peptic ulcer disease. The significance of adverse GI events with NSAIDs was also highlighted in a survey of the members of the Norwegian Rheumatism Association, 68% of whom reported experiencing adverse GI events.[24] In addition, 35% reported concomitant use of over-the-counter gastro-protective agents and 30% reported using prescribed gastro-protective agents. Almost half of these individuals used a gastro-protective agent at least every other day.

Osteoarthritis

Evidence-based treatment recommendations for OA of the hand, hip, and knee are summarized in Box 9.4.[25–28] OA is typically treated symptomatically with acetaminophen or NSAIDs. The high frequency of additional medical illnesses in OA patients must also be considered when prescribing additional therapy. A recent survey of 1,021 patients with hip or knee OA identified a concomitant medical illness in the majority of OA patients (Table 9.3).[29] Due to frequent additional medical illnesses and risk for gastric and renal toxicity as well as medication interactions associated with NSAID use, acetaminophen is considered first-line therapy for patients with OA. Interestingly, knee OA improves significantly better to NSAIDs than hip OA ($P < 0.05$).[30] Topical analgesics, such as OTC capcaisin cream, may also be helpful.

Rheumatoid Arthritis

ACR 2006 treatment guidelines for RA are summarized in Box 9.5.[31] These recommendations have been widely accepted, with a recent prospective study showing generally adequate implementation in RA patients.[32] Although both NSAIDs and disease-modifying antirheumatic drugs (DMARDs) can effectively reduce joint pain, only DMARDs retard joint destruction (*see* Table 9.4). DMARDs significantly improve the quality of life,[33] with function preserved in patients treated early

Box 9.4 Evidence-based, consensus recommendations for treating OA (based on Jordan et al.[25], Zhang et al.[26], Zhang et al.[27], Zhang et al.[28])

- Treatment should include both medication and non-medication therapies.
- Effective medications include:
  - Acetaminophen as first-line therapy
  - Short-term NSAIDs for patients failing to achieve relief with acetaminophen. Gastro-protective agents may also be needed.
  - Topical NSAIDs and capsaicin as adjunctive treatment
  - Glucosamine and chondroitin (Discontinue if no effect after 6 months.)
  - Intra-articular injections with corticosteroids or hyaluronate
  - Opioids have a limited role.
- Effective non-medication therapies include:
  - Self-management training in lifestyle adjustments, exercise, weight control, and activity pacing
    - Exercise should include range of motion, muscle strengthening, and aerobics.
    - Patients should be instructed in proper footwear.
  - Regular phone contact from the healthcare provider
  - Physical therapy for exercise instruction and application of necessary orthotics and assistive devices (e.g., cane or walker)
    - Mild-moderate knee varus or valgus instability may benefit from a brace.
    - Thermal treatment, ultrasound, and TENS may provide short-term symptomatic relief.
- Joint surgery or replacement may become necessary in patients failing to respond to other measures.

Table 9.3 Concomitant illnesses in patients with OA (based on Rosemann et al.[29])

Diagnosis	Percentage affected
Hypertension	55.2
Hypercholesterolemia	36.1
Ulcer/gastritis	21.8
Depression	19.4
Cardiac insufficiency	19.0
Diabetes	17.3
Coronary artery disease	12.9
Asthma/COPD	9.6
Renal insufficiency	5.5
Stroke	4.5
Cancer	3.6

COPD=chronic obstructive pulmonary disease

Box 9.5 ACR treatment recommendations (based on ACR website)

- Patient diagnosed with RA requires disease status assessments within 3 months of diagnosis and annually thereafter
  - Joint examination
  - Functional assessment
  - Pain measurement
  - Global status assessment
  - Acute phase reactant testing
- First-line treatment is DMARD unless
  - DMARD is contraindicated
  - RA is inactive
  - Patient refuses
- Patients treated with DMARD with increased disease activity or progressive bone damage should have one of the following
  - Changed DMARD (dose, route, or drug)
  - Added DMARD
  - Add or increase glucocorticoids

Table 9.4 Disease-modifying antirheumatic drugs

Drug	Typical maintenance dosage
Abatacept [Orencia]	500–1,000 mg IV very 4 weeks (Dosage based on weight)
Adalimumab [Humira]	40 mg SQ every other week
Anakinra [Kineret]	100 mg per day SQ
Azathioprine [Imuran]	25 mg per day
Cyclosporine [Neoral, Sandimmune, Gengraf]	3–4 mg per kg per day
Etaneracept [Enbrel]	25 mg SQ twice weekly
Gold [Ridaura, Auranofin]	3 mg BID-TID
Hydroxychloroquine [Plaquenil]	200–400 mg per day
Infliximab [Remicade]	3 mg per kg IV every 8 weeks
Leflunomide [Arava]	20 mg per day
Methotrexate [Rheumatrex]	7.5–30 mg per week
Minocycline [Minocin]	100 mg BID
Rituximab [Rituxan]	Two-1,000 mg IV infusions separated by 2 weeks
Sulfasalazine [Azulfidine]	1,000 mg BID

BID Twice daily, *IV* Intravenous, *TID* Three times per day, *SQ* subcutaneous

in the course of their disease.[34] Comparative studies of DMARDs show similar efficacy among various drug classes.[35] Hydroxychloroquine or sulfasalazine are often selected as initial therapy in the early stages of RA, whereas methotrexate is reserved for patients with more advanced disease. Sulfasalazine works faster than

hydroxychloroquine and is better at retarding bony destruction. Patients who fail to achieve any benefit from traditional DMARDs may benefit from changing to tumor necrosis factor (TNF)-α inhibitors (e.g., adalimumab, etanercept, and infliximib) or interleukin-1 receptor antagonists (anakinra), or combining these agents with a traditional DMARD. Both drug categories effectively reduce joint erosions, but the onset of response is faster with TNF-α inhibitors.

Despite reduction in inflammation and joint symptoms, bony changes often occur over time in treated patients. A 10-year study conducted in the United Kingdom evaluated clinical symptoms and radiographs in RA patients treated with DMARDs.[36] Average joint tenderness, morning stiffness, and grip strength remained relatively stable over the 10 years, while radiographic scores showed deterioration. At 10 years, 19% of patients received joint surgery, with 15% having at least one large joint replacement. Joint replacement was significantly more common in women than in men (18.6% vs. 6.5%; $P=0.02$).

Anemia should also be treated. A recent evaluation of patients participating in RA clinical trials identified anemia (hemoglobin <12 g/dL) in one in three patients.[37] Disability correlated with hemoglobin levels, with mild disability among patients with mild anemia and more severe disability with greater levels of anemia ($P<0.001$). Furthermore, as anemia improved, disability likewise decreased ($P<0.001$). Significant improvement in disability occurred with an increase in hemoglobin of 1 g/dL.

Non-pharmacological Therapy

Patient education for arthritis patients typically involves information about the disease and specific self-management strategies (i.e., changing activities or activity scheduling, pain management skills, and physical exercises). Both comprehensive programs addressing a wide variety of techniques[38] and focused skills training (e.g., cognitive-behavioral therapy [CBT]) [39,40] provide significant short- and long-term reduction in pain and psychological distress and improvement in functional ability. A brief educational intervention (a single 30- to 60-minute educational session with a nurse, followed by two telephone calls) resulted in significant reduction in pain and disability for 1 year after the intervention.[41] Benefits did decrease over time, suggesting the need for repeated or ongoing education in patients with arthritis. Additionally, pharmacological compliance is enhanced by arthritis disease education. In one study, brief educational sessions that focused on disease information and self-management skills delivered by a nurse increased pharmacological compliance from 55% to 85%.[42]

Weight Reduction

Excess weight increases the risk for clinical OA (Fig. 9.6).[43] Obesity increases mechanical load on joints, particularly in the lower extremities,[44] and increases the availability of pro-inflammatory cytokines that promote joint destruction.[45,46] Fortunately, weight loss significantly reduces stress on joints. For example, the risk for knee OA decreased over a 10-year period by more than 50% in women who lost 5.1 kg.[47]

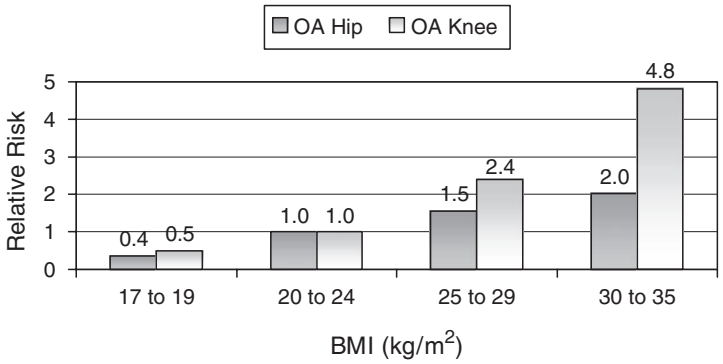


Fig. 9.6 Relative risk of OA based on body mass index (BMI) (based on Järvholm et al.[43]).

Exercise

Both strengthening and aerobic exercises significantly reduce pain and disability in patients with OA or RA.[48,49] High-intensity exercise undertaken twice weekly was shown to reduce long-term joint destruction in RA patients.[50] Radiographic joint damage progression occurred in 11% of RA patients treated with exercise, compared with 22% treated with physical therapy over 2 years ($P < 0.05$).

Physical therapy should focus on range of motion and strengthening exercises, as well as devices to assist ambulation and activities of daily living. An occupational therapy referral should be made for patients with significant disability or activity restriction. Aerobic exercises and aquatic therapy tailored for arthritic patients are also recommended. A variety of exercise resources are available online (see Box 9.6). Both aquatic and land exercise programs are recommended for patients with arthritis. A comparative study evaluated the benefits of an exercise

Box 9.6 Online resources for arthritis exercise

- Arthritis Foundation exercise programs
  - http://www.arthritis.org/programs.php
  - http://www.arthritis.org/exercise-intro.php
- Exercise instruction sheet from the National Arthritis Foundation
  - http://www.arthritis.org.sg/101/treat/exercise.html
- Johns Hopkins Arthritis Center exercise instructions
  - http://www.hopkins-arthritis.org/patient-corner/disease-management/exercise.html
- Hand exercises for OA from the Mayo Clinic
  - http://www.mayoclinic.com/health/arthritis/AR00030

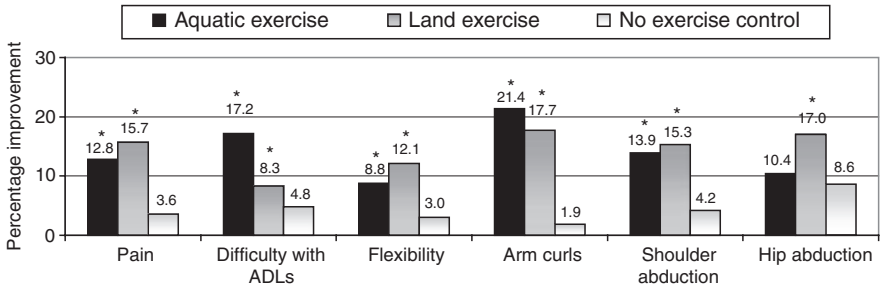


Fig. 9.7 Benefit from aquatic or land Arthritis Foundation exercise. * denotes significant improvement from study initiation to end ($P<0.05$). Arm curls and shoulder and hip abduction tests are reported for the right side of the body (based on Suomi and Collier[51]).

program compared with no exercise in non-exercising patients with RA, aged more than 60 years.[51] Arthritis Foundation exercise programs were conducted in two 45-minute sessions each week for 8 weeks. Controls were asked to refrain from beginning any new exercise program. Exercise programs resulted in a significant reduction in pain and disability and a significant improvement in flexibility and strength (Fig. 9.7).

Investigators involved in the Rheumatoid Arthritis Patients in Training compared long-term symptoms in patients participating in an intensive exercise program twice weekly with symptoms in those receiving usual care.[52] The exercise consisted of a warm-up period; 20 minutes each of bicycling, exercises, and a game (e.g., badminton, indoor soccer, volleyball, basketball, or relay games); and a cool-down period. Exercise program compliance was very good, with 81% of the patients continuing to participate after 2 years.[53] Improvement in ability was significantly better in the exercise group compared with usual care after both 1 and 2 years of treatment ($P<0.05$). Improvement in muscle strength and reduction in emotional distress were also significantly better in the exercise group ($P<0.01$). In addition, aerobic fitness increased in the exercise group, although it diminished in those receiving usual care. Treatment safety was assessed using radiographs of the large joints, with no significant difference noted between usual care and aggressive exercise groups.

Psychological Treatments

Treatment with psychological pain management techniques, such as stress management and CBT, results in reduced physical and psychological symptoms in arthritis patients.[40] Although psychological treatments are not recommended as monotherapy, they are important adjunctive therapy. Sharpe and colleagues compared both psychological and physical benefits in patients with RA who were randomized to either medical therapy alone or medical therapy plus CBT.[54] Those who participated in CBT experienced superior short- and long-term improvement in measures of both physical and emotional health (Fig. 9.8).

As with all types of chronic pain, patients with comorbid psychological distress need additional therapy targeted to their emotional symptoms. Targeted depression

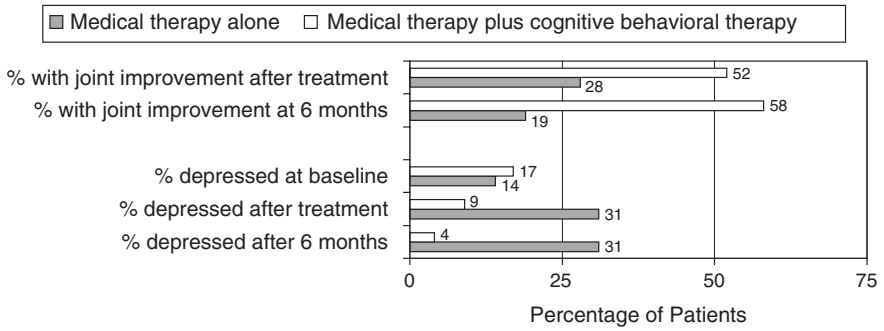


Fig. 9.8 Benefits of adding psychological treatment to usual medical care (based on Sharpe et al.[54]).

therapy in patients with arthritis resulted in significantly superior reduction in depressive symptoms, as well as pain and pain interference in activities of daily living, compared with patients treated with usual care.[55]

Alternative/Complementary Medicine

Complementary or alternative therapies are generally not recommended in rheumatologic disease. A 1-year, longitudinal study of the effects of complementary therapies in rheumatology patients (15% with OA, 39% RA, and 19% with fibromyalgia) failed to find any benefit from a wide variety of treatments, including acupuncture, chiropracty, nutritional and herbal supplements, or copper bracelets and magnets.[56] Two recent, randomized trials similarly failed to show benefit from acupuncture.[57,58] Patients should alternatively focus on therapies with proven efficacy in arthritis, such as weight reduction, exercise, and psychological pain management.

Summary

Arthritis is one of the most common chronic pain complaints, with the prevalence increasing with age in most populations. Most cases of chronic arthritis are caused by degenerative or inflammatory pathology. Degenerative OA typically affects large, weight-bearing joints in a non-symmetrical fashion. Inflammatory RA, conversely, usually causes symmetric symptoms in the small joints. The knee is a common site for either OA or RA. Treatment for arthritis includes both pharmacologic and rehabilitative therapy. Acetaminophen is considered first-line therapy for OA, whereas DMARDs are used in RA. Patients with either OA or RA should be treated with weight reduction, exercise, and pain management techniques. Although patients are often concerned that aerobic exercise will add further stress to painful joints and aggravate both pain and joint deformity, studies have shown that exercise

improves the strength and flexibility of surrounding structures to provide support and protection to arthritic joints. Indeed, aerobic exercise improves pain and function in patients with arthritis.

Test Your Knowledge

1. How many adults are affected by arthritis or chronic joint pain, aching, stiffness, or swelling?

   (a) 1 in 2
   (b) 1 in 3
   (c) 1 in 5
   (d) 1 in 10
   (e) 1 in 20

2. Choose the correct statement(s) about rheumatoid arthritis:

   (a) RA affects about 1% of people worldwide
   (b) Females are affected over twice as often as men
   (c) Risk factors for developing RA include estrogen, cigarette use, diet, and occupation
   (d) Overall mortality is increased twofold in adults with RA
   (e) All of the above

3. Which of the following feature(s) is typical of osteoarthritis?

   (a) Symmetrical joint involvement
   (b) Pain mainly in the small joints
   (c) Pain in weight-bearing joints
   (d) Joint inflammation
   (e) All of the above

4. Select the correct first-line therapy or therapies for osteoarthritis

   (a) Acetaminophen
   (b) Nonsteroidal anti-inflammatory drugs
   (c) Aerobic exercise
   (d) A and C
   (e) All of the above

5. Select the correct first-line therapy or therapies for rheumatoid arthritis

   (a) Methotrexate
   (b) Sulfasalazine
   (c) Hydroxychloroquine
   (d) Leflunomide
   (e) All of the above

6. Which of the following non-pharmacological therapies should be prescribed for patients with rheumatoid arthritis?

   (a) Acupuncture
   (b) Aqua therapy
   (c) Copper bracelets
   (d) Magnets
   (e) Bed rest

Answers: 1b, 2e, 3c, 4d, 5e, 6b

References

1. Schappert SM, Burt CW. Ambulatory care visits to physician offices, hospital outpatient departments, and emergency departments: United States, 2001–02. Vital Health Stat 13 2006;159:1–66
2. Koleva D, Krulichova I, Bertolini G, Caimi V, Garattini L. Pain in primary care: an Italian survey. Eur J Public Health 2005;15:475–479
3. Feinglass J, Lee C, Durazo-Arvizu R, Chang R. Health status, arthritis risk factors, and medical care use among respondents with joint symptoms or physician diagnosed arthritis: findings from the 2001 behavioral risk factor surveillance system. J Rheumatol 2005;32:130–136
4. Hootman JM, Hlemick CG, Schappert SM. Magnitude and characteristics of arthritis and other rheumatic conditions on ambulatory medical care visits, United States, 1997. Arthritis Care Res 2002;47:571–581
5. Arden N, Nevitt MC. Osteoarthritis: epidemiology. Best Pract Res Clin Rheumatol 2006;20:3–25
6. Sangha O. Epidemiology of rheumatic diseases. Rheumatology 2000;39(Suppl 2):3–12
7. Alamanos Y, Voulgari PV, Drosos AA. Incidence and prevalence of rheumatoid arthritis, based on the 1987 American College of Rheumatology criteria: a systematic review. Semin Arthritis Rheum 2006;36:182–188
8. Loiver JE, Silman AJ. Risk factors for the development of rheumatoid arthritis. Scand J Rheumatol 2006;35:169–174
9. Thomas E, Symmons DM, Brewster DH, Black RJ, Macfarlance GJ. National study of case-specific mortality in rheumatoid arthritis, juvenile chronic arthritis, and other rheumatic conditions: a 20 year followup study. J Rheumatol 2003;30:958–965
10. Yelin E, Murphy L, CIsternas MG, et al. Medical care expenditures and earnings losses among persons with arthritis and other rheumatic conditions in 2003, and comparisons with 1997. Arthritis Rheum 2007;56:1397–1407
11. Fautrel B, Clarke AE, Guillemin F, et al. Costs of rheumatoid arthritis: new estimates from the human capital method and comparison to the willingness-to-pay method. Med Decis Making 2007;27:138–150
12. Kessler RC, Maclean JR, Petukhova M, et al. The effects of rheumatoid arthritis on labor force participation, work performance, and healthcare costs in two workplace samples. J Occup Environ Med 2008;50:88–98
13. Söderlin MK, Kautiainen H, Jonsson D, Skogh T, Leirisalo-Repo M. The costs of early inflammatory joint disease: a population-based study in southern Sweden. Scand J Rheumatol 2003;32:216–224
14. Hallert E, Husberg M, Jonsson D, Skogh T. Rheumatoid arthritis is already expensive during the first year of the disease (the Swedish TIRA project). Rheumatology (Oxford) 2004;43:1374–1382

15. Newhall-Perry K, Law NJ, Ramos B, et al. Direct and indirect costs associated with the onset of seropositive rheumatoid arthritis. Western Consortium of Practicing Rheumatologists. J Rheumatol 2000;27:1156–1163
16. Gormley GJ, Steele WK, Gilliland A, et al. Can diagnostic triage by general practitioners or rheumatology nurses improve the positive predictive value of referrals to early arthritis clinics? Rheumatology 2003;42:763–768
17. American College of Rheumatology Subcommittee on Rheumatoid Arthritis Guidelines. Guidelines for the management of rheumatoid arthritis: 2002 update. Arthritis Rheum 2002;46:328–346
18. Yelin EH, Such CL, Criswell LA, Epstein WV. Outcomes for persons with rheumatoid arthritis with a rheumatologist versus a non-rheumatologist as the main physician for this condition. Med Care 1998;36:513–522
19. Machold KP, Stamm TA, Eberl GJ, et al. Very recent onset arthritis – clinical, laboratory, and radiological findings during the first year of disease. J Rheumatol 2002;29:2278–2287
20. Kitamura CR, Rohekar G, Bykerk VP, Carette S. Are the 2002 American College of Rheumatology guidelines for the management of rheumatoid arthritis being followed in Canada's largest academic rheumatology center? J Rheumatol 2007;34:2183–2192
21. Steiner G, Smolen J. Autoantibodies in rheumatoid arthritis and their clinical significance. Arthritis Res 2002;4(Suppl 2):S1–S5
22. Nishimura K, Sugiyama D, Kogata Y, et al. Are rheumatoid factor (RF) and anti-cyclic citrullinated peptide antibody (anti-CCP) accurate tests for rheumatoid arthritis (RA)? Evidence-Based Medicine 2007;12:183
23. Hernández-Díaz S, Rodríguez LG. Association between nonsteroidal anti-inflammatory drugs and upper gastrointestinal tract bleeding/perforation. Arch Int Med 2000;160:2093–2099
24. Steinfeld S, Bjørke PA. Results from a patient survey to assess gastrointestinal burden of non-steroidal anti-inflammatory drug therapy contrasted with a review of data from EVA to determine satisfaction with rofecoxib. Rheumatology 2002;41(Suppl 1):23–27
25. Jordan KM, Arden N, Doherty M, et al. EULAR recommendations 2003: an evidence based approach to the management of knee osteoarthritis: report of a task force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT). Ann Rheum Dis 2003;62:1145–1155
26. Zhang W, Doherty M, Arden N, et al. EULAR evidence based recommendations for the management of hip osteoarthritis: report of a task force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT). Ann Rheum Dis 2005;64:669–681
27. Zhang W, Doherty M, Leeb BF, et al. EULAR evidence based recommendations for the management of hand osteoarthritis: report of a task force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT). Ann Rheum Dis 2007;66:377–388
28. Zhang W, Moskowitz RW, Nuki G, et al. OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. Osteoarthritis Cartilage 2008;16:137–162
29. Rosemann T, Laux G, Szecsenyi J. Osteoarthritis: quality of life, comorbidities, medication and health care service utilization assessed in a large sample of primary care patients. J Ortho Surg Res 2007;2:12
30. Svensson O, Malenäa M, Fajutrao L, Roos EM, Lohmander LS. Greater reduction of knee than hip pain in osteoarthritis treated with naproxen, as evaluated by WOMAC and SF-36. Ann Rheum Dis 2006;65:781–784
31. American College of Rheumatology website quality measures: http://rheumatology.org/. Accessed February 2008
32. Kahn KL, MacLean CH, Wong AL, et al. Assessment of American College of Rheumatology quality criteria for rheumatoid arthritis in a pre-quality criteria patient cohort. Arthritis Care Res 2007;57:707–715

33. Blumenauer B, Cranney A, Clinch J, Tugwell P. Quality of life in patients with rheumatoid arthritis: which drugs make a difference? Pharmacoeconomics 2003;21:927–940
34. Sokka T, Möttönen T, Hannonen P. Disease-modifying anti-rheumatic drug use according to the "sawtooth" treatment strategy improves the functional outcome in rheumatoid arthritis: results of a long-term follow-up study with review of the literature. Rheumatology 2000;39:34–42
35. Osiri M, Shea B, Robinson V, et al. Leflunomide for treating rheumatoid arthritis. Cochrane Database Syst Rev 2003;1:CD002047
36. Gordon P, West J, Jones H, Gibson T. A 10 year prospective followup of patients with rheumatoid arthritis 1986–1996. J Rheumatol 2001;28:2409–2415
37. Han C, Rahman MU, Doyle MK, et al. Association of anemia and physical disability among patients with rheumatoid arthritis. J Rheumatol 2007;34:2177–2182
38. Barlow JH, Turner AP, Wright CC. Long-term outcomes of an arthritis self-management programme. Br J Rheumatol 1998;37:1315–1319
39. Sharpe L, Snesky T, Timberlake N, Ryan B, Allard S. Long-term efficacy of a cognitive behavioural treatment from a randomized controlled trial for patients recently diagnosed with rheumatoid arthritis. Rheumatology 2003;42:435–441
40. Evers AW, Kraaimaat FW, van Riel PL, de Jong AJ. Tailored cognitive-behavioral therapy in early rheumatoid arthritis for patients at risk: a randomized controlled trial. Pain 2002;100:141–153
41. Mazzuca SA, Brandt KD, Katz BP, Chambers M, Byrd D, Hanna M. Effects of self-care education on the health status of inner-city patients with osteoarthritis of the knee. Arthritis Rheum 1997;40:1466–1474
42. Hill J, Bird H, Johnson S. Effect of patient education on adherence to drug treatment for rheumatoid arthritis: a randomized controlled trial. Ann Rheum Dis 2001;60:869–875
43. Järvholm B, Lewold S, Malchau H, Vingård E. Age, body weight, smoking habits and the risk of severe osteoarthritis in the hip and knee in men. Eur J Epidemiol 2005;20:537–542
44. Sharma L, Lou C, Cahue S, Dunlop DD. The mechanism of the effect of obesity in knee osteoarthritis: the mediating role of malalignment. Arthritis Rheum 2000;43:568–575
45. Bastard JP, Jardel C, Bruckett E, et al. Elevated levels of interleukin 6 are reduced in serum and subcutaneous adipose tissue of obese women after weight loss. J Clin Endocrinol Metab 2000;85:3338–3342
46. Winkler G, Salamon F, Harmos G, et al. Elevated serum tumor necrosis factor-alpha concentrations and bioactivity in Type 2 diabetes and patients with android type obesity. Diabetes Res Clin Pract 1998;42:169–174
47. Felson DT, Zhang Y, Anthony JM, Naimark A, Anderson JJ. Weight loss reduces the risk for symptomatic knee osteoarthritis in women. The Framingham Study. Ann Intern Med 1992;116:535–539
48. Roddy E, Zhang W, Doherty M. Aerobic walking or strengthening exercise for osteoarthritis of the knee? A systematic review. Ann Rheum Dis 2005;64:544–548
49. De Jong Z, Munneke M, Zwinderman AH, et al. Is a long-term high-intensity exercise program effective and safe in patients with rheumatoid arthritis? Arthritis Rheum 2003;48:2415–2424
50. Maxwell L, Tugwell P. High-intensity exercise for rheumatoid arthritis was associated with less joint damage of the hands and feet than physical therapy. ACP J Club 2005;142:73
51. Suomi R, Collier D. Effects of arthritis exercise programs on functional fitness and perceived activities of daily living measures in older adults with arthritis. Arch Phys Med Rehab 2003;84:1589–1594
52. De Jong Z, Munneke M, Zwinderman AH, et al. Is a long-term high-intensity exercise program effective and safe in patients with rheumatoid arthritis? Arthritis Rheum 2003;48:2415–2424
53. Munneke M, de Jong Z, Zwinderman AH, et al. Adherence and satisfaction of rheumatoid arthritis patients with a long-term intensive dynamic exercise program (RAPIT Program). Arthritis Care Res 2003;49:665–672
54. Sharpe L, Sensky T, Timberlake N, Ryan B, Brewin CR, Allard S. A blind, randomized, controlled trial of cognitive-behavioral intervention for patients with recent onset rheumatoid arthritis: preventing psychological and physical morbidity. Pain 2001;89:275–283

55. Lin EB, Katon W, Von Korff M, et al. Effect of improving depression care on pain and functional outcomes among older adults with arthritis: a randomized controlled trial. JAMA 2003;290:2428–2434
56. Rao JK, Kroenke K, Mihaliak KA, Grambow SG, Weinberger M. Rheumatology patients' use of complementary therapies: results from a one-year longitudinal study. Arthritis Care Res 2003;49:619–625
57. Scharf HP, Mansmann U, Streitberger K, et al. Acupuncture and knee osteoarthritis: a three-arm randomized trial. Ann Intern Med 2006;145:12–20
58. Foster NE, Thomas E, Barlas P, et al. Acupuncture as an adjunct to exercise based physiotherapy for osteoarthritis of the knee: randomized controlled trial. BMJ 2007;335:436

Chapter 10
Neuropathic Pain

Key Chapter Points:

- Hallmarks of neuropathic pain include burning sensation, hyperalgesia, and allodynia.
- Peripheral neuropathy occurs in a variety of chronic medical conditions, including diabetes, thyroid disease, rheumatoid arthritis, cancer, and human immunodeficiency virus infection. One of three patients with diabetes has painful peripheral neuropathy.
- Postherpetic neuralgia occurs in approximately 30% of patients with herpes zoster. The incidence may be minimized by early treatment with antiviral agents and amitriptyline.
- Complex regional pain syndrome (formerly called reflex sympathetic dystrophy, causalgia, or sympathetically-maintained pain) is recognized by excessive guarding of the painful extremity.
- First-line therapy for neuropathic pain includes neuromodulating antiepileptics (e.g., gabapentin and pregabalin) and tricyclic antidepressants.

Key Words Diabetes, HIV, Postherpetic neuralgia, Zoster

Case History

Mrs. Showalter is a 60-year-old woman with well-controlled diabetes, which was diagnosed at age 45. She complains of cold, numb feet, noting pain primarily when water hits her feet after stepping into the shower or when the bedclothes brush against her feet after going to bed. She says that her feet often feel "dead" or "wooden" during the day. A physical examination reveals that she is wearing thick woolen socks, which she reports is necessary to keep her feet warm. Both feet appear normal, with good coloring, temperature, and pulses. Despite her complaints of "numbness," she is able to identify light touch throughout both feet. When approached with an open safety pin for pinprick testing, Mrs. Showalter reacts with dramatic withdrawal, complaining that the pin produces an intolerable, searing "fire" whenever it touches her feet. Her doctor orders Doppler studies and nerve conduction tests, both of which show relatively normal results. Because of

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

the normal testing and lack of confirmatory examination evidence to support the claims of either coldness or numbness, Mrs. Showalter is advised to limit activities that may stress the foot and aggravate her pain. No other therapy is prescribed.

Introduction

Neuropathic pain is the 14th most common pain complaint seen in general practice,[1] affecting an estimated 1.5–3% of people worldwide.[2,3] Painful neuropathies comprise a variety of specific disorders, including conditions associated with direct nerve compression or trauma (e.g., mononeuropathy, radiculopathy, deafferentation pain, and complex regional pain sydrome [reflex sympathetic dystrophy]) and neuropathies related to other medical illnesses (e.g., peripheral neuropathy with diabetes) (*see* Box 10.1). This chapter will focus on peripheral neuropathy, postherpetic

Box 10.1 Common neuropathic pain syndromes

- Peripheral neuropathy
  - Systemic disease
    - Diabetes
    - Thyroid disease
    - Renal disease
    - Rheumatoid arthritis
  - Nutritional/toxic
    - Alcoholism
    - Pernicious anemia
    - Chemotherapy
  - Infectious
    - Human immunodeficiency virus (HIV)
- Postherpetic neuralgia (PHN)
- Complex regional pain syndrome (CRPS)
  - Reflex sympathic dystrophy (CRPS Type I)
  - Causalgia (CRPS Type II)
- Compressive neuropathies
  - Carpal tunnel syndrome
  - Tarsal tunnel syndrome
- Radiculopathy
- Deafferentation syndrome
  - Phantom pain
  - Spinal cord injury
  - Post-stroke pain

neuralgia, and complex regional pain syndrome, although treatment can be generalized to all types of neuropathic pain. Compressive neuropathies and radiculopathy are described in Chaps. 6 and 7.

Mrs. Showalter's history is very typical of early diabetic peripheral neuropathy. As in her case, reports of pain symptoms often exceed findings on examination. In addition, patients with neuropathic pain frequently guard the painful area, covering it with clothing to avoid access to air currents or incidental light touch, or refuse a sensory examination because of extreme pain with touch or pinprick. The excessive drawing away from pinprick is usually involuntary and may be very embarrassing for the patient who believes that she is being perceived as someone who is exaggerating pain severity. Neuropathic pain, however, changes the body's perception of touch and pain, heightening pain perception from even minor sensations, such as the sensation of air rushing across a bare arm, water beating onto a bare leg in the shower, or the gentlest prick from the examiner's pin.

Despite the availability of many well-tolerated therapies, patients like Mrs. Showalter often receive inadequate care. A recent survey of patients with neuropathic pain showed that the majority were under-treated.[4] In this survey, 73% of respondents reported inadequate pain control. In addition, 25% had never been treated with standard therapy, including antiepileptic drugs (AEDs), antidepressants, or opioids. Despite the widespread acceptance of AEDs and antidepressants as effective, first-line therapy, 72% of patients with neuropathic pain had never been treated with an AED and 60% had never been treated with a tricyclic antidepressant.

Epidemiology of Common Neuropathic Pain Syndromes

Neuropathy is a common accompaniment to a variety of common medical conditions. The etiology of the neuropathy is usually identified based on a history of comorbid medical illnesses or previous nerve injury. Patients with evidence of peripheral neuropathy should be screened for these common medical conditions (*see* Box 10.1).

Diabetic Neuropathy

Symptomatic peripheral neuropathy affects one in three adults with diabetes.[5,6] Data from the National Health and Nutrition Examination Surveys estimate that diabetes affects about 12 million adults ≥40 years of age in the United States, with peripheral neuropathy in 4 million.[5] The risk of developing microvascular complications with diabetes (neuropathy and/or retinopathy) is predicted by factors related to diabetes, patient age, and health markers (Fig. 10.1).[7] Obesity and high cholesterol have also been linked to increased risk for diabetic neuropathy.[6] These data should be utilized to encourage patients to aggressively reduce modifiable risk factors by achieving tight glucose control, reducing elevated lipids, increasing physical activity, reducing excessive weight, and discontinuing nicotine use. Arterial disease

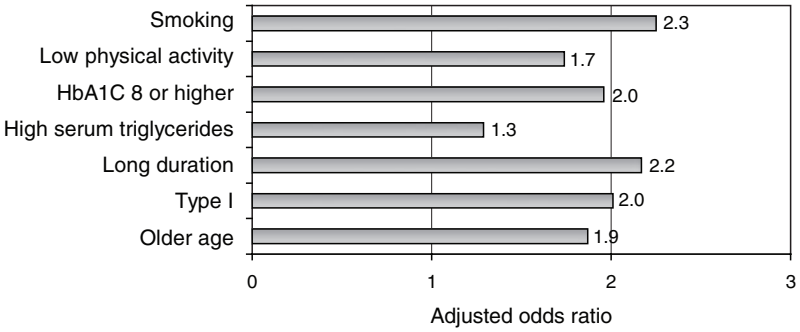


Fig. 10.1 Risk factors for microvascular complications with diabetes (based on McClean et al.[7]).

has also been linked to increased risk for neuropathy, supporting the need to encourage patients to reduce cardiovascular risk factors for general health, as well as the prevention of painful neuropathy.[8]

Postherpetic Neuralgia

Postherpetic neuralgia (PHN) is defined as pain that persists for more than 1 month after the onset of herpes zoster. PHN occurs in one in three patients following acute zoster and lasts 1 year in approximately 10% of the patients (Fig. 10.2).[9] Persistence of PHN increases with aging and pain severity. PHN most commonly affects the trunk or face (usually the ophthalmic division of the trigeminal nerve) (Fig. 10.3a).[10] Improvement varies by region, with the best outcome for patients with pain in the neck, face (especially the jaw), and trunk (Fig. 10.3b). Risk factors for the development of PHN include female gender, older age, experiencing pain or sensory disturbance

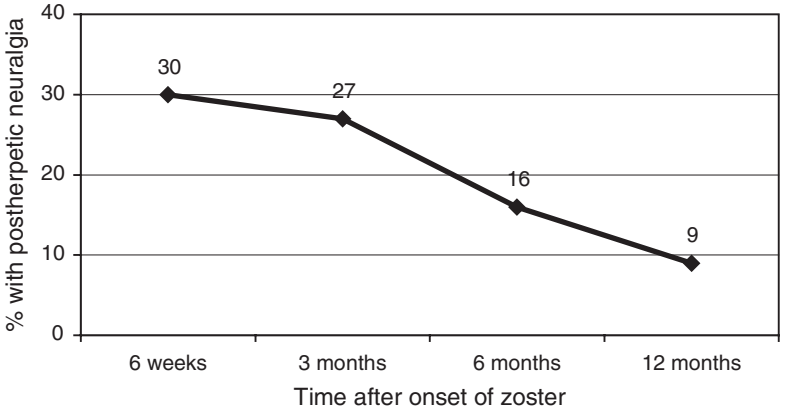
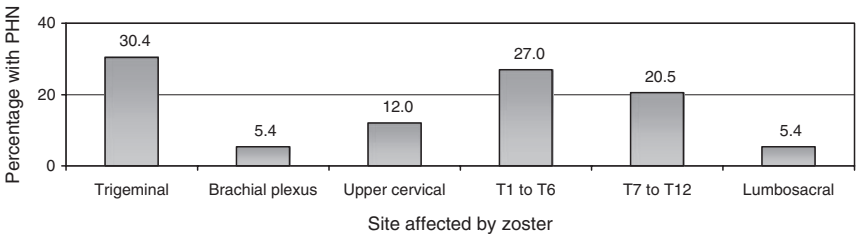


Fig. 10.2 Prevalence of PHN in patients with herpes zoster (based on Scott et al.[9]).

A. Incidence by body location



B. $\geq$ 75% improvement by body location

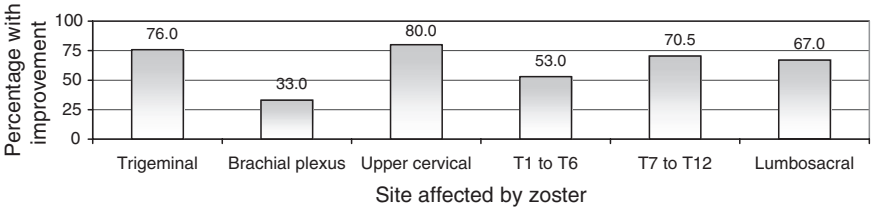


Fig. 10.3 Epidemiology of PHN after herpes zoster (based on Bowsher[10]) A. Incidence by body location B. ≥75% improvement by body location. T=thoracic level

before the development of the rash, greater pain severity during acute herpes zoster, and larger distribution of the zoster rash.[11]

Complex Regional Pain Syndrome

Complex regional pain syndrome (CRPS) develops following an identified injury or period of limb immobilization (e.g., casting). CRPS may be categorized as type I (occurring in the absence of a nerve injury; formerly called reflex sympathetic dystrophy) or type II (occurring after injury to a specific large nerve; formerly called causalgia). The terms "sympathetically maintained pain" and "sympathetically mediated pain" were also formerly used to describe this syndrome. Failure to achieve relief using sympathetic blocks, particularly in patients with long-standing complaints, led to the discontinuation of these terms.

CRPS patients are readily identified in the clinic by seemingly exaggerated guarding of the painful extremity, often holding the arm in a splinted posture and avoiding movement. They may shroud the extremity with a cover to limit sensory exposure or, alternatively, hold the extremity away from the body as though trying to continually demonstrate the painful area to onlookers. Some patients will place an affected arm across the doctor's desk for history taking, often to the surprise of the examiner. These behaviors serve to reduce normal movement of or contact with the painful limb. The patient history reveals a persistently painful extremity with pain severity that is disproportionately in excess of the expected pain from a

preceding injury.[12] Patients typically report changes in temperature in the painful limb, as well as intermittent redness and swelling. These findings may or may not be evident at the time of evaluation because they are generally transient (*see* Box 10.2). "Motor neglect" has also been described in some patients with CRPS, who have reported an inability to move the extremity, to move an extremity without mentally focusing on the extremity, or a perception that the extremity is no longer part of the person's body.[13] Objective motor findings are rarely present in CRPS, but may include restricted range of motion, weakness, or tremor. Motor findings typically are seen with very long-standing, untreated CRPS. Ten or 20 years ago, it was common to see patients with end-stage CRPS, with contracted joints, as well as abnormal skin, hair, and nail growth. Better identification of this syndrome and an emphasis on rehabilitation and maintaining function in the painful limb have resulted in current patients typically displaying evidence of only early, more reversible disease stages, such as color and temperature changes and avoidance of movement by voluntary splinting.

Box 10.2 Diagnostic criteria for complex regional pain syndrome (based on Merskey and Bogduk[12])

- Identification of inciting event or history of immobilization
- Persistent pain, allodynia, or hyperalgesia with severity in excess of expectations from inciting event
- History of changes in swelling, temperature, color, or sweating in the painful area

A Mayo Clinic survey identified the prevalence of CRPS types I and II, respectively, as 0.02 and 0.004%.[14] Patients with CRPS type I were predominantly female (female:male ratio = 4:1). Pain typically affected an upper extremity in patients with either type I or II. The most common precipitating events for CRPS type I were fracture (46%) and sprain (12%). CRPS type I symptoms resolved in 74% of cases, with a mean time to resolution of 1 year. In this sample, clinical signs and symptoms were similar (*see* Table 10.1). In clinical practice, however, symptoms reported by patients are usually not observed during the initial visit or visits but

Table 10.1 Clinical symptoms and signs in Complex Regional Pain Syndrome Type I Patients, % (based on Sandroni et al.[14])

	Patient reported symptom	Clinician observed sign
Swelling	97.3	91.9
Color changes	77.0	73.0
Temperature changes	62.2	59.5
Motor deficit	56.7	45.9
Sensory abnormality	45.9	18.9
Allodynia	54.0	59.5
Sweating abnormality	28.4	24.3
Trophic changes	0	32.4

may be noted over time when multiple opportunities to observe the extremity have occurred. Interestingly, subjective patient reports of CRPS changes (allodynia, edema, and sweating/color/temperature abnormality) have greater diagnostic sensitivity and specificity than objective clinical examination findings for the same conditions.[15]

Cancer-Related Neuropathy

Cancer-related neuropathy may occur as a consequence of compressive neuropathy, direct injury from surgery, chemotherapy, or nutritional deficits. Management of cancer-related neuropathy with standard analgesics and neuropathic medications is effective in most patients. A survey of 213 cancer patients with neuropathy showed satisfactory to good efficacy with standard neuropathic treatment in 79–91% of patients.[16] A detailed discussion on cancer pain is provided in Chap. 13.

HIV-Related Neuropathy

Distal sensory polyneuropathy (with complaints of painful feet) is the most common neuropathy seen in human immunodeficiency virus (HIV)-infected patients and may be caused by immunological dysfunction related to the infection itself, as well as to the toxicity of antiretroviral drugs.[17] A survey of HIV patients who had never been treated with antiretroviral drugs showed symptomatic neuropathy in 35%, with a 1-year incidence rate for symptomatic distal sensory neuropathy of 36%.[18] The risk for neuropathy increases with antiretroviral therapy, with combination dideoxynucleoside therapy having synergistic effects on neurotoxicity and symptomatic neuropathy.[19] An international survey of patients treated at HIV clinics identified symptomatic sensory neuropathy in 52% of patients, with significantly increased risk among patients ≥40 years old (odds ratio = 2.87) or exposed to didanosine [Videx] (odds ratio = 3.21) or stavudine [Zerit] (odds ratio = 7.66).[20] Another survey of patients with advanced HIV reported a similar prevalence of symptomatic distal sensory neuropathy of 52%.[21] Interestingly, symptoms among these patients remained relatively stable over a 48-week follow-up observation period.

Evaluation of Neuropathic Pain

Neuropathic pain should be considered in patients describing abnormal, unpleasant sensations (*see* Table 10.2).[22] Textbook descriptions of neuropathy often focus on numbness. Patients, however, are generally less disturbed by the absence of normal sensation (or numbness) and are more concerned with new disturbing sensations

Table 10.2 Percentages of patients endorsing pain descriptors: Neuropathic vs. Non-neuropathic pain (based on Boreau et al.[22])

Pain descriptor	Neuropathic pain	Non-neuropathic pain
Electric shock	53	21
Burning	54	29
Cold	22	10
Pricking	37	18
Tingling	48	25
Itching	33	9

These seven pain descriptors are more commonly used by neuropathic pain patients ($P < 0.05$).

perceived in the numb area, including burning, prickling, heat, cold, or a perception of swelling.[23] Patients may also refer to the affected area as feeling "wooden" or "dead." Although the painful area may become insensible to normal touch stimuli, patients will often describe the presence of intense sensations over the neuropathic area. Generally, these perceptions are greatest when the damaged area is stimulated (e.g., by wearing clothing, using bedclothes, or being exposed to the wind). Patients may occasionally report that the neuropathic area feels misshapen, deformed, or alien, although the external appearance may be quite normal. The presence of hyperalgesia (increased pain perception after exposure to a painful stimulus, like pinprick) and allodynia (perception of pain after exposure to a non-painful stimulus, like light touch) effectively discriminate neuropathic from non-neuropathic pain.[24] Occasionally, the examiner may notice that the painful area is cool to the touch. Rarely, the same area may be warm and red.

Peripheral neuropathy is best recognized by the identification of symmetrical, distal dysesthesia and sensory loss, such as a stocking or sock distribution of numbness or burning pain. Historical reports of hyperalgesia and allodynia, along with a history of predisposing medical conditions, establish a probable diagnosis for peripheral neuropathy. Diagnosis becomes more obvious as neuropathy severity increases and sensory loss becomes denser. Other types of chronic neuropathic pain, such as postherpetic neuralgia and CRPS, are identified by eliciting a history of inciting events. Losses of vibratory and joint position sensations are good markers of early peripheral neuropathy. Except in cases of severe nerve impairment, when vibratory testing is no longer necessary because of marked loss of tactile sensation, most patients with neuropathy will still perceive vibration from a tuning fork that has been struck hard enough to produce audible sound. Detection of early neuropathy requires a comparison of the level of tuning fork vibration that is perceived in the toe of the healthy examiner. Elderly patients and patients with diabetes who lack significant neuropathy should be able to sense the level of vibration that is just perceived in the healthy examiner's great toe when the tuning fork is immediately placed on the patient's lateral malleolus (Fig. 10.4). Few patients, even those with severe disease, will fail to perceive vibration at the knee, so testing above the ankle is not helpful. Reduction in sensing of joint position also occurs in early peripheral neuropathy. Normal patients should be able to detect a very small change in joint position (movement of as little as 2–3 mm) at the end of the great toe (Fig. 10.5). Movement of the joint to the extreme end of its range of motion elicits pain and does not test joint position sense.

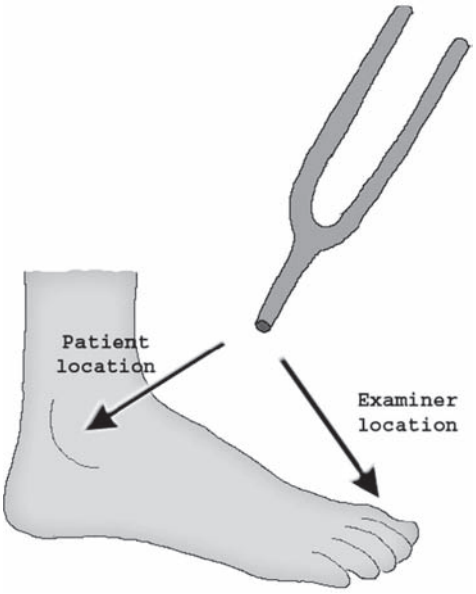


Fig. 10.4 Vibratory sense testing for early neuropathy. Tuning-fork vibration barely perceptible for the examiner at the great toe should be perceived at the lateral malleolus in normal elderly patients and patients with diabetes.

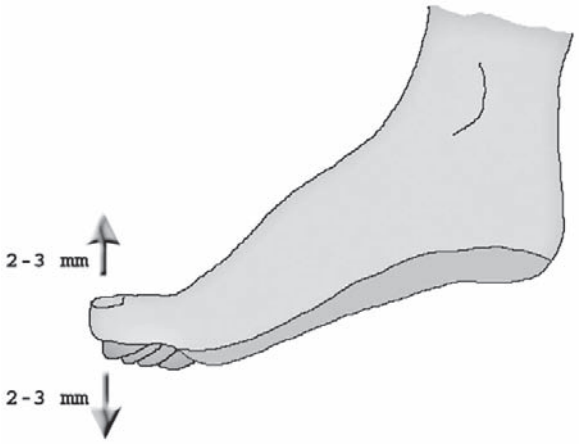


Fig. 10.5 Joint position sense testing for early neuropathy. Normal individuals perceive movement of the tip of the great toe that is 2–3 mm above or below resting position.

Electromyographic (EMG) and nerve conduction velocity (NCV) studies are very helpful to identify mononeuropathies, such as radiculopathy and compressive neuropathies (e.g., carpal tunnel syndrome). Often abnormalities are also seen in peripheral neuropathy. Unfortunately, abnormal EMG/NCV findings indicating

peripheral neuropathy do not necessarily correspond with clinical symptoms. Therefore, electrical testing should be used to rule out alternative causes of pain in the extremities of patients with atypical symptoms, such as unilateral neuropathic symptoms, rather than as a routine test for patients with symmetrical bilateral sensory neuropathy.

Quantitative sensory testing and the quantitative sudomotor axon reflex test (sweat test) are frequently used research tools. The sensitivity and specificity of these tests for different types of painful neuropathies are low. Therefore, these tools are not recommended for routine clinical practice.

Treatment of Neuropathic Pain

In patients with neuropathy caused by a treatable medical condition, improvement in pain symptoms may occur during the management of the primary disease (such as surgical release of compression, normalization of blood sugar in diabetics, and nutritional supplementation in alcoholics). For example, tight glucose control minimizes peripheral neuropathy in patients with diabetes.[25]

A survey of primary care physicians revealed that medications are typically initiated for about half of those patients diagnosed with neuropathic pain at the time of the initial diagnosis, with 30% of patients receiving antidepressants, 20% AEDs, and 20% opioid analgesics.[26] Patients with diabetic neuropathy typically required one change in medication before reaching a stable treatment, while those with PHN required an average of two medication changes. A variety of medications can be used to reduce neuropathic pain, although the most effective therapies are tricyclic antidepressants and neuromodulating AEDs (Fig. 10.6).[27,28] Symptomatic treatment of neuropathic pain can be divided into first- and second-line medications (*see* Table 10.3).

First-Line Therapy

Neuromodulating AEDs and tricyclic antidepressants provide superior neuropathic pain relief and are considered first-line treatments for neuropathic pain. Excellent efficacy and superior tolerability make gabapentin [Neurontin] or pregabalin [Lyrica] primary choice therapies.

Antiepileptic Drugs

Newer AEDs enhance the activity of neurochemicals that inhibit pain messages, such as γ-aminobutyric acid. Animal studies show that AEDs effectively reduce both hyperalgesia and allodynia associated with neuropathic pain.[29] Gabapentin and

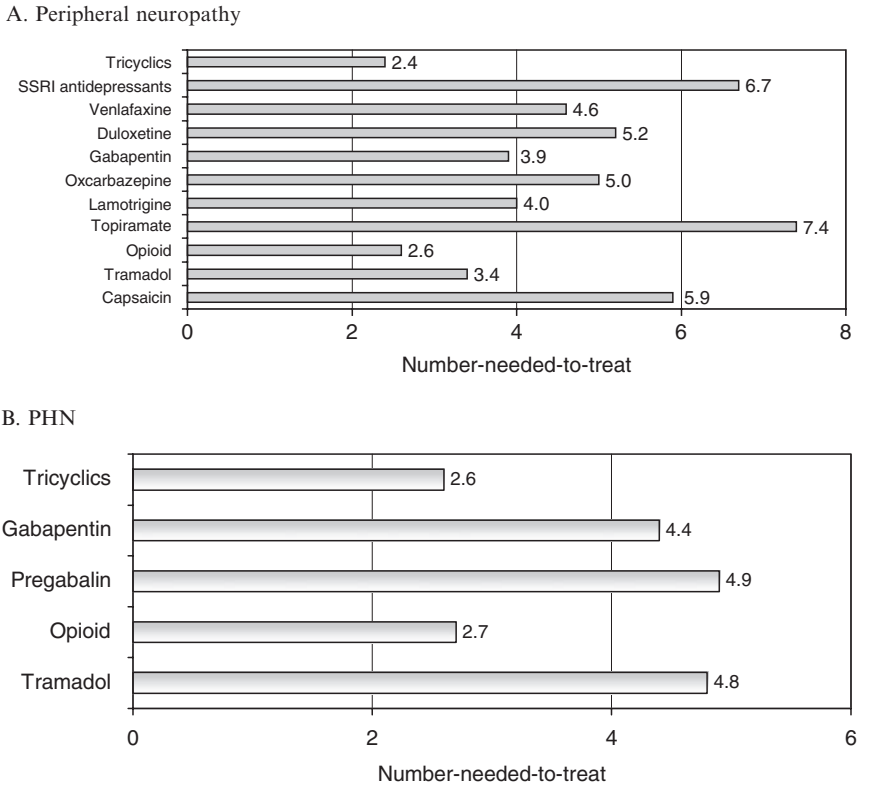


Fig. 10.6 Number-needed-to-treat for neuropathic pain relief (Adapted from Coluzzi and Mattia[27] and Attal et al.[28]) (**A**) peripheral neuropathy; (**B**) PHN. Number of patients needed to be treated to obtain one patient with ≥ 50% pain reduction is shown in the graphs. SSRI = selective serotonin reuptake inhibitor.

pregabalin are considered first-line therapy for painful neuropathy because of good efficacy and tolerability. It is important to remind patients that these drugs are not expected to restore normal sensation, but rather decrease annoying abnormal sensations that occur in numb areas. A comparative study of gabapentin (mean dose: 1,800 mg per day) and amitriptyline [Elavil] (mean dose: 50 mg per day) in patients with diabetic neuropathy showed significant pain reduction with both treatments although reduction in pain and paresthesias and tolerability were superior with gabapentin.[30] Other AEDs – such as carbamazepine [Tegretol], topiramate [Topamax], and lamotrigine [Lamictal] – are also effective for neuropathic pain as second-line therapy. The Food and Drug Administration recently announced a warning about increased suicidal risk among patients using some AEDs, including those used for neuropathic pain (e.g., gabapentin, pregabalin, lamotrigine, topiramate, and carbamazepine).[31]

Table 10.3 Medications for neuropathic pain

	Dosage
First-line therapies	
Antiepileptics	
Gabapentin [Neurontin]	Start at 300 mg per day. Increase to 300 mg three times a day over 2 weeks. Failure to achieve effective control calls for further titration to 1,800 mg per day in divided doses for most patients; a few patients will require up to 3,600 mg per day in divided doses.
Pregabalin [Lyrica]	Start at 50 mg three times a daily. Dosage may be increased to 300 mg per day in divided doses over the first week. A few patients may require increased dose up to 600 mg per day in divided doses.
Antidepressants	
Tricyclic	Nortriptyline [Pamelor], imipramine [Tofranil], or desipramine [Norpramin]: 25–150 mg administered 2 hours before bed. Amitriptyline [Elavil] is too sedating for many patients.
SNRI	Duloxetine [Cymbalta]: 60 mg once daily Milnacipran [Ixel]: initiate at 25–50 mg daily and titrate to 50 mg twice daily; not available in the United States
SSRI	Paroxetine [Paxil] or citalopram [Celexa]: 40 mg per day
Second-line therapies	
Topical	Topical agents are applied directly over the area of pain.
Capsaicin cream [Zostrix]	Start with 0.025% cream. Apply a small drop – the size of a small pea or half a chocolate chip – to the painful area three to four times daily. After completing one tube, if burning from capsaicin is not too intense, switch to 0.075% cream, applied in the same fashion. Wash hands *thoroughly* with soap and water and avoid putting hands into eyes or mouth. Do not use over open skin or mucous membranes. Use for 6 weeks before assessing efficacy.
Lidocaine patch [Lidoderm]	5% patch: 1–3 patches daily, worn for 12 hours on, then 12 hours off. Number of patches is determined by size of painful area. Patches ideally cover painful area (if area is not too large). Patches may be cut to smaller sizes. Do not use over open skin. Use for 2 weeks before assessing efficacy.
Long-acting opioids	
	Methadone 10 mg twice daily. Sustained-release oxycodone [Oxycontin] 10 mg three times a day or 20 mg twice a day

SNRI Serotonin and norepinephrine reuptake inhibitor, *SSRI* Selective serotonin reuptake inhibitors

Antidepressants

Antidepressants have significant analgesic properties in addition to their mood-altering effects. A rodent study comparing analgesic benefits from transdermal antidepressant or anesthetic showed longer duration of analgesia from amitriptyline to comparable doses of lidocaine.[32] Tricyclic antidepressants, serotonin noradrenaline reuptake inhibitors, and selective serotonin reuptake inhibitors have

all been shown to reduce both hyperalgesia and pain-related anxiety in experimental neuropathic pain.[33] Tricyclics are more effective in reducing clinical peripheral neuropathy pain than are other antidepressants.[34]

Second-Line Therapy

Patients who fail to achieve adequate symptomatic relief or who experience intolerable side effects from a first-line medication may be offered a second-line therapy. Second-line treatment should not be used before first-line therapy, however, unless the patient has a medical condition that precludes the use of a first-line therapy.

Topical Agents

Topical therapies are typically well tolerated, although they are generally less effective than antidepressants and AEDs. In a controlled study of neuropathic pain patients, investigators found that lidocaine patches reduced both pain severity and allodynia by approximately 30%.[35] In a double-blind comparison of topical capsaicin (0.075% four times a day) and oral amitriptyline (titrated to 125 mg per day, as tolerated), investigators found a similar reduction in pain (approximately 40%) and improved function in both treatment groups.[36] This level of improvement with capsaicin is superior to what is typically seen in clinical practice.

Opioids

Although traditional teachings suggest that opioids are ineffective for neuropathic pain, low doses of long-acting opioids can be beneficial in patients for whom other types of therapy have failed. For example, in controlled trials, investigators have found that low-dose methadone (10 mg twice a day) or sustained-release oxycodone (20 mg twice a day) effectively reduced chronic neuropathic pain symptoms.[37,38] (*See* Chap. 19 for detailed information on opioid analgesia.)

Treatment of Individual Pain Syndromes

PHN and CRPS typically require supplemental treatment modalities. Early treatment of each condition with general neuropathic medication and condition-targeted therapy may help reduce the risk for more prolonged and recalcitrant pain.

Postherpetic Neuralgia

In the large, double-blind Shingles Prevention Trial, zoster vaccination [Zostavax] of immunocompetent seniors with a history of varicella reduced the incidence of

shingles by 51% and postherpetic neuralgia by 66%.[39] The Centers for Disease Control and Prevention Advisory Committee on Immunization Practices consequently recommended vaccinating all seniors >60 years old for the prevention of herpes zoster and its consequent PHN, unless otherwise contraindicated.[40] Vaccinating all 60-year-olds would prevent an estimated 250,000 cases of herpes zoster annually, and subsequently a comparably substantial number of patients with PHN.[41]

Early and aggressive treatment of herpes zoster reduces the risk for PHN. Early antiviral therapy of herpes zoster (within 72 hours of symptom onset) can effectively minimize symptoms of PHN (*see* Table 10.4). In a double-blind, placebo-controlled study, famciclovir [Famvir] administered within the first 72 hours of appearance of herpes zoster lesions resulted in a twofold decrease in the duration of PHN.[42] Among all adults in the study, average PHN duration decreased from 119 days with placebo to 62 days with antiviral therapy. Among patients >50 years old, PHN duration decreased from 163 days to 63 days. Early intervention with other antivirals may similarly reduce PHN duration. Brivudin [Brivirac], valacyclovir [Valtrex], and acyclovir [Zovirax] similarly reduce duration of PHN; however the incidence of PHN is higher with acyclovir.[43–45]

Table 10.4 Antiviral therapy for early herpes zoster

Drug	Dosage
Acyclovir [Zovirax]	800 mg five times a day for 7–10 days
Famciclovir [Famvir]	500 mg three times a day for 7 days
Valacyclovir [Valtrex]	1 g three times a day for 7 days
Brivudin[a] [Brivirac]	125 mg once a day for 7 days

[a]Not available in the United States

Neuropathic therapy administered during the early stages of zoster may also reduce the incidence of PHN. Low-dose amitriptyline (25 mg per day) administered within 48 hours of the onset of zoster rash significantly reduced the rate of PHN in elderly patients (mean age: 68 years) (Fig. 10.7).[47]

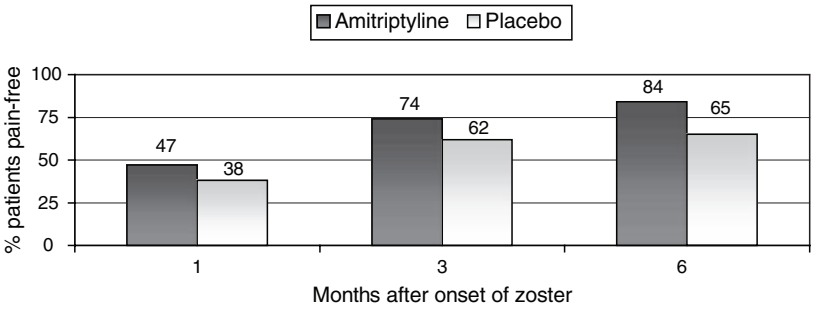


Fig. 10.7 Reduction in persistent pain in patients aged >60 years with acute zoster treated within 48 hours of rash onset with amitriptyline 25 mg per day vs. placebo. Difference between amitriptyline and placebo is significant ($P < 0.05$) (based on Bowsher[47]).

An evidence-based consensus statement from the American Academy of Neurology recommended tricyclic antidepressants, gabapentin, pregabalin, lidocaine patch, and opioids as the most effective therapies for PHN.[48] Inflammation and increased prostaglandin activity occur in early PHN.[49] In one study, treatment with topical aspirin (750-1,500 mg plus 20-30 mL diethyl ether), but not other nonsteroidal anti-inflammatory drugs, reduced pain more than with a placebo (-66% with aspirin vs. -34% with placebo).[50] The onset of pain relief was rapid (approximately 4 minutes), with relief lasting a mean of 3.6 hours.

Complex Regional Pain Syndrome

Preventing injuries, especially nerve trauma, and minimizing unnecessary immobilization can help reduce the development of CRPS. A recent, double-blind, placebo-controlled study randomized 416 patients with wrist fractures to receive vitamin C or placebo for 50 days.[51] CRPS developed in 1.8% of patients treated with 500 mg vitamin C daily versus 10.1% with the placebo, suggesting a preventive role for vitamin supplementation after wrist fracture.

CRPS is treated with a combination of medications to achieve symptomatic relief and physical rehabilitation to prevent progression to motor changes, such as reduced range of motion, joint contracture, and motor loss. CRPS occurring during the first few weeks of therapy is often managed with oral corticosteroids (30 mg per day for 2 weeks, followed by a tapering schedule) and sympathetic blocks, including sympathetic ganglion blocks (i.e., stellate, thoracic, or lumbar ganglion blockade) or intravenous regional sympathetic blocks (i.e., Bier blocks).[52] Response to stellate ganglion blocks is superior in younger patients with early CRPS symptoms.[53] Blocks typically have minimal benefit for long-standing or later symptoms of CRPS. These therapies should be combined with vigorous physical therapy. The goal of early intervention with steroids, blocks, or both is to provide temporary symptomatic reduction to allow optimal participation in rehabilitative therapy. Both early and late treatment of CRPS focus on physical and occupational therapy designed to maintain or improve range of motion and maximize active use of the painful extremity. The goal of such a therapy is to help the patient resume normal use of the extremity for both functional and casual use, including a return to a normal arm posture when sitting and arm swing while walking. Gait training is essential for patients with lower extremity CRPS to help them regain a normal, unrestricted walking pattern. Although physical and occupational therapy are often contrary to the desires of the patient with CRPS, who often wishes to minimize movement and stimulation of the painful extremity, the clinician must insist on aggressive therapy and resumption of more normal extremity postures and use at all times. Psychological interventions may serve as invaluable adjunctive pain management for patients with CRPS. Antidepressants, AEDs, and long-acting opioids may also help the patient participate in rehabilitative therapy activities.

Summary

Neuropathic pain is frequently treated in general practice, typically in conjunction with systemic medical illness, nutritional abnormalities, cancer, and infection. Hallmarks of neuropathic pain include a burning sensation, hyperalgesia, and allodynia. Laboratory testing may be needed to identify systemic medical illness but is rarely helpful for diagnosing neuropathic pain. A variety of effective, symptomatic therapies are available for neuropathic pain. These therapies will not reduce numbness, but can decrease dysethesia, hyperalgesia, and allodynia. Treatment of underlying medical conditions – such as glucose control in diabetes and antiviral therapy in herpes zoster – reduces the severity of neuropathic pain. First-line medication for neuropathic pain includes neuromodulating AEDs (e.g., gabapentin and pregabalin) and tricyclic antidepressants. Neuropathic pain syndromes that result in restricted use of the painful area should be treated with physical therapy and occupational therapy to normalize active use of the painful extremity.

Test Your Knowledge

1. Choose the correct statement(s) about neuropathic pain:

   (a) One in three diabetics develops peripheral neuropathy.
   (b) Complex regional pain syndrome is a psychological response to minor trauma.
   (c) One in three patients with zoster will develop postherpetic neuralgia.
   (d) A and C
   (e) All of the above

2. Risk factors for peripheral neuropathy in patients with diabetes include:

   (a) Elevated lipids
   (b) Obesity
   (c) Reduced physical activity
   (d) Poor glucose control
   (e) All of the above
   (f) None of the above

3. Common features of complex regional pain syndrome include:

   a. Excessive extremity guarding
   b. Decreased hair growth
   c. Tremor
   d. Nail deformities
   e. All of the above

4. Postherpetic neuralgia can be reduced by treating herpes zoster early with:

   a. Antiviral agents
   b. Amitriptyline
   c. Opioids
   d. A and B
   e. All of the above

5. Choose the correct statement(s):

   a. About half of patients undergoing treatment for HIV develop symptomatic sensory neuropathy.
   b. Cancer-related neuropathy pain may occur due to neural compression, surgical trauma, chemotherapy, or nutritional deficiency.
   c. Postherpetic neuralgia most commonly affects the extremities.
   d. When performing joint position sense testing, elevate the great toe >45 degrees to achieve an accurate response.
   e. A and B
   f. All of the above

6. First-line therapy for neuropathic pain includes:

   a. 5% lidocaine patches
   b. Duloxetine
   c. Gabapentin
   d. Low-dose opioids
   e. All of the above

Answers: 1d, 2e, 3a, 4d, 5e, 6c

References

1. Hasselström J, Liu-Palmgren J, Rasjö-Wrååk G. Prevalence of pain in general practice. Eur J Pain 2002;6:375–385
2. Taylor RS. Epidemiology of refractory neuropathic pain. Pain Pract 2006;6(1):22–26
3. Moulin DE, Clark AJ, Gilron I, et al. Pharmacological management of chronic neuropathic pain – consensus statement and guidelines from the Canadian Pain Society. Pain Res Manage 2007;12:13–21
4. Gilron I, Bailey J, Weaver DF, Houlden RL. Patients' attitudes and prior treatments in neuropathic pain: a pilot study. Pain Res Manag 2002;7:199–203
5. Candrilli SD, Davis KL, Kan HJ, Lucero MA, Rousculp MD. Prevalence and the associated burden of illness of symptoms of diabetic peripheral neuropathy and diabetic retinopathy. J Diabetes Complications 2007;21:306–314
6. Al-Mahroos F, Al-Roomi K. Diabetic neuropathy, foot ulceration, peripheral vascular disease and potential risk factors among patients with diabetes in Bahrain: a nationwide primary care diabetes clinic-based study. Ann Saudi Med 2007;27:25–31
7. McClean MT, Andrews WJ, McElnay JC. Characteristics associated with neuropathy and/or retinopathy in a hospital outpatient diabetic clinic population. Pharm World Sci 2005;27:154–158

8. Yokoyama H, Yokota Y, Tada J, Kanno S. Diabetic neuropathy is closely associated with arterial stiffening and thickness in Type 2 diabetes. Diabet Med 2007;24:1329–1335
9. Scott FT, Leedhan-Green ME, Barrett-Muir WY, et al. A study of shingles and the development of postherpetic neuralgia in East London. J Med Virol 2003;70 (suppl 1):S24–S30
10. Bowsher D. Postherpetic neuralgia and its treatment: a retrospective survey of 191 patients. J Pain Symptom Manag 1996;12:290–299
11. Jung BF, Johnson RW, Griffin DR, Dworkin RH. Risk factors for postherpetic neuralgia in patients with herpes zoster. Neurology 2004;62:1545–1551
12. Merskey H, Bogduk N. Classification of chronic pain. Seattle: IASP Press, 1994
13. Galer BS, Butler S, Jensen M. Case reports and hypothesis: a neglect like syndrome may be responsible for the motor disturbance in reflex sympathetic dystrophy. J Pain Symptom Mange 1995;10:385–392
14. Sandroni P, Benrud-Larson LM, McClelland RL, Low PA. Complex regional pain syndrome type I: incidence and prevalence in Olmstead county, a population-based study. Pain 2003;103:199–207
15. Galer BS, Bruehl S, Harden RN. Diagnostic clinical criteria for CRPS and painful diabetic neuropathy. Clin J Pain 1998;14:48–54
16. Stute P, Soukup J, Menzel M, Sabatowski R, Grond S. Analysis and treatment of different types of neuropathic cancer pain. J Pain Symptom Manage 2003;26:1123–1131
17. Luciano CA, Pardo CA, McArthur JC. Recent developments in the HIV neuropathies. Curr Opin Neurol 2003;16:403–409
18. Schifitto G, McDermott MP, McArthur J, et al. Incidence of and risk factors for HIV-associated distal sensory polyneuropathy. Neurology 2002;58:1764–1768
19. Moore R, Wong WM, Keruly J, McArthur J. Incidence of neuropathy in HIV-infected patients on monotherapy versus those on combination therapy with didanosine, stavudine and hydroxyurea. AIDS 2000;14:273–278
20. Cherry CL, Skolasky RL, Lal L, et al. Antiretroviral use and other risks for HIV-associated neuropathies in an international cohort. Neurology 2006;66:867–873
21. Simpson DM, Kitch D, Evans SR, et al. HIV neuropathy natural history cohort study. Assessment measures and risk factors. Neurology 2006;66:1679–1687
22. Boreau F, Doubrère JF, Luu M. Study of verbal description in neuropathic pain. Pain 1990;42:145–152
23. Dworkin RH. An overview of neuropathic pain: syndromes, symptoms, signs, and several mechanisms. Clin J Pain 2002;18:343–349
24. Bennett M. The LANSS pain scale: the leeds assessment of neuropathic symptoms and signs. Pain 2001;92:147–157
25. Krishnan AM, Rayman G. New treatment for diabetic-neuropathy: symptomatic treatments. Curr Diabet Rep 2003;3:459–467
26. Hall GC, Carroll D, Parry D, McQuay HJ. Epidemiology and treatment of neuropathic pain: the UK primary care perspective. Pain 2006;122:156–162
27. Coluzzi F, Mattia C. Mechanism-based treatment in chronic neuropathic pain: the role of antidepressants. Curr Pharm Des 2005;11:2945–2960
28. Attal N, Cruccu G, Haanpää M, et al. EFNS guidelines on pharmacological treatment of neuropathic pain. Eur J Neurol 2006;13:1153–1169
29. Fox A, Gentry C, Patel S, Kesingland A, Bevan S. Comparative activity of the anti-convulsants oxcarbazepine, carbamazepine, lamotrigine and gabapentin in a model of neuropathic pain in the rat and guinea-pig. Pain 2003;105:355–362
30. Dallocchio C, Buffa C, Mazzarello P, Chiroli S. Gabapentin vs. amitriptyline in painful diabetic neuropathy: an open-label pilot study. J Pain Symptom Manage 2000;20:280–285
31. http://www.fda.gov/cder/drug/InfoSheets/HCP/antiepilepticsHCP.htm (accessed February 2008)
32. Haderer A, Gerner P, Kao G, Srinivasa V, Wang GK. Cutaneous analgesia after transdermal application of amitriptyline versus lidocaine in rats. Anesth Analg 2003;96:1707–1710

33. Matsuzawa-Yanagida K, Narita M, Nakajima M, et al. Usefulness of antidepressants for improving neuropathic pain-like state and pain-induced anxiety through actions at different brain sites. Neuropsychopharmacology 2008;33(8):1952–1965
34. Mattia C, Coluzzi F. Antidepressants in chronic neuropathic pain. Min Rev Med Chem 2003;3:773–784
35. Meier T, Wasner G, Faust M, et al. Efficacy of lidocaine patch 5% in the treatment of focal peripheral neuropathic pain syndromes: a randomized, double-blind, placebo-controlled study. Pain 2003;106:151–158
36. Biesbroeck R, Bril V, Hollander P, et al. A double-blind comparison of topical capsaicin and oral amitriptyline in painful diabetic neuropathy. Adv Ther 1995;12:111–120
37. Morley JS, Bridson J, Nash TP, Miles JB, White S, Makin MK. Low-dose methadone has an analgesic effect in neuropathic pain: a double-blind randomized controlled crossover trial. Palliat Med 2003;17:576–587
38. Watson CP, Moulin D, Watt-Watson J, Gordon A, Eisenhoffer J. Controlled-release oxycodone relieves neuropathic pain: a randomized controlled trial in painful diabetic neuropathy. Pain 2003;105:71–78
39. Oxman MN, Levin MJ, Johnson GR, et al. A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults. N Engl J Med 2005;352:2271–2284
40. Centers for Disease Control website: http://www.cdc.gov/vaccines/vpd-vac/shingles/default.htm (accessed March 2008)
41. Gelb LD. Preventing herpes zoster through vaccination. Ophthalmology 2008;115 (suppl): S35–S38
42. Tyring S, Barbarash RA, Nahlik JE, et al. Famciclovir for the treatment of acute herpes zoster: effects on acute disease and postherpetic neuralgia. A randomized, double-blind, placebo-controlled trial. Ann Intern Med 1995;123:89–96
43. Wassilew S. Brivudin compared with famciclovir in the treatment of herpes zoster: effects in acute disease and chronic pain in immunocompetent patients. A randomized, double-blind, multinational study. J Eur Acad Dermatol Venereol 2005;19:47–55
44. Wassilew SW, Wutzler P. Oral brivudin in comparison with acyclovir for herpes zoster: a survey study on postherpetic neuralgia. Antiviral Res 2003;59:57–60
45. Tyring SK, Beutner KR, Tucker BA, Anderson WC, Crooks RJ. Antiviral therapy for herpes zoster: randomized, controlled clinical trial of valacyclvir and famciclovir therapy in immunocompetent patients 50 years and older. Arch Fam Med 2000;9:863–869
46. Oxman MN, Levin MJ, Johnson GR, et al. A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults. N Engl J Med 2005;352:2271–2284
47. Bowsher D. The effects of pre-emptive treatment of postherpetic neuralgia with amitriptyline: a randomized, double-blind, placebo-controlled trial. J Pain Symptom Manage 1997;13:327–331
48. Dubinsky RM, Kabbani H, El-Chami Z, et al. Practice parameter: treatment of postherpetic neuralgia: an evidence-based report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 2004;63:959–965
49. Pappagallo M, Haldey EJ. Pharmacological management of postherpetic neuralgia CNS Drugs 2003;17:771–780
50. DeBeneditis G, Lorenzetti A. Topical aspirin/diethyl ether mixture versus indomethacin and diclofenac/diethyl ether mixture for acute herpetic neuralgia and postherpetic neuroalgia: a double-blind, cross-over placebo controlled study. Pain 1996;65:45–51
51. Zollinger PE, Tuinebreijer WE, Breederveld RS, Kreis RW. Can vitamin C prevent complex regional pain syndrome in patients with wrist fractures? A randomized, controlled, multicenter dose-response study. J Bone Joint Surg Am 2007;89:1424–1431
52. Chung OY, Bruehl SP. Complex regional pain syndrome. Curr Treatment Options Neurol 2003;5:499–511
53. Ackerman WE, Zhang JM. Efficacy of stellate ganglion blockade for the management of type 1 complex regional pain syndrome. South Med J 2006;99:1084–1088

Chapter 11
Myofascial Pain

Key Chapter Points:

- Myofascial pain should be considered in patients with localized pain complaints without arthritic or neuropathic features.
- Myofascial pain syndrome should not be diagnosed in patients with no physical findings. Myofascial pain requires the presence of a taut band and muscular trigger points.
- Active trigger points refer pain in predictable patterns.
- Treatment of myofascial pain focuses on active stretching and range of motion exercises. Physical therapy modalities, injections, and medications may be used adjunctively.

Key Words Injection, Modalities, Referred pain, Trigger point

Case History

Mr. Duffy is a 50-year-old electrical engineer whose work and hobbies cause him to be sedentary. One day, a shipment of new computers arrived at his job and he helped to carry the computer crates during his lunch break. At the end of the day, he complained of soreness over the left side of his back above his hip bone. The pain was aggravated by bending forward or to the side. Pain did not radiate into his leg, and he reported there was no numbness. Over the next 3 months, Mr. Duffy had persistent low back pain. After work, he would lie on the sofa to rest his back; pain was most severe when he arose from lying down position and walked to the kitchen or bathroom. Although initial walking or bending forward was painful, the pain actually improved after walking for approximately 10 minutes or bending several times. On examination, there was no discomfort to palpation over the hip, spine, or ribs. Mr. Duffy yelled and jumped when the doctor pressed an area of muscle spasm between the top of his hip and the bottom of his ribs, telling the doctor that pressing his back in that spot created a severe pain in his lower left buttock. Mr. Duffy also complained of severe pain when asked to bend forward or to the side, although his response to a straight leg raise testing was normal. An x-ray revealed only mild arthritis in the

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

lumbar spine. Because of his lack of physical findings (absence of pain over joints or an abnormal neurological examination) and dramatic response to palpation with a non-neurological pain referral pattern, Mr. Duffy's treating physician wondered if he was seeking workers' compensation benefits.

Introduction

Myofascial pain is often diagnosed in patients with chronic, non-malignant pain who lack clinical or laboratory evidence of radiculopathy, neuropathy, or joint disease. Under these circumstances, persistent pain is believed to be caused by chronic changes in muscles and surrounding soft tissues, or myofascial pain. The diagnosis of myofascial pain, however, is not a diagnosis of exclusion, but requires the presence of specific abnormalities.

Myofascial pain is characterized by localized shortened (contracted), tender muscles. The hallmark of myofascial pain is the trigger point – a tender area within contracted muscle bands that produces an involuntary contraction with stimulation (see Box 11.1).[1] These taut bands have been shown to have spontaneous electrical activity on electromyographic testing.[2] Taut bands are important to identify for diagnosis, also because they may restrict normal muscle stretch, resulting in reduced active range of motion and muscle weakness related to muscle shortening. Taut bands are produced involuntarily and serve as an objective sign of myofascial pain. *Trigger points* are distinguished from *tender points*, which merely represent areas of increased sensitivity to stimulation. Biochemical analysis of the muscle milieu at the site of active trigger points shows increase in inflammatory markers and pain neurochemicals, including bradykinin, calcitonin gene-related peptide, substance P, tumor necrosis factor-alpha, interleukins, serotonin, and norepinephrine.[3,4]

Many doctors use the terms *myofascial pain* (with trigger points) and *fibromyalgia* (with tender points) interchangeably, often denoting chronic pain in patients without

Box 11.1 Diagnostic criteria for trigger points (based on Simons[1])

- Taut band
  - Palpable contracted cord-like group of muscle fibers
  - Point tenderness over taut band
- Local twitch response
  - Involuntary contraction of taut band after physically plucking or inserting a needle into it
- Trigger points
  - Active if palpation results in pain referred to chronic pain area
  - Latent if locally tender, but without referred pain

demonstrable pathology. Both myofascial pain and fibromyalgia, however, have specific diagnostic criteria (see Table 11.1). (For additional information about fibromyalgia, see Chap. 12.) Perhaps the most important distinction is that myofascial pain represents a localized pain complaint (e.g., low-back or shoulder-girdle pain), whereas fibromyalgia produces widespread pain, covering most regions of the body. Because fibromyalgia may result in modification of posture, gait, and activity, patients with fibromyalgia may develop additional myofascial pain complaints (localized areas of muscle spasm, trigger points, and contracted muscles on the background of widespread fibromyalgia pain).

Table 11.1 Distinguishing myofascial pain and fibromyalgia

	Myofascial pain	Fibromyalgia
Pain location	Localized	Widespread
Physical examination		
Tenderness	Trigger point: discrete tenderness over painful muscle spasm. May or may not refer to pain	Tender points: tenderness to palpation over pre-specified points that may not be within areas of pain complaints
Range of motion	Passive range of motion shows normal joint movement. Active range of motion is limited by pain.	Full passive and active range of motion
Somatic complaints	Disturbances in sleep and mood are common. Irritable bowel syndrome, paresthesias, and other somatic complaints are infrequent.	Fatigue, mood disturbance, and somatic complaints are typical and are often as severe as pain.
Treatment		
Physical therapy	Focus on muscle stretching.	Focus on strengthening plus aerobic exercise.
Injections	Trigger point injections temporarily relieve pain and improve active range of motion.	Local injection of tender points is not beneficial.

Mr. Duffy's story is typical for one of the most common causes of low back pain – quadratus lumborum syndrome – which is caused by muscle tightness and shortening in the lower back. This is the spot on the sides of the back above the waistband that one typically massages after stooping too long while gardening or doing too much housecleaning. Myofascial pain is a common cause of localized chronic pain. Like other myofascial or muscle-based chronic pain conditions, quadratus lumborum syndrome lacks the characteristic features of radicular pain (such as radiating extremity pain, numbness, or weakness).

Mr. Duffy's examination is characterized by one of the hallmarks of myofascial pain – an active trigger point, that is, a focal area of exquisitely tender muscle spasm, which, when palpated, causes pain vocalization and referral of pain to areas of the body that are characteristic for that muscle – in this case, the hip and buttock. Mr. Duffy's pain is characteristically located over a muscle bulk and affected by

muscle stretching. Because muscles in myofascial pain syndrome are contracted, initial stretch is often painful. Once the muscle is stretched, however, pain is improved. For this reason, treatment focuses on returning contracted muscles to normal length through stretching techniques.

Epidemiology

Myofascial pain occurred in approximately 30% of patients in a general medical clinic and is usually the most common diagnosis in specialty pain clinics.[5] Common myofascial syndromes include lateral epicondylitis (tennis elbow), quadratus lumborum syndrome (a common cause of non-radicular low back pain), and piriformis syndrome (a common cause of buttock and hip pain). Quadratus lumborum syndrome is one of the most common causes of low back pain. The quadratus lumborum muscle connects at the 12th rib, iliac crest, and lumbar vertebrae (Fig. 11.1). It is responsible for lateral bending of the lumbar spine. Patients with quadratus lumborum syndrome often have unilateral hip elevation because of muscle shortening. Active quadratus lumborum trigger points refer pain to the hip and buttock (Fig. 11.2). Another common myofascial pain condition is piriformis syndrome. The piriformis muscle attaches from the inner ileum and sacrum to the greater trochanter (Fig. 11.3) and rotates the hip externally, thereby contributing to the stability of the hip and back. Active piriformis trigger points also refer to the hip and buttock (Fig. 11.4). When hypertrophied, the piriformis may compress the sciatic nerve, which usually travels beneath it, resulting in additional leg pain or sciatica.

Several muscle groups in addition to the quadratus lumborum and piriformis are commonly affected in patients with myofascial pain. These include the upper trapezius, scalene, rhomboids, levator scapulae, and serratus anterior muscles. Areas of common trigger points and their referral patterns are shown in Figs. 11.5–11.9. Identifying typical pain referral patterns in myofascial pain helps the clinician recognize these common pain syndromes.

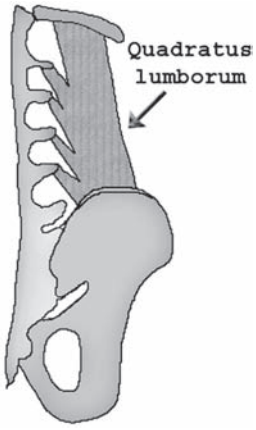


Fig. 11.1 Anatomy of the quadratus lumborum muscle.

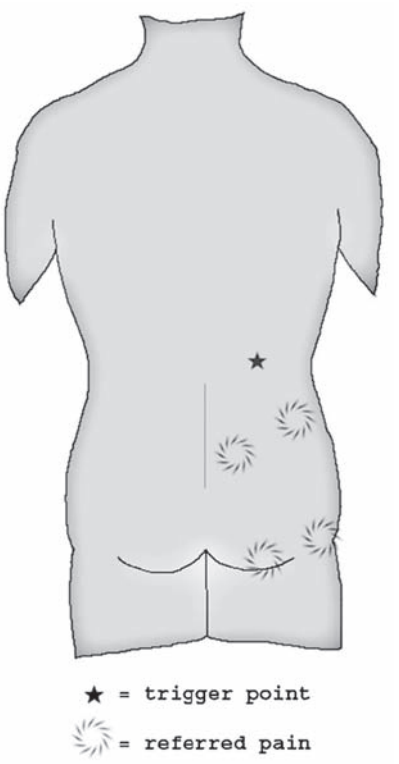


Fig. 11.2 Referral pattern of active quadratus lumborum trigger points.

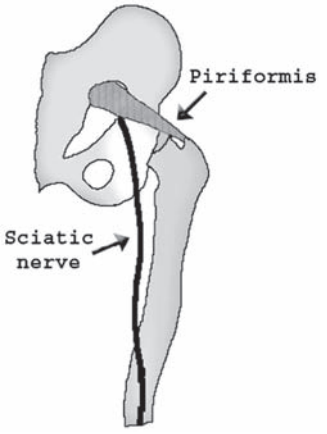


Fig. 11.3 Anatomy of the piriformis muscle.

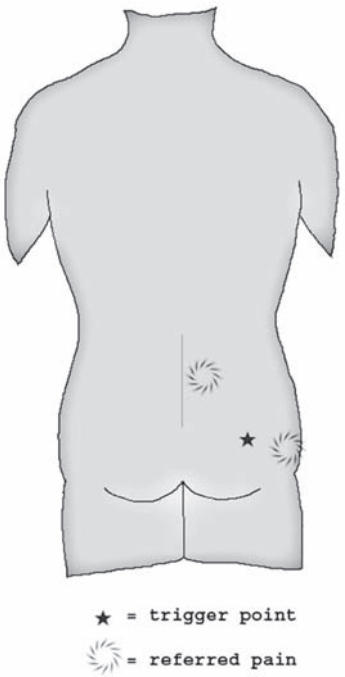


Fig. 11.4 Referral pattern from active piriformis trigger point.

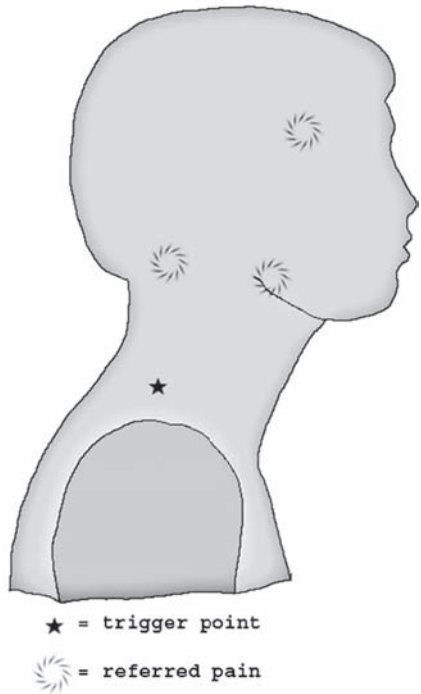


Fig. 11.5 Referral pattern for upper trapezius trigger points.

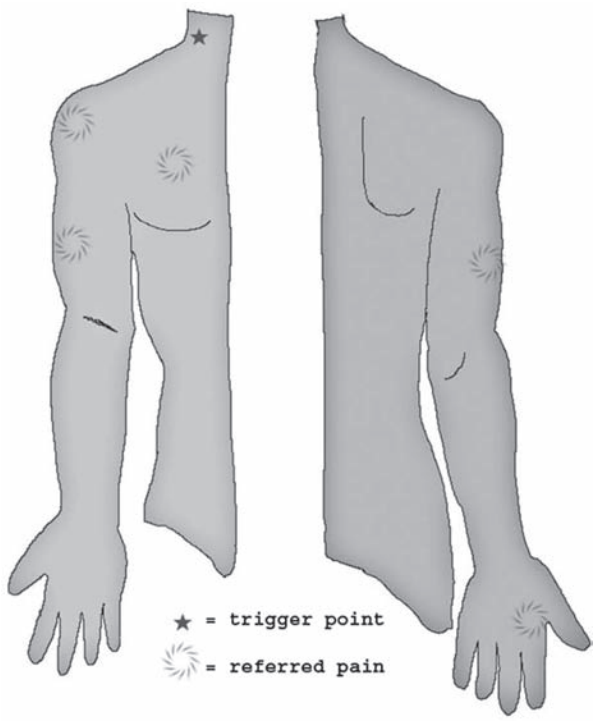


Fig. 11.6 Referral pattern for scalene muscle.

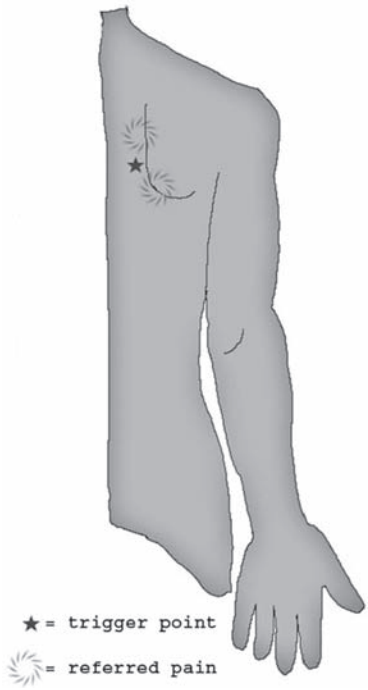


Fig. 11.7 Referral pattern for rhomboids.

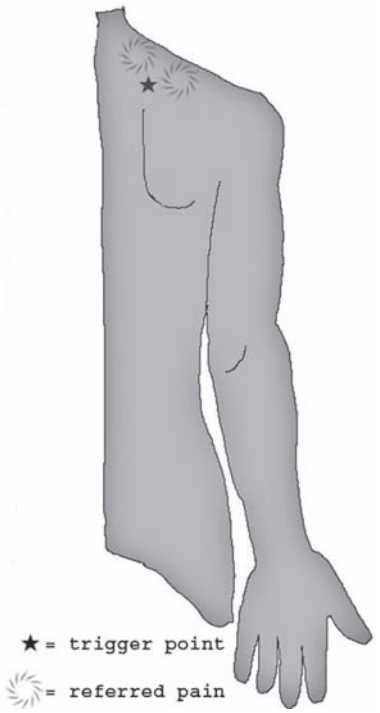


Fig. 11.8 Referral pattern for levator scapulae.

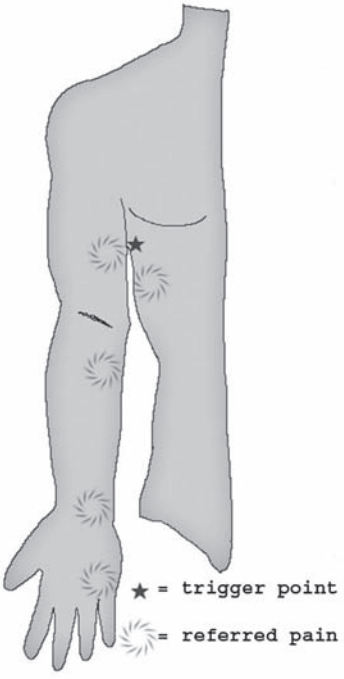


Fig. 11.9 Referral pattern for serratus anterior.

Evaluation

Localized chronic pain is generally caused by muscles and their surrounding tissue (myofascial pain), joints (mechanical pain), or nervous system structures (neuropathic pain). Patient evaluations should be designed to test each of these systems (see Table 11.2).

Evaluation should include a detailed musculoskeletal examination to assess posture (which may be abnormal in all three types of pain), range of motion, muscle tone and tenderness, joint motion, and neurological function. Passive range of motion is evaluated by an examiner manipulating a joint through its full range in the relaxed patient. Active range of motion, on the other hand, requires the patient to voluntarily activate muscles to move each joint through its range of motion. An examiner can record the extent of active range of motion, as observed through patient performance. Greater restriction of active range of motion compared with passive range of motion suggests a myofascial restriction or reduced patient effort.

The presence of myofascial features can be identified by directly visualizing painful areas for increased muscle bulk, which suggests a spasm, and by palpating for taut bands and trigger points. Identification of taut bands is best performed by examining the stretched muscle with the fingertips. The taut band should feel like a tight cord or rope in the muscle. In addition, as seen in Mr. Duffy, palpation of taut bands demonstrates tenderness and may cause involuntary muscle contraction

Table 11.2 Evaluation of patient with localized pain

System to test	Physical examination findings	Supplemental testing	Diagnostic label if abnormal
Muscles and soft tissues	Muscle spasm and tenderness Taut bands and trigger points AROM restricted; PROM normal	Physical therapy assessment	Myofascial
Joints	PROM restricted Joint crepitus Joint inflammation Joint instability	X-ray	Mechanical
Nerves	Numbness, weakness, reflex changes in distributions consistent with spine, spinal root, or nerve abnormality[a] Abnormal SLR	EMG/NCV MRI for suspected myelopathy or radiculopathy	Neuropathic

AROM active range of motion, *EMG/NCV* electromyography with nerve conduction velocity, *MRI* magnetic resonance imaging, *PROM* passive range of motion, *SLR* straight leg raise test

[a]See chapters 6, 7, and 10

locally (a local twitch response), flinching and vocalizing pain, or both. This flinch response should occur exclusively when the trigger point is palpated and not as a response to palpation of other areas. Tenderness cannot be assessed in patients who do not permit even the gentlest touch of areas distant to the painful area.

Myofascial pain should not be diagnosed unless these abnormal clinical examination findings are identified. If patients cannot cooperate with testing because of extreme pain, the clinician should reschedule them for another visit when they may be more amenable to testing. Myofascial pain cannot be diagnosed unless a detailed assessment of range of motion, posture and gait, and strength and sensory testing has been completed. Myofascial pain should not be diagnosed in patients with no physical findings.

No laboratory or radiographic abnormalities are associated with myofascial pain. The diagnosis is generally based on a history of an inciting event or injury, physical examination findings of tight and tender muscles, and the absence of mechanical instability or neurological deficits. X-rays should be performed in patients with suspected joint abnormality, inflammation, or instability. Plain x-rays also provide a useful screening tool for patients with chronic pain over bony structures to rule out underlying bone disease. Magnetic resonance scans should be reserved for patients with evidence of myelopathy, radiculopathy, or another specific type of pathology that would be identified with this testing.

Treatment

Physical therapy is the cornerstone of myofascial pain therapy. A careful evaluation by a trained physical therapist is invaluable for correctly identifying trigger points and areas of muscle shortening. The exercise program needs to be tailor-made for each patient to specifically address postural abnormalities and myofascial changes contributing to individual pain complaints. Therapy must focus on active stretching and range of motion exercises, although supplemental passive treatment modalities (administered by the therapist) may also be utilized. Patients should be instructed in a home-exercise routine to be performed at least twice daily, in addition to their physical therapy sessions. Isolated, 1-hour therapy sessions producing temporary muscle stretching, with no additional exercise to maintain stretches between appointments, will not be effective for most patients. The addition of targeted trigger point injections, medications, or other physical therapy modalities is designed to improve the ability to achieve an effective muscle stretch during active exercise (see Box 11.2).

Physical Therapy

Physical therapy treatment begins with a gentle stretching program and active range of motion exercises. Although passive stretching (stretching performed by

Box 11.2 Treatment of myofascial pain

- Primary treatment
  - Physical therapy
    - Posture correction
    - Stretching exercises
    - Active range of motion exercises
- Secondary treatment
  - Pharmacological therapy
    - Analgesics for pain flares
      - Acetaminophen
      - Nonsteroidal anti-inflammatory drugs
      - Tramadol
    - Tizanidine
      - Initially 1–2 mg at bedtime. May increase slowly to 24 mg/day in divided doses
    - Trigger point injections
  - Nonpharmacological therapy
    - Occupational therapy
      - Pacing skills
      - Work simplification/modification
    - Pain management psychology
      - Relaxation techniques
      - Stress management
      - Coping skills

a therapist on a relaxed patient) may be soothing, myofascial pain is most likely to improve in patients who perform active exercise (stretching performed by the patient). Patients should perform both whole body stretches and stretches targeted to the painful area twice daily. Muscles should be stretched until a stretched sensation is first felt. Patients should not overstretch their muscles or attempt to achieve maximal stretch. Stretching exercises help return shortened muscles to a more normal length, inactivating the taut band and trigger points. Several weeks after beginning a stretching program, patients should start using light weights to incorporate strengthening into the exercise routine. In one study, physical therapy that included active exercise (and incorporated a home-exercise program) and passive trigger point massage over 4 weeks significantly reduced both the number of trigger points and trigger point severity score.[6]

A variety of treatment modalities may be added to myofascial stretching (see Table 11.3). In a study comparing techniques used in patients with cervical myofascial pain, investigators observed significant pain reduction from all tested treatment modality combinations (Fig. 11.10).[7] The addition of any therapy to hot packs

Table 11.3 Supplemental treatment modalities used in conjunction with a physical therapy stretching exercise program

Treatment	Description
Injections	
• Trigger point injections	Local anesthetic (e.g., 0.5–1% lidocaine or 0.25–0.5% bupivacaine) injected into trigger point.
• Dry needling	Insertion of a solid acupuncture-type needle into trigger point
Physical therapy modalities	
• Ischemic compression	Application of pressure to trigger points for 90 seconds. Force is halfway between that which produces any pain and that which produces intolerable pain.
• Hot packs	Moist heating pads placed over the painful area for 20 minutes before exercise
• Active range of motion	Five repetitions of actively moving painful area through full range of motion
• Spray and stretch	Vasocoolant fluorimethane spray is applied to the entire painful area (not just the trigger point) prior to stretching.
• TENS	Electrodes placed around painful area and current applied for approximately 20 minutes
• Interferential current therapy	Electrodes placed around painful area and current applied for approximately 20 minutes. Minimal skin resistance with interferential current therapy allows a maximum amount of energy to penetrate to deeper tissues. Used in patients who fail TENS
• Myofascial release	Passive stretching and traction techniques, applied by a trained therapist

TENS transcutaneous electrical nerve stimulation

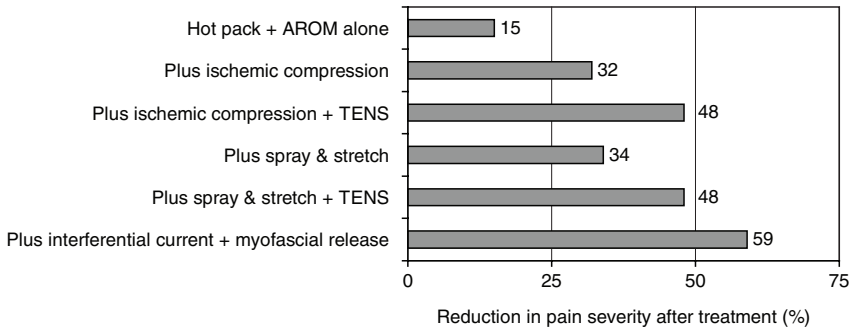


Fig. 11.10 Comparison among treatment modalities for myofascial pain (based on Chuen-Ru 2002).

plus active range of motion exercises resulted in significantly better pain reduction. The most effective forms of therapy were those that included transcutaneous electrical nerve stimulation or interferential current therapy. Notably, neither modality was administered in isolation in this study. Rather, both therapies were appropriately

used as adjunctive therapy to improve the benefit that could be achieved from active range of motion exercises.

Injections

Trigger point injections require infiltration of a local anesthetic into myofascial trigger points. A 22- to 25-gauge needle is inserted into the skin approximately 1 cm away from the trigger point, and then advanced to the trigger point. After verification of its placement outside of blood vessels, 0.1–0.2 mL of anesthetic is injected. The needle is then partially withdrawn, redirected, and advanced toward another area within the trigger point. This process is repeated until a local twitch response is no longer elicited, muscle tautness is reduced, or 0.5–1.0 mL of anesthetic has been injected around the trigger point. Pressure is maintained over the area after the injection to minimize hematoma development. Trigger point injections are contraindicated in patients with a risk for coagulopathy or bleeding. It is not clear whether the addition of steroids to trigger point injections lengthens the duration of pain relief.

Superficial dry needling involves the insertion of a solid thin needle (resembling an acupuncture needle) into trigger points. This method can also help deactivate myofascial trigger points when used in conjunction with stretching exercises.[8] Dry needling results in significantly reduced pain and improved range of motion.[9] A small, randomized trial compared improvement in pain severity and range of motion between patients with myofascial shoulder pain treated with trigger point lidocaine injections ($N = 21$) or dry needling ($N = 18$).[10] Pain and cervical range of motion improved for both groups ($P < 0.001$), with no outcome differences between treatments (Fig. 11.11). Benefit with either trigger point injections with local anesthetic or dry needling is only achieved when a local twitch response was generated with the needle insertion.[11] The benefits of dry needling are further supported by studies showing similar benefits after trigger point injections, regardless of the injected substance (including saline).[12]

Injection with botulinum toxin A has been tested in patients with myofascial pain, although consistent benefits have not been demonstrated.[13–15]

Pharmacological Therapy

Pharmacological therapy is designed to supplement physical therapy. Patients who fail to benefit from stretching programs alone may be treated with adjunctive tizanidine [Zanaflex], a muscle relaxant with analgesic properties.[16] Unlike most muscle relaxants, which are ineffective in chronic pain, tizanidine effectively reduces chronic myofascial pain for many patients.[17] Tizanidine is also mildly sedating and can improve sleep disturbance in some patients when administered in low doses at bedtime. Analgesics may be used on an intermittent basis to treat pain flares. Daily analgesics are rarely helpful, and chronic use may produce significant gastric and renal toxicity.[18,19]

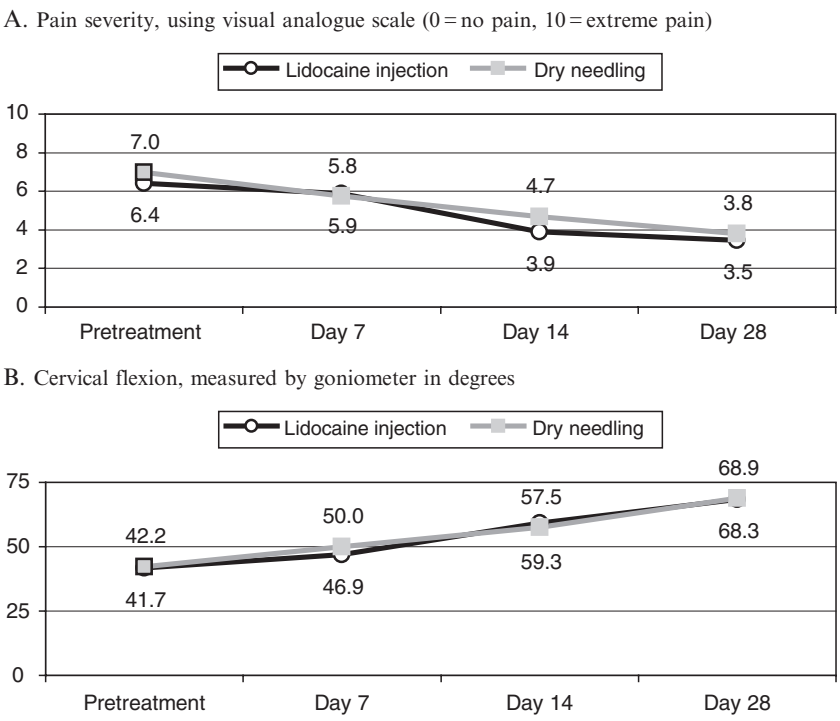


Fig. 11.11 Comparison of trigger point injections vs. dry needling for myofascial pain (based on Ga[10]). Values for lidocaine trigger point injections are given *below* the corresponding line, while values for dry needling are placed *above* the corresponding line. (**A**) Pain severity, using visual analogue scale (0 = no pain, 10 = extreme pain) (**B**) Cervical flexion, measured by goniometer in degrees.

Psychological Therapy

As with other types of chronic pain, myofascial pain is often associated with mood disturbance that can impact patients' ability to participate in pain rehabilitation. A recent study evaluated depression in 77 patients with chronic myofascial neck pain and 72 healthy, family member controls without pain complaints. Major depression occurred in 39% of myofascial pain patients vs. 4% of family controls. Interestingly, depression scores for pain patients correlated with pain severity ($P < 0.001$), with higher levels of pain reported in patients with more severe depression.

In addition to addressing psychological distress, psychological pain management skills can help reduce myofascial pain, especially when combined with physical therapy and exercise. For example, a recent study evaluated reduction in myofascial pain after receiving usual care and, subsequently, by the addition of a psychological training intervention.[20] One in three patients improved with usual

care, while two in three improved after the addition of cognitive behavioral therapy. Incorporation of relaxation techniques, stress management, scheduling and pacing skills, and body mechanics can further supplement benefits from physical therapy and exercise.

Summary

Myofascial pain is a unique pain syndrome, characterized by tight, tender muscles, with taut bands and tender trigger points. Myofascial pain syndrome is distinguished from mechanical pain by the absence of joint pathology, from neuropathic pain by the absence of neurological dysfunction, and from fibromyalgia by the absence of widespread body pain. Myofascial pain should be considered in patients with localized pain complaints. Knowledge of typical myofascial pain referral patterns (e.g., quadratus lumborum and piriformis syndromes) facilitates the identification of these common pain syndromes.

The focus of treatment for myofascial pain is active stretching and range of motion exercises. Passive physical therapy modalities, injections, and medications may be used adjunctively. Patients with long-standing myofascial pain may have additional psychological distress, disability, or both that will require additional, targeted therapy, including psychological interventions and occupational therapy.

Test Your Knowledge

1. What percentage of patients in a general medical practice may be diagnosed with myofascial pain?

   a. 3
   b. 10
   c. 30
   d. 90

2. Hallmarks of myofascial pain include the following:

   a. Tight muscle bands
   b. Muscular trigger points
   c. Restricted joint motion
   d. A and B
   e. All of the above

3. Choose the correct statement(s) about myofascial pain:

   a. Taut bands are involuntary markers of myofascial pain.
   b. The terms tender point and trigger point can be used interchangeably.

c. Biochemical analysis of active trigger points shows increases in inflammatory and pain chemicals.
d. A and B
e. A and C
f. All of the above

4. Choose the most accurate statement(s):

a. The terms myofascial pain and fibromyalgia are both used to describe chronic pain experienced by patients with no real abnormalities.
b. Myofascial pain and fibromyalgia may be considered synonymous.
c. Myofascial pain is characterized by localized pain and trigger points; fibromyalgia is characterized by widespread pain with positive tender points.
d. All of the above.

5. Effective treatment for myofascial pain includes the following:

a. Stretching exercises
b. Interferential current therapy
c. Spray and stretch
d. All of the above

6. Which medication(s) may be routinely used for patients with myofascial pain?
a. Acetaminophen
b. Tizanidine
c. Opioids
d. A and B
e. All of the above

Answers: 1c, 2d, 3e, 4c, 5d, 6d

References

1. Simons DG, Travell JG, Simons LS. Myofascial Pain and Dysfunction: The Trigger Point Manual, vol. 1, Ed 2. Baltimore: Lippincott Williams & Wilkins, 1999
2. Hubbard DR, Berkoff GM. Myofascial trigger points show spontaneous needle EMG activity. Spine 1993;18:1803–1807
3. Shah JP, Phillips TM, Danoff JV, Gerber LH. An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle. J Appl Physiol 2005;99:1977–1984
4. Shah JP, Danoff JV, Desai MJ, et al. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. Arch Phys Med Rehabil 2008;89:16–23
5. Shootsky SA, Jaeger B, Oye RK. Prevalence of myofascial pain in general internal medicine practice. West J Med 1989;151:157–160
6. Gam AN, Warming S, Larsen LH, et al. Treatment of myofascial trigger-points with ultrasound combined with massage and exercise – a randomized controlled trial. Pain 1998;77:73–79

7. Chuen-Ru H, Tsai L, Cheng K, Chung K, Hong C. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. Arch Phys Med Rehabil 2002;83:1406–1414
8. Edwards J, Knowles N. Superficial dry needling and active stretching in the treatment of myofascial pain – a randomized controlled trial. Acupunct Med 2003;21:80–86
9. Hsieh YL, Kao MJ, Kuan TS, et al. Dry needling to a key myofascial trigger point may reduce the irritability of satelitte MTrPs. Am J Phys Med Rehabil 2007;86:397–403
10. Ga H, Choi J, Park C, Yoon H. Acupuncture needling versus lidocaine injection of trigger points in myofascial pain syndrome in elderly patients – a randomized trial. Acupunct Med 2007;25:130–136
11. Hong CZ. Lidocaine injection versus dry needling to myofascial trigger point. The importance of the local twitch response. Am J Phys Med Rehabil 1994;73:256–263
12. Cummings TM, White AR. Needling therapies in the management of myofascial trigger point pain: a systematic review. Arch Phys Med Rehabil 2001;82:986–992
13. Göbel H, Heinze A, Reichel G, Hefter H, Benecke R. Efficacy and safety of a single botulinum type A toxin complex treatment (Dysport) for the relief of upper back myofascial pain syndrome: results from a randomized double-blind placebo-controlled multicentre study. Pain 2006;125:82–88
14. Qerama E, Fuglsang-Frederiksen A, Kasch H, Bach FW, Jensen TS. A double-blind, controlled study of botulinum toxin A in chronic myofascial pain. Neurology 2006;67:241–245
15. Lew HL, Lee EH, Castaneda A, Klima R, Date E. Therapeutic use of botulinum toxin type A in treating neck and upper back pain of myofascial origin: a pilot study. Arch Phys Med Rahabil 2008;89:75–80
16. Hord AH, Chalfoun AG, Denson DD, Azevedo MI. Systemic tizanidine hydrochloride (Zanaflex) relieves thermal hyperalgesia in rats with an experimental mononeuropathy. Anesth Analg 2001;93:1310–1315
17. Malanga GA, Gwynn MW, Smith R, Miller D. Tizanidine is effective in the treatment of myofascial pain syndrome. Pain Physician 2002;5:422–432
18. Matzke GR. Nonrenal toxicities of acetaminophen, aspirin and nosteroidal anti-inflammatory agents. Am J Kidney Dis 1996;28 (Suppl 1):S63–S70
19. Gambaro G, Perazella MA. Adverse renal effects of anti-inflammatory agents: evaluation of selective and nonselective cyclooxygenase inhibitors. J Intern Med 2003;253:643–652
20. Bogart RK, McDaniel RJ, Dunn WJ, et al. Efficacy of group cognitive behavior therapy for the treatment of masticatory myofascial pain. Mil Med 2007;172:169–174

Chapter 12
Fibromyalgia

Key Chapter Points:

- Fibromyalgia describes a diverse symptom complex, including widespread body pain, tenderness to palpation, and somatic complaints.
- Fibromyalgia affects approximately 2% of adults, with women affected six times more frequently than men. Prevalence increases with age.
- Patients with fibromyalgia report significant disability, psychological distress, and reduced physical and mental health and quality of life.
- Most patients with fibromyalgia report reduced pain and medication use over a 3-year period.
- Fibromyalgia is best treated with multidisciplinary treatment, using therapies to specifically target symptoms of individual patients.

Key Words Fatigue, Multidisciplinary, Quality of life, Tender point

Case History

Ms. Colegrove is a 23-year-old elementary school teacher who reported persistent widespread body aching since falling while rollerblading 3 years earlier. She had not missed work because of the pain, but reported that she had curtailed her previously active evening sports, like rollerblading 5 miles or participating in an adult basketball league. She reported pain affecting different areas of her body on different days, with pain occurring at different times in all extremities, neck, and back. She also reported incapacitating migraine headaches twice a week. In addition to pain complaints, Ms. Colegrove reported difficulty with sleep and extreme fatigue, as well as intermittent numbness in non-dermatomal areas. Examination showed a vivacious, attractive woman with a brisk gait and full active range of motion of her neck, back, and all extremities.

Her strength and sensory examinations were completely normal, despite complaints of feeling weak and having numbness in her right leg. After completing the examination, she opened a spiral notebook, in which she recorded a daily log of all of her symptoms

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

and another notebook containing materials from the Internet on fibromyalgia for her doctor to review. Her primary care physician (PCP) was struck with the stark contrast between Ms. Colegrove's severe complaints and reports of physical limitations and her perfect work attendance and her completely normal examination. The PCP suspected that the absence of marriage and children had resulted in excessive focus on bodily sensations and recommended that she increase her participation in social activities to provide additional distractions. No treatment was recommended in light of her lack of work disability and absence of physical dysfunction on examination.

Introduction

The term *fibromyalgia* has been used to describe a wide variety of non-localized pain complaints, particularly pain syndromes in women with no identifiable pathology. In 1990, the American College of Rheumatology (ACR) established specific criteria to allow identification of fibromyalgia as a unique pain syndrome, rather than a waste-basket diagnosis for patients who failed to meet criteria for other pain disorders.[1] The ACR requires both widespread pain and the presence of at least 11 of 18 painful tender points to meet diagnostic criteria for fibromyalgia (see Box 12.1 and Fig. 12.1).

Tender points are predetermined areas throughout the body that tend to be painful with pressure in patients with fibromyalgia (Fig. 12.2). Interestingly, firm palpation of these specific points tends to be perceived as painful in fibromyalgia patients, but not in patients with other types of chronic pain. Positive tender points discriminate between fibromyalgia patients and other pain patients when using a cut-off score of at least 2 on a 0–10 severity scale (0 = *no pain or pressure*; 10 = *excruciating pain*) after application of 4 kg of pressure.[2] Digital palpation more effectively discriminates fibromyalgia patients than dolorimeter testing, making testing at the bedside easy.[1] Pressing with the thumb results in approximately 4 kg of pressure when the examiner's nail bed blanches. Higher scores reported for tender points correlate with greater levels of disability.[3]

Although the presence of these pain features defines fibromyalgia, fibromyalgia patients typically describe a variety of additional somatic and psychological complaints

Box 12.1 Diagnosis of fibromyalgia (based on American College of Rheumatology criteria; Wolfe et al.[1])

- Widespread body pain
  - Pain on both left and right sides of the body
  - Pain above and below the waist
  - Axial pain present
- Pain persisting ≥3 months
- ≥11 of 18 tender points painful to 4 kg pressure

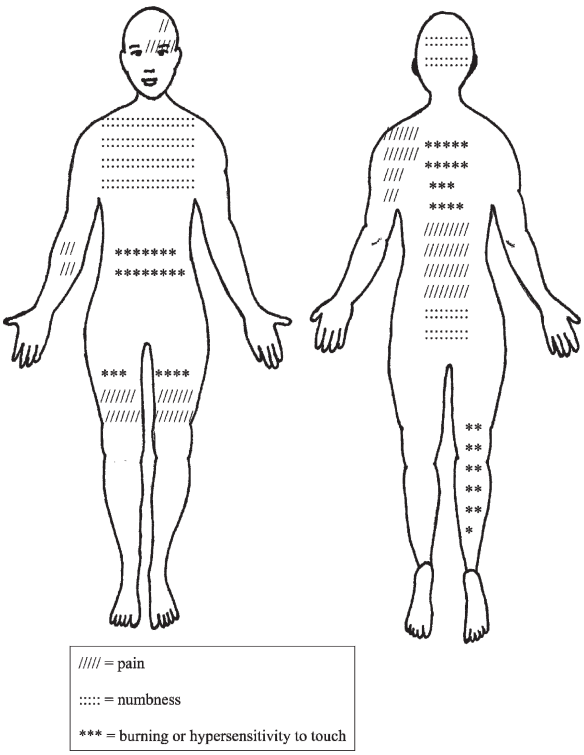


Fig. 12.1 Typical pain drawing from a fibromyalgia patient.

(see Box 12.2). Fatigue, sleep disturbance, morning stiffness, and headache are reported by the majority of fibromyalgia patients. Paresthesias, irritable bowel syndrome (IBS), depression, and anxiety are also common. IBS is a diagnosis of exclusion, with the diagnosis assigned in patients with no identifiable and correctable pathology. Patients with IBS report at least 12 weeks of abdominal pain during a year, with pain that is relieved with bowel movements and bowel movements that change in frequency and appearance (e.g., alternating diarrhea and constipation). It is important to ensure that patients are not aggravating gastrointestinal complaints through excessive and/or alternating use of over-the-counter laxatives and diarrhea treatments. (A more detailed discussion of IBS can be found in Chap. 8.) Ms. Colegrove typifies fibromyalgia patients by reporting a variety of somatic complaints in addition to widespread pain.

Ms. Colegrove embodies many of the features of the typical patient with fibromyalgia. She is young, intelligent, high-achieving, and highly motivated to improve. In addition, most patients with fibromyalgia will maintain required work activities, while curtailing additional enjoyable activities because of both pain and fatigue. Patients with fibromyalgia are highly cooperative with their examination and often cause the doctor to remark, "You did those tests better than I could do!" Instead of interpreting lack of physical limitations as a sign of a highly cooperative patient, healthcare providers often falsely assume that patients' reports of disability must be

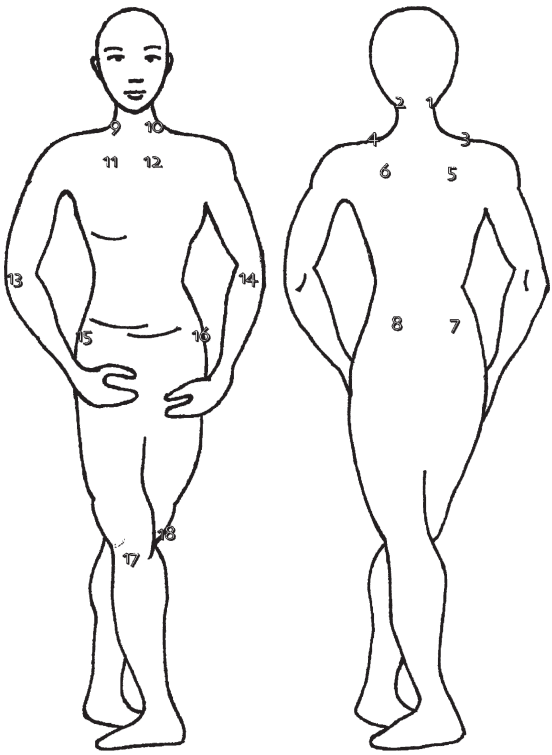


Fig. 12.2 Location of 18 possible fibromyalgia tender points. Location of tender points (*right* and *left*): 1 and 2: occiput; 3 and 4: trapezius; 5 and 6: supraspinatus; 7 and 8: gluteal; 9 and 10: lower lateral cervical; 11 and 12: second costochondral junction; 13 and 14: lateral epicondyle; 15 and 16: greater trochanter; 17 and 18: medial knee fat pad.

exaggerated. As suspected by her PCP, most patients with fibromyalgia do tend to be very *tuned in* to bodily sensations and experience stress as somatic rather than emotional symptoms. This, along with a strong desire to improve, often results in patients with fibromyalgia recording copious, detailed information about their symptoms and scouring available literature for suggested treatments. PCPs must understand that patients with fibromyalgia are not seeking to maintain their disability by these actions, but are exceptionally eager to improve. This makes patients with fibromyalgia ideal candidates for self-management pain rehabilitation.

Epidemiology

Fibromyalgia affects approximately 2% of adults.[4–6] Fibromyalgia is more prevalent in women than in men. A large community survey identified ACR-defined fibromyalgia in 3% of women vs. 0.5% of men.[7] In addition, fibromyalgia prevalence

Box 12.2 Common associated somatic and psychological symptoms in patients with fibromyalgia (based on Wolfe et al.[1,7] and White et al.[4])

- Constitutional
  - Fatigue – 66–82%
  - Sleep disturbance – 66–75%
  - Sicca syndrome/dry eyes – 10–36%
  - Raynaud's syndrome – 17%
- Musculoskeletal
  - Morning stiffness – 76–77%
- Gastrointestinal
  - Irritable Bowel Syndrome – 30–48%
- Neurological
  - Headache – 53–82%
  - Paresthesias – 31–53%
- Gentiourinary
  - Urinary urgency – 26–32%
  - Dysmenorrhea – 26%
- Psychiatric
  - Depression – 32–48%
  - Anxiety – 28–48%

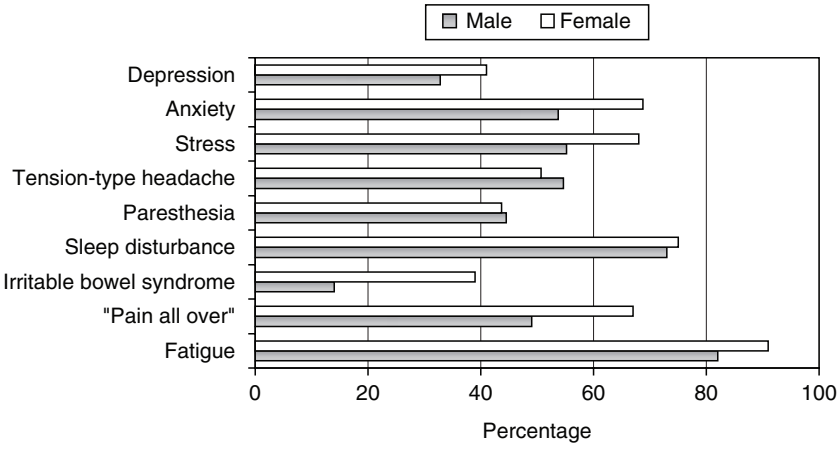


Fig. 12.3 Gender differences in fibromyalgia symptoms (based on Yunus et al.[9]).

increases with age, reaching more than 7% of women aged 60 years or older. An evaluation for fibromyalgia symptoms in the general population revealed significantly higher reporting of fatigue, sleep disturbance, "pain all over", and IBS in women compared with that in men.[8] Similarly, a survey of fibromyalgia patients revealed that, although pain severity comparisons were similar between men and women, female patients more commonly endorsed fatigue, "pain all over", and IBS (Fig. 12.3).[9]

Psychological Comorbidity

Anxiety and depression affect the majority of fibromyalgia patients. A recent screening for psychological distress among patients participating in a clinical trial identified anxiety in 71% of fibromyalgia patients and depression in 56%.[10] Although chronic pain in general is associated with increased prevalence of depression and anxiety, these symptoms appear to be even more common in fibromyalgia patients (see Table 12.1).[11] In addition, patients with fibromyalgia and comorbid anxiety or depression tend to have more physical symptoms and disability.[12]

Quality of life (QOL) is also reduced in patients with fibromyalgia. The Medical Outcomes Study Health Survey (SF-36) scores provide self-reported life quality for a variety of physical and emotional variables, with possible scores ranging from 0 (*poorest QOL*) to 100 (*maximum QOL*). Interestingly, QOL is substantially worse among fibromyalgia patients than those with rheumatoid arthritis, which is also characteristically associated with widespread, disabling pain, and chronic low back pain (see Table 12.2).[11] As described by Ms. Colegrove, fibromyalgia patients routinely express marked QOL impairments, despite the appearance of a *normal* general physical examination.

Table 12.1 Comparison of prevalence of psychological distress in patients with fibromyalgia vs. other chronic pain syndromes

	Fibromyalgia	Complex regional pain syndrome	Chronic low back pain
SCL-90 score	$N = 54$	$N = 22$	$N = 35$
Total distress**	192	159	152
Agoraphobia	9	8	9
Phobic anxiety*	19	15	15
Depression**	41	28	25
Somatization**	36	29	27
Obsessive compulsive**	25	20	19
Interpersonal sensitivity	31	28	26
Hostility	10	9	7
Sleep disorders	11	10	8

Scores based on Symptom Checklist (SCL-90); based on Verbunt et al.[11]
Higher SCL-90 scores represent greater psychological distress. Fibromyalgia scores were significantly higher than both other pain categories:
*$P < 0.05$, **$P < 0.01$. Trends were seen for higher scores in fibromyalgia patients with interpersonal sensitivity ($P = 0.07$) and sleep disorders ($P = 0.07$).

Table 12.2 Quality of life comparison between fibromyalgia and other chronic pain patients

SF-36 score	General population	Fibromyalgia		Rheumatoid arthritis		Chronic low back pain	
Physical function	83	38	39	31	63	44	52
Role physical	76	8	15	25	35	11	32
Role emotional	82	52	32	59	58	20	33
Mental health	77	55	44	69	68	43	48
Social function	84	45	45	54	74	44	62
Body pain	75	31	26	37	69	23	43
Vitality	69	35	39	39	60	29	49
General health	71	38	43	44	52	34	42

Data are presented for the general population and two samples with each pain diagnosis (based on Verbunt et al.[11])

Disability

Despite the presence of a generally unremarkable physical examination in fibromyalgia patients, fibromyalgia is associated with significant disability.[13] During a 2-week period, 74% of a community fibromyalgia sample endorsed reducing usual activities and 58% spent at least 1 day in bed because of health symptoms.[4] The mean number of days with reduced activities over a 2-week period was 4.7. Work activities were limited because of fibromyalgia for 65%, with work disability in 31%. Another study compared work status in 136 fibromyalgia patients and age- and sex-matched controls who were treated for non-rheumatologic conditions.[14] Work at the time of diagnosis was compared with current work situation (Fig. 12.4). Patients with fibromyalgia were significantly less likely to still be employed in the same job compared with those without fibromyalgia ($P < 0.0001$).

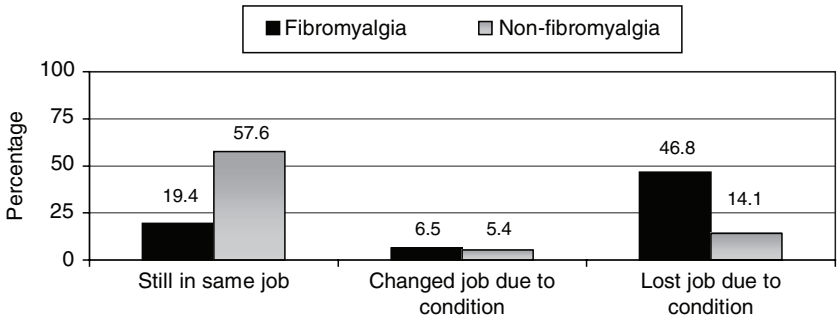


Fig. 12.4 Comparison of employment at the time of medical condition diagnosis and at the current time in patients with and without fibromyalgia (based on Al-Allaf[14]).

Evaluation

Patients with widespread pain complaints should be assessed for somatic symptoms that are comorbid with fibromyalgia (see Box 12.2). Although some symptoms, like paresthesias, cannot be individually treated beyond standard fibromyalgia therapy, others (e.g., migraine, sleep disturbance, and IBS) can be addressed directly. In addition, because fibromyalgia is comorbid with somatic complaints, patients seeking treatment for fatigue, sleep disturbance, or IBS should also be screened for pain complaints.

Assessment Measures

Patients reporting pain in several body regions should be screened for fibromyalgia with a tender point examination. Appendix G provides a recording sheet for scoring tender points in the clinic. Scores should be recorded at baseline and again during and after treatment. The number of positive tender points (score ≥ 2) is the tender point count, with a possible range of 0 (*no tender points are positive*) to 18 (*all tender points are positive*). A score of 11 is necessary to establish the diagnosis of fibromyalgia. The total numeric score obtained from adding each individual tender point score is the tender point score. Monitoring tender point count and tender point score can serve as useful treatment efficacy markers.

In addition to pain assessments, patients identified with fibromyalgia should be screened for commonly associated somatic and psychological complaints (see Box 12.3). Treatment can be targeted to those symptoms that limit the patient's daily routine. Identifying those symptoms that occur but are not disabling helps both patients and their doctors acknowledge the occurrence of somatic symptoms, but also prioritize those symptoms most in need of treatment.

Box 12.3 Assessment of fibromyalgia patients

Which of the following problems limit your daily activities?

Problem	Not a problem	Problem occurs but does *not* limit daily routine	Problem limits daily routine
Fatigue			
Sleep disturbance			
Frequent constipation			
Frequent diarrhea			
Depressed or blue mood			
Anxiety or nervousness			
Headache			

All patients with fibromyalgia should be screened for depression and anxiety because of the high prevalence of mood disturbance with fibromyalgia and the reluctance of many patients to discuss psychological symptoms with their treating clinicians. Many patients fear being labeled as psychiatric patients, with all fibromyalgia symptoms attributed to emotional problems. Also, unless symptoms are severe, many patients do not recognize symptoms of anxiety or depression. Patients often believe that their mood or anxiety symptoms are a consequence of suffering with chronic pain and that these symptoms will resolve once the pain severity has improved. Identifying severity of psychological distress can help motivate patients to address psychological symptoms separate from pain reduction. Screening tools for readily identifying anxiety and depression are available online (see Table 12.3).

The effect of fibromyalgia can be evaluated using the fibromyalgia impact questionnaire (FIQ) (see Appendix G).[15] This questionnaire may be used to determine severity of disability and follow patient progress through treatment. The FIQ correlates well with work disability.[4]

Table 12.3 Online psychiatric screening tools

Web address	Symptom tested
www.healthyplace.com/site/tests/psychological.asp	Separate tests screen for depression, anxiety, personality traits, and stress
http://www.psychcorp.com	Standard depression assessment tool: Beck Depression Inventory
http://www.mindgarden.com/Assessments/Info/staiinfo.htm	Standard anxiety assessment: State-Trait Anxiety Inventory

Treatment

Most patients with fibromyalgia improve over time. Pöyhiä et al. followed 59 patients with fibromyalgia who were treated in university and community practices for 3 years.[16] During that time, patients experienced a significant ($P < 0.01$) decrease in pain scores (visual analog scale score: 66 at baseline vs. 55 at 3 years) and tender point count (14 vs. 10). Most importantly, both pain and medication use decreased over 3 years (Fig. 12.5). This study offers encouragement that fibromyalgia patients and their healthcare providers can expect both symptomatic improvement and reduced reliance on medications over time.

The first step in treating fibromyalgia patients is to establish an appropriate diagnosis. Once patients have received a diagnosis of fibromyalgia, they often become stereotyped by other healthcare providers, so the fibromyalgia label should never be used unless patients meet ACR criteria. Fibromyalgia patients need to be reassured that fibromyalgia is not a disease, but a symptom complex. Fibromyalgia symptoms are not progressive and will not lead to loss of muscle strength, paralysis, dementia, and so on.

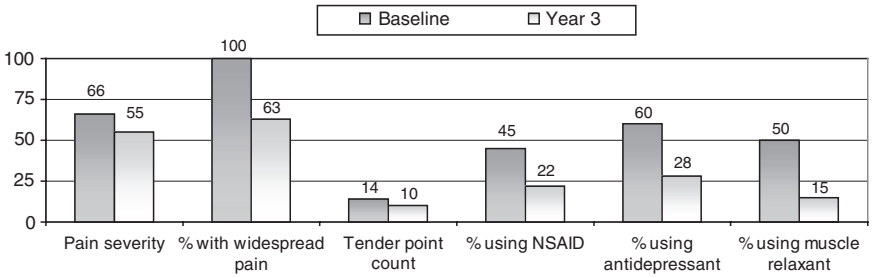


Fig. 12.5 Long-term outcome in fibromyalgia patients: comparison of pain and medication use at baseline and after 3 years. *NSAID* nonsteroidal anti-inflammatory drug (based on Pöyhiä et al.[16]).

As described earlier, fibromyalgia treatments should be targeted to specific, problematic symptoms. Effective therapeutic options include medication, non-medication, and complementary and alternative treatments (*see* Table 12.4). Improvements are maximized by providing targeted intervention in a multidisciplinary treatment program.

Table 12.4 Effective fibromyalgia treatments

Treatment category	Effective therapies
Medication	
Antidepressants	First-line: SNRIs (duloxetine [Cymbalta] 60 mg once or twice a day and milnacipran* [Ixel] 25–200 mg a day)
	Second-line: Tricyclics
	Third-line: SSRIs
Antiepileptics	First-line: pregabalin [Lyrica] 450 mg daily
	Second-line: gabapentin [Neurontin] 400–800 mg three times daily
Non-pharmacologic therapies	
Exercise	Aerobic exercise
	Water/pool exercise
	Strength training
Psychology	Distraction
	Cognitive behavioral therapy
	Guided imagery
	Relaxation
	Stress management
Occupational therapy	Work simplification
	Ergonomic training
	Pacing
	Body mechanics
Complementary alternative medicine	Melatonin 3–6 mg at bedtime
	Massage
	S-adenosyl methionine 800 mg daily
	Yoga

SNRI serotonin and norepinephrine reuptake inhibitors, *SSRI* selective serotonin reuptake inhibitors

*Unavailable in the United States

Pharmacological Treatment

Both antidepressants and neuromodulating antiepileptics have demonstrated benefit for reducing symptoms in fibromyalgia patients, although symptomatic reduction is generally modest to moderate. Among antidepressants, serotonin and norepinephrine reuptake inhibitors (SNRIs) offer the best efficacy and tolerability for fibromyalgia (see Box 12.4).[17,18] Both duloxetine (Cymbalta) and milnacipran (Ixel – not available in the USA) have proven efficacy in randomized, blinded, controlled studies. Duloxetine was approved by the Food and Drug Administration in the United States for the treatment of fibromyalgia in 2008. Interestingly, duloxetine is more effective in female fibromyalgia patients, with minimal benefit in males. Both efficacy and tolerability are superior with these SNRIs compared with tricyclic antidepressants, with nausea the most common side effect with SNRIs. Selective serotonin reuptake inhibitors (SSRIs) offer inconsistent benefit for fibromyalgia.

Pregabalin [Lyrica] was approved by the Food and Drug Administration for the treatment of fibromyalgia in 2007. Gabapentin [Neurontin] has also demonstrated efficacy in decreasing pain, disability, and sleep disturbance in fibromyalgia patients in a randomized, double-blind, placebo-controlled clinical trial.[19] Dizziness and somnolence are common side effects with both pregabalin and gabapentin, affecting about one in three treated patients. In addition, the Food and Drug Administration recently announced a warning about increased risk of suicide among patients using some antiepileptic drugs, including pregabalin and gabapentin.[20]

Analgesics have limited benefit for fibromyalgia patients. A review of four placebo-controlled trials testing nonsteroidal anti-inflammatory medications in patients with fibromyalgia failed to find superiority of analgesics over placebo.[21] A double-blind study evaluating the combination of 37.5-mg tramadol plus 325-mg acetaminophen (1–2 tablets four times daily), however, did report significant improvements in pain, disability, and QOL.[22]

Box 12.4 Comparison of antidepressants for fibromyalgia efficacy (based on Littlejohn and Guymer[17])

- Good efficacy
  - Duloxetine [Cymbalta]
  - Milnacipran [Ixel]
- Moderate efficacy
  - Amitriptyline [Elavil]
- Inconsistent efficacy
  - Venlafaxine [Effexor]
  - Fluoxetine [Prozac]
- Ineffective
  - Citalopram [Celexa]

Non-pharmacologic Treatments

While exercise and physical therapy treatments for most chronically painful conditions focus on stretching exercises, fibromyalgia treatment centers on aerobic exercise and strength training. For example, a 21-week strength training program in older women with fibromyalgia resulted in about a 40% decrease in average pain severity.[23] Exercise has also demonstrated efficacy in reducing fatigue in fibromyalgia patients.[24]

Performing aerobic exercise in warm water is often particularly soothing, resulting in an improved ability to fully participate in aerobic conditioning. In addition, fibromyalgia patients reap symptomatic benefits earlier when exercises are performed in water compared with land exercises.[25] Interestingly, water exercise has been consistently shown to decrease fibromyalgia pain,[26,27] as well as improve cognitive function in one controlled study.[28]

As with other types of chronic pain, psychological pain management skills are also typically beneficial for patients with fibromyalgia. A recent study demonstrated improvement in functional status and a perception of self-control over pain symptoms when guided imagery was added to usual fibromyalgia care.[29] Psychological therapy should also be used to help reduce symptoms of anxiety and depression.

Occupational therapy may offer added benefit, particularly for patients reporting impairments in performing activities of daily living or work disability. A work assessment may be appropriate for patients who are still working in order to maximize the probability of maintaining their current work status. Education in pacing skills, scheduling, and the proper use of body mechanics may also help minimize pain and interference.

Complementary and Alternative Medicine

A survey of fibromyalgia patients treated at a tertiary care center revealed that 98% had used complementary or alternative medicine during the preceding 6 months.[30] Patients used an average of three different therapies. Vitamins or minerals were used by 83% of patients, with nutritional supplements or herbs used by 51%. The most commonly used individual treatments were exercise (48%), spiritual healing (prayers) (45%), massage therapy (44%), chiropractic treatments (37%), vitamin C (35%), vitamin E (31%), magnesium (29%), vitamin B complex (25%), green tea (24%), and weight-loss programs (20%).

A number of well-designed, controlled trials have evaluated the efficacy of complementary and alternative medicine in fibromyalgia. Treatments with the best evidence for efficacy include massage and *S*-adenosyl methionine.[31] Acupuncture demonstrated efficacy in open-label series,[32,33] with mixed results in randomized, clinical trials.[34] Yoga has demonstrated improvement in both pain and disability in an open-label study.[35]

Bedtime dosing with melatonin was also shown to be effective in reducing fibromyalgia symptoms in two open-label studies.[36] Despite lack of controlled trials in fibromyalgia patients, melatonin treatment may be considered, due to the predominance of associated sleep disturbance in fibromyalgia patients and the benign nature of melatonin treatment.

Individualized, Symptom-Focused, Multidisciplinary Treatment

Treatment outcome may be maximized in an individual patient by identifying specific symptom targets and prescribing a variety of treatments (Table 12.5). Some therapies, such as antidepressants, may be used to treat a variety of possible symptoms, including fibromyalgia pain, migraine, sleep disturbance, and mood disturbance.

Table 12.5 Individualized, symptom-focused fibromyalgia treatment

Troublesome symptoms	Clinician	Treatment
Body pain	Physician	Antidepressant
		Antiepileptic
	Physical therapist	Aerobic exercise/reconditioning
		Strengthening exercises
	Occupational therapist	Work station modification
		Body mechanics
	Psychologist	Stress management
		Cognitive behavioral therapy
		Relaxation training
Fatigue	Physical therapist	Aerobic exercise
	Occupational therapist	Pacing skills
	Nursing	Nutritional counseling
Irritable bowel syndrome	Physician	Laxatives, anti-diarrhea agents, antidepressants
	Physical therapist	Aerobic exercise
	Psychologist	Stress management
	Nursing	Dietary counseling: high-fiber, good hydration, low fat, frequent small meals
Sleep disturbance	Physician	Antidepressants
	Psychologist	Relaxation training
	Nursing	Sleep hygiene
Depression/anxiety	Physician	Antidepressants
	Psychologist	Counseling
		Psychotherapy
Headache	Physician	Antidepressants or other standard headache therapy
	Psychologist	Stress management
		Biofeedback

Choose possible treatments based on the presence of troublesome symptoms.

Fibromyalgia patients benefit from education about their condition. Several valuable online references are available (see Box 12.5). These sites inform patients that they are not unique in their complaints and help legitimize fibromyalgia for patients and their families. Recording exercise and relaxation practices in a daily diary or calendar can also serve as an educational tool to assist with scheduling and compliance. (Exercise program logs are available in Appendix B.)

Box 12.5 Online fibromyalgia resources

- American Academy of Family Physicians web page
  http://familydoctor.org
- National Fibromyalgia Association web page
  http://fmaware.org
- National Fibromyalgia Partnership, Inc.
  http://fmpartnership.org
- John Hopkins Arthritis web page
  http://www.hopkins-arthritis.som.jhmi.edu/other/fibromyalgia.html

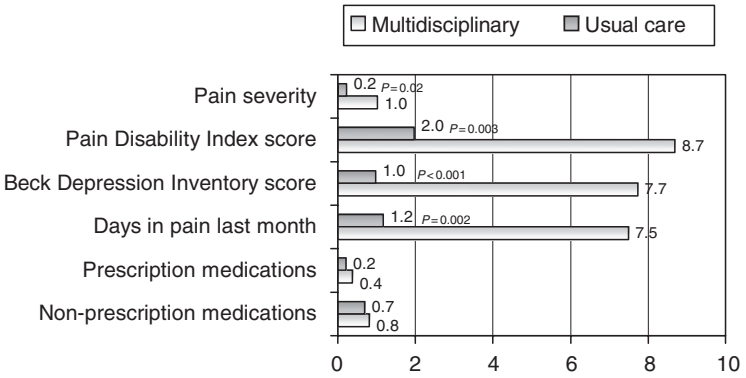


Fig. 12.6 Changes in fibromyalgia patients randomized to usual care or group multidisciplinary treatment (based on Lenstra and Olszynski[37]). Pain severity was rated using an 11-point scale.

The cost-effectiveness of delivering multidisciplinary treatment can be maximized by utilizing group training sessions. In one study, fibromyalgia patients were randomized to one of two 6-week treatments: usual care by their primary care practitioner or group, multidisciplinary intervention.[37] The multidisciplinary treatment consisted of four group educational lectures (discussing fibromyalgia, pain management techniques, stress management, and diet), 18 supervised group exercise sessions, and 2 massage therapy sessions. After completing treatment, improvements in pain severity, disability, depression, and time in pain all favored patients receiving multidisciplinary treatment (Fig. 12.6). Return to work also occurred more frequently among multidisciplinary treatment patients (11.6% vs. 2.8%).

A long-term follow-up assessment performed 15 months after completing treatment showed maintenance of benefits for pain, mood, and disability. Disability and hours in pain continued to show superior improvement among patients who had received multidisciplinary treatment. In addition, change in the use of both prescription and non-prescription medications also favored multidisciplinary treatment patients ($P < 0.01$) at long-term follow-up, even though only 51% of the multidisciplinary patients reported continuing to perform exercises at least 3 times weekly during the 15-month follow-up.

Summary

Fibromyalgia is a common, chronic pain condition affecting approximately 3% of women and 0.5% of men. Patients with fibromyalgia report a wide variety of troublesome somatic complaints, including fatigue, sleep disturbance, paresthesias, headache, and digestive complaints. Fibromyalgia is diagnosed by the presence of widespread body pain and at least 11 of 18 possible tender points that are painful to digital palpation. Recording and monitoring the tender point examination aids both in the establishment of a diagnosis and assessment of treatment efficacy. Symptoms of fibromyalgia are not progressive and tend to improve over time. Symptom improvement can be maximized by identifying, targeting, and treating troublesome symptoms in each individual patient. Antidepressants are the most beneficial types of medication for individuals with fibromyalgia, as they help reduce pain, depression, and headache and help improve sleep. Aerobic exercise and learning proper activity pacing skills, body mechanics, and sleep hygiene techniques are also beneficial.

Test Your Knowledge

1. Fibromyalgia is diagnosed in patients with the following pain characteristics:
   a. Pain occurs on both sides of the body.
   b. Pain is present above and below the waist.
   c. 11 or more tender points are painful to firm pressure.
   d. All of the above.
2. Which of the following statements about fibromyalgia epidemiology is/are true?
   a. Fibromyalgia occurs six times more often in women than in men.
   b. Fibromyalgia prevalence increases with advancing age.
   c. Fibromyalgia is associated with better QOL and less disability than other types of widespread pain or rheumatologic disease.
   d. A and B.
   e. All of the above.

3. Typical associated symptoms with fibromyalgia include the following:

   a. Fatigue
   b. IBS
   c. Bleeding disorder
   d. A and B
   e. All of the above

4. Which class of medications is most effective for treating fibromyalgia symptoms:

   a. Opioids
   b. Antidepressants
   c. Analgesics
   d. Muscle relaxants

5. Which of the following statement(s) is true about the treatment of fibromyalgia patients:

   a. Exercise tolerance and response is improved by using land-based exercises in fibromyalgia patients.
   b. Fibromyalgia patients infrequently use complementary and alternative medicine.
   c. The most commonly used complementary and alternative treatments by fibromyalgia patients include exercise, prayer, and massage.
   d. Multidisciplinary treatment will produce long-term benefits only if patients continue to religiously perform daily exercises.
   e. All of the above

Answers: 1d, 2d, 3d, 4b, 5c

References

1. Wolfe F, Smythe HA, Yunus MB, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia: report of the Multicenter Criteria Committee. Arthritis Rheum 1990;33:160–172
2. Okifuji A, Turk DC, Sinclair JD, Starz TW, Marcus DA. A standardized manual tender point survey. I. Development and determination of a threshold point for the identification of positive tender points in fibromyalgia syndrome. J Rheumatol 1997;24:377–383
3. Lundberg G, Gerdle B. Tender point scores and their relations to signs of mobility, symptoms, and disability in female home care personnel and the prevalence of fibromyalgia. J Rheumatol 2002;29:603–613
4. White KP, Harth M, Speechley M, Ostbye T. Testing an instrument to screen for fibromyalgia syndrome in general population studies: the London Fibromyalgia Epidemiology Study Screening Questionnaire. J Rheumatol 1999;26:880–884
5. Carmona L, Ballina J, Gabriel R, Laffon A. The burden of musculoskeletal diseases in the general population of Spain: results from a national survey. Ann Rheum Dis 2001;60: 1040–1045

6. Maquet D, Croisier JL, Crielaard JM. Fibromyalgia in the year 2000. Rev Med Liege 2000;55:991–997
7. Wolfe F, Ross K, Anderson J, Russell IJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. Arthritis Rheum 1995;8:19–28
8. Wolfe F, Ross K, Anderson J, Russell IJ. Aspects of fibromyalgia in the general population: sex, pain threshold, and fibromyalgia symptoms. J Rheumatol 1995;22:151–156
9. Yunus MB, Inanici F, Aldag JC, Mangold RF. Fibromyalgia in men: comparison of clinical features with women. J Rheumatol 2000;27:485–490
10. Arnold LM, Crofford LJ, Martin SA, Young JP, Sharma U. The effect of anxiety and depression on improvements in pain in a randomized, controlled trial of pregabalin for treatment of fibromyalgia. Pain Med 2007;8:633–638
11. Verbunt JA, Pernot DH, Smeets RJ. Disability and quality of life in patients with fibromyalgia. Health Qual Life Outcomes 2008;6:8
12. White KP, Nielson WR, Harth M, Ostbye T, Speechley M. Chronic widespread musculoskeletal pain with or without fibromyalgia: psychological distress in a representative community adult sample. J Rheumatol 2002;29:588–594
13. White KP, Speechley M, Harth M, Ostbye T. Comparing self-reported function and work disability in 100 community cases of fibromyalgia syndrome versus controls in London, Ontario: the London Fibromyalgia Epidemiology Study. Arthritis Rheum 1999;42:76–83
14. Al-Allaf AW. Work disability and health system utilization in patients with fibromyalgia syndrome. J Clin Rheumatol 2007;13:199–201
15. Burckhardt CS, Clark SR, Bennett RM. The fibromyalgia impact questionnaire: development and validation. J Rheumatol 1991;18:728–734
16. Pöyhiä R, Da Costa D, Fitzcharles MA. Pain and pain relief in fibromyalgia patients followed for three years. Arthritis Rheum 2001;45:355–361
17. Littlejohn GO, Guymer EK. Fibromyalgia syndrome: which antidepressant drug should we choose. Curr Pharm Des 2006;12:3–9
18. Arnold LM. Duloxetine and other antidepressants in the treatment of patients with fibromyalgia. Pain Med 2007;8:S63–S74
19. Arnold LM, Goldenberg DL, Stanford SB, et al. Gabapentin in the treatment of fibromyalgia: a randomized, double-blind, placebo-controlled, multicenter trial. Arthritis Rheum 2007;56:1336–1344
20. http://www.fda.gov/cder/drug/InfoSheets/HCP/antiepilepticsHCP.htm (accessed February 2008)
21. Lautenschläger J. Present state of medication therapy in fibromyalgia syndrome. Scand J Rheumatol 2000;29 (suppl 113):32–36
22. Bennett RM, Kamin M, Kamin R, Rosenthal N. Tramadol and acetaminophen combination tablets in the treatment of fibromyalgia pain: a double-blind, randomized, placebo-controlled study. Am J Med 2003;114:537–545
23. Valkeinen H, Häkkinen A, Hannonen P, Häkkinen K, Alén M. Acute heavy-resistance exercise-induced pain and neuromuscular fatigue in elderly women with fibromyalgia and in healthy controls: effects of strength training. Arthritis Rheum 2006;54:1334–1339
24. Jones KD, Burckhardt CS, Deodhar AA, et al. A six-month randomized controlled trials of exercise and pyridostigmine in the treatment of fibromyalgia. Arthritis Rheum 2008;58:612–622
25. Assis MR, Silva LE, Alves AM, et al. A randomized controlled trial of deep water running: clinical effectiveness of aquatic exercise to treat fibromyalgia. Arthritis Rheum 2006;55:57–65
26. Gusi N, Tomas-Carus P, Häkkinen A, Häkkinen K, Ortega-Alonso A. Exercise in waist-high warm water decreases pain and improves health-related quality of life and strength in the lower extremities in women with fibromyalgia. Arthritis Rheum 2006;55:66–73
27. Tomas-Carus P, Häkkinen A, Gusi M, et al. Aquatic training and detraining on fitness and quality of life in fibromyalgia. Med Sci Sports Exerc 2007;39:1044–1050

28. Munguía-Izquierdo D, Legaz-Arrese A. Exercise in warm water decreases pain and improves cognitive function in middle-aged women with fibromyalgia. Clin Exp Rheumatol 2007;25:823–830
29. Menzies V, Taylor AG, Bourguignon C. Effects of guided imagery on outcomes of pain, functional status, and self-efficacy in persons diagnosed with fibromyalgia. J Altern Complement Med 2006;12:23–30
30. Wahner-Roedler DL, Elkin PL, Vincent A, et al. Use of complementary and alternative medical therapies by patients referred to a fibromyalgia treatment program at a tertiary care center. Mayo Clin Proc 2005;80:55–60
31. Sarac AJ, Gur A. Complementary and alternative medical therapies in fibromyalgia. Curr Pharm Des 2006;12:47–57
32. Duncan B, White A, Rahman A. Acupuncture in the treatment of fibromyalgia in tertiary care – a case series. Acupunct Med 2007;25:137–147
33. Singh BB, Wu WS, Hwang SH, et al. Effectiveness of acupuncture in the treatment of fibromyalgia. Altern Ther Health Med 2006;12:34–41
34. Mayhew E, Ernst E. Acupuncture for fibromyalgia – a systematic review of randomized clinical trials. Rheumatology 2007;46:801–804
35. Da Silva GD, Lorenzi-Filho G, Lage LV. Effects of yoga and the addition of Tui Na inpatients with fibromyalgia. J Altern Complement Med 2007;13:1107–1113
36. Reiter RJ, Acuna-Castroviejo D, Tan D. Melatonin therapy in fibromyalgia. Curr Pain Headache Rep 2007;11:339–342
37. Lenstra M, Olszynski WP. The effectiveness of multidisciplinary rehabilitation in the treatment of fibromyalgia. A randomized controlled trial. Clin J Pain 2005;21:166–174

Chapter 13
Cancer Pain

Key Chapter Points:

- About half of all cancer patients experience pain. Pain affects 2 in 3 patients with metastatic disease.
- About half of all patients with cancer-related pain are under-treated for their pain.
- Pain in cancer patients is usually caused directly by cancer, but it may also occur due to cancer treatment effects and additional non-malignant conditions.
- Although most patients with cancer pain will be treated with opioids, therapy should include additional non-opioid and adjuvant medications, along with multidisciplinary pain management treatments.

Key Words Breakthrough pain, Malignancy, Metastasis, Opioid

Case History

Mr. George is a 71-year-old patient with prostate cancer that has metastasized to bone. He completed another course of targeted radiation therapy and reports continued troublesome pain, "I've been using acetaminophen for this pain, doc, but it's been keeping me up at night and I feel miserable all day. I've stopped doing much of anything and just sit around moaning and complaining to my wife. She's really getting frustrated, too. I'm afraid the pain is a sign that I'll need morphine soon and that will be it." His doctor responds, "I see you finished that last course of radiation. That should help. If the pain gets to be a problem, let me know."

Introduction

A recent assessment of over 2,000 cancer patients identified the top five moderate to severe symptoms causing distress among cancer patients: fatigue (reported by 42% of patients), sleeping (32%), finances (31%), pain (29%), and controlling fear

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

and worry about the future (28%).[1] Cancer pain is poorly understood by many patients and often inadequately addressed by the treatment team, as in the case of Mr. George. A survey of cancer patients identified several myths of cancer pain.[2] First, patients often believe that their doctors do not understand why cancer patients are reporting pain, do not believe that their patients are actually having bad pain, or are "mystified" by patient reports of pain. Patients further believe the treatment team is often "too busy" to have time to address pain complaints, likely due to failure by healthcare providers to include pain assessment during visits, as in the case of Mr. George. Second, pain and using pain medications are viewed by patients as omens of impending death. As echoed by Mr. George, surveyed cancer patients particularly viewed starting opioids as a predictor of imminent demise, believing that doses would be increased to achieve sedation and hasten death. When patients had established a trusting relationship with their healthcare provider and this provider took time to explain pain symptoms and the rationale for treatment, patient distress was decreased and pain-relieving therapy was more readily accepted.

Epidemiology of Cancer-Related Pain

Cancer is a global condition, with a 5-year prevalence of about 0.5% worldwide.[3] Prevalence is highest in North America, with 1.5% of the adult population affected. About 1% of the adult population is affected in Australia, Europe, Japan, and New Zealand. Cancer prevalence is increasing in both industrialized and developing countries, with a marked increase among developing countries.[4] Although the incidence was similar between country categories in 1990, the incidence in developing countries

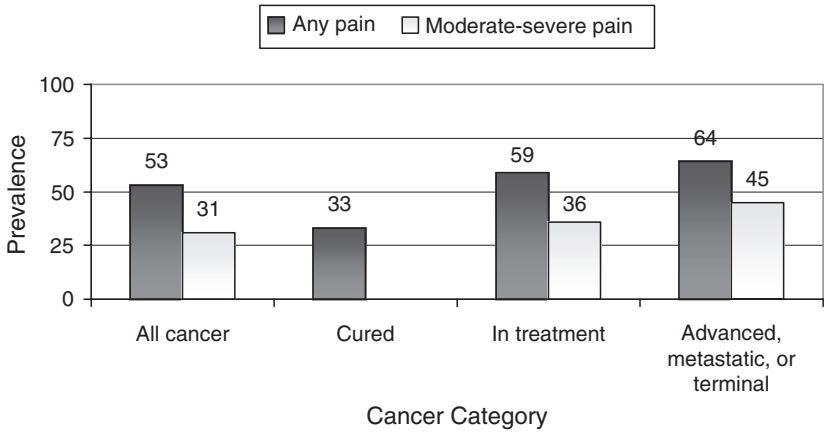


Fig. 13.1 Prevalence of pain among cancer patients (van den Beuken-van Everdingen et al.[5]). Prevalence was determined from a meta-analysis of 52 adult cancer pain studies. Overall pain prevalence was significantly lower for patients after completing curative treatment compared with the other three categories ($P < 0.01$). Data on moderate to severe pain prevalence were not available for patients after completing curative treatment.

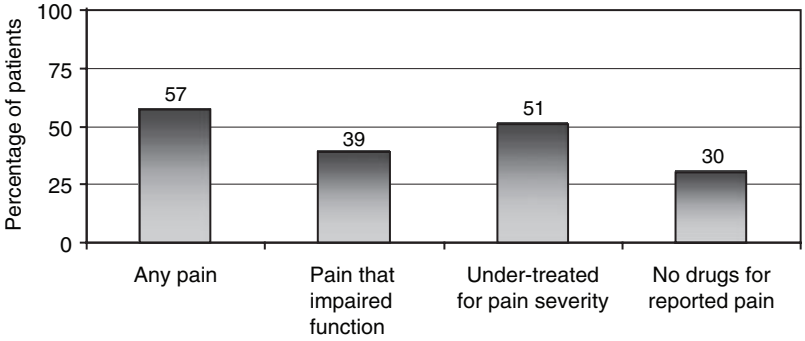


Fig. 13.2 Epidemiology of cancer pain prevalence and its treatment (based on Larue et al.[6]).

currently surpasses that in industrialized nations, with a prediction for almost 2 of every 3 new cancer patients in 2020 to be residing in a developing country.

Pain occurs in the majority of patients with cancer, especially among patients with metastatic disease (Fig. 13.1).[5] Pain during the preceding week was reported by 57% of a representative sample of 601 cancer patients from 20 treatment settings including cancer treatment centers, hospitals, private clinics, and one home care setting (Fig. 13.2).[6] Pain was moderate to severe in over 2 of every 3 patients reporting pain. Using the World Health Organization's ladder to determine appropriate treatment, half of the patients with cancer pain were considered to be under-treated for their pain complaints. One in three cancer patients reporting pain was receiving no pain medication prescriptions, with pain reported as moderate to severe in 39% of these patients.

Cancer Pain Assessement

Cancer pain may be caused by cancer directly, cancer treatment, or non-cancer conditions. Cancer-pain specialists from 21 countries representing five continents collected data on 1,095 consecutive cancer patients with pain severe enough to

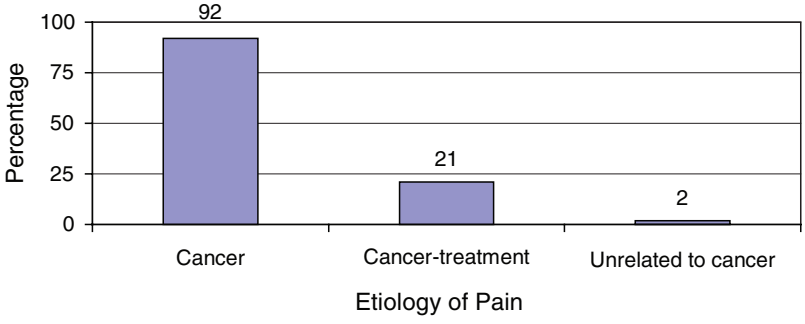


Fig. 13.3 Causes of pain in cancer patients worldwide (based on Caraceni and Portenoy[7]).

Table 13.1 Common causes of pain in cancer patients

Category	Specific causes
Directly caused by cancer	Bony erosion or metastasis
	Mucous membrane ulceration
	Nerve impingement
	Soft tissue infiltration
	Visceral distention
Cancer treatment – chemotherapy	Avascular necrosis hip
	Peripheral neuropathy
	Plexopathy with interarterial infusion
Cancer treatment – radiation	Osteoradionecrosis
	Myelopathy or plexopathy
	Radiation enteritis and proctitis
Cancer treatment – surgery	Phantom pain
	Postoperative pain (e.g., post-mastectomy or post-thoracotomy)
Non-cancer conditions	Musculoskeletal pain
	Zoster and postherpetic neuralgia

require opioid analgesics (Fig. 13.3).[7] Metastatic disease was present in 70% of these patients. Pain could be directly attributed to cancer for the vast majority of patients, although pain caused by cancer treatment occurred in 1 in 5 patients.

Although pain is usually directly related to cancer, assessment should consider additional common causes of pain in cancer patients (Table 13.1). Cancer pain may be caused by visceral, neurological, and musculoskeletal abnormalities. Bony metastases are more likely to be related to pain and functional disability when lesions are lytic.[8] Neuropathic pain may be caused by direct invasion, surgery, or post-surgical scarring, or from radiation or chemotherapy. Musculoskeletal pain syndromes may be caused by direct effects on bones and muscles or severe joint deconditioning due to pain or neurological loss of surrounding structures. Identifying factors contributing to pain are important to allow appropriate understanding of pain complaints and subsequent development of treatment recommendations.

Quantifying Cancer Pain Severity

Doctors treating cancer patients and hospice nurses tend to under-estimate pain severity among cancer patients, which can result in inadequate treatment.[6,9] Choice of therapy often depends on assessments of pain severity, with opioids typically reserved for patients with moderate to severe pain. Optimal cut-off points for cancer pain, using a 0 (no pain) to 10 (pain as bad as you can imagine) severity scale are as follows:

- 1–4: mild pain
- 5–6: moderate pain
- 7–10: severe pain

These pain cut-offs correspond to functional interference, suggesting good validity for clinical pain severity assessment.[10] Similar to other types of chronic pain,

assessment of patients with malignant pain should also include evaluations of psychological distress, social impairments, and functional disability.

Cancer Pain Treatment

The same principles that guide chronic non-malignant pain therapy should also be used for cancer pain, including use of therapies matched to pain severity and multidisciplinary treatment to address pain, functional impairment, and psychosocial factors (Table 13.2). Cancer patients have many concerns that need to be addressed, which are often best managed through multidisciplinary treatment with a treatment team including doctors, nurses, pain-management psychologists, and other therapists. A recent query of patients with breast cancer identified seven areas of concern about pain that patients wanted to be addressed by their healthcare providers (Table 13.3).[11] Addressing patient concerns helps improve important doctor–patient communication, increase the patient's trust in the healthcare provider and investment in participating in treatment, and decrease patient and family fears, anxiety, and depression.

Table 13.2 Cancer treatment options

Treatment category	Treatment options	Conditions treated
Medications		
Analgesics	Acetaminophen	Mild pain
	NSAIDs	Bone pain (e.g., metastases)
	Opioids	Moderate to severe pain
Coanalgesics	Anticonvulsants	Neuropathic pain
	Antidepressants	Neuropathic pain, depression, sleep disturbance
Non-medication treatments		
Psychology	Cognitive therapy	Pain, sleep disturbance
	Affective therapy, counseling	Depression, anxiety
	Family therapy	Family issues with grieving and death
Physical therapy	Exercise, modalities	Musculoskeletal pain
Occupational therapy	Pacing, activity modification	Impairments in daily activities or work duties
Radiation		
Radiation therapy	Fractionated or large, single-dose targeted radiation	Bony metastases
Interventional therapies		
Neurolytic blocks	Celiac plexus blocks	Upper abdominal cancer
Spinal analgesia	Epidural or intrathecal infusions	Moderate to severe pain inadequately managed with oral opioids

NSAID nonsteroidal anti-inflammatory drug

Table 13.3 Typical cancer patient concerns about pain (based on Bender et al.[11])

Information category	Specific questions
Understanding cancer pain	Is the pain caused by my cancer?
	If my pain gets worse, does that mean my cancer is progressing or spreading?
Knowing what to expect	When should I expect to experience pain, and what will it feel like?
	Is there a *normal* pattern of pain that I can expect?
Understanding pain treatment options	What are the different medication and non-medication options?
	How do these treatments work?
	How often can I take medication, how much relief will I get, and how long will the relief last?
	What side effects can I expect?
	Will I develop tolerance or addiction to opioids?
Developing coping skills to control pain interference	What cognitive and behavioral treatments can help me cope with my pain?
Talking with other cancer patients about pain	Do other people with my cancer also get pain? What is their pain like, how has it interfered with their lives, and how do they manage it?
Finding help in managing pain	How much pain relief can I reasonably expect?
	Who should be managing my pain – my family doctor, my oncologist, or someone else?
	Who is a pain specialist and when should I see one?
Describing pain	How can I best describe my pain so my doctor understands what it is like?
	Are there common pain descriptors that I might use?
	What does my doctor really want to know about my pain?

Opioids for Cancer Pain

Opioids are considered the mainstay therapy for managing most patients with cancer pain (Box. 13.1).[12] As in non-malignant pain, cancer pain patients rarely achieve complete pain relief with opioid therapy. A survey of inpatients and outpatients with cancer pain revealed that 2 in 3 patients were considered to be adequately medicated, although complete pain relief occurred in only 21%.[13] Prior to initiating pain medications, patients and their families should be counseled about expectations for pain reduction and advised that complete freedom from pain is unlikely to occur at tolerable drug doses.

Achieving adequate pain relief with opioids may be further limited by the occurrence of treatment-limiting side effects. The occurrence and severity of side effects commonly attributed to opioids was surveyed in 42 consecutive cancer inpatients and outpatients treated with morphine (Fig. 13.4).[14] Directly attributing side effects to morphine was limited since most patients were using concomitant medications (most commonly other analgesics, tricyclic antidepressants, benzodiazepines, and phenothiazines). Despite these limitations, this study supports that, while many side effects occur frequently among cancer patients treated with morphine, moderate

Box 13.1 Steps to opioid therapy for cancer pain (based on National Comprehensive Cancer Network recommendations)

- Step 1: Ensure that pain is not related to medical condition (e.g., infection, obstruction, metastatic disease)
- Step 2: Treat mild pain with non-opioid analgesics. If ineffective, add opioid:
  - 5–10 mg oral morphine equivalent if not currently using opioids.
  - If using opioids, increase dose by 25%.
  - Maximize bowel regiment.
  - Add antinausea medications, as needed.
- Step 3: Treat moderate pain with opioids.
  - 5–10 mg oral morphine equivalent if not currently using opioids.
  - If using opioids, increase dose by 25–50%.
  - Maximize bowel regiment.
  - Add antinausea medications, as needed.
- Step 4: Treat moderate pain with opioids.
  - 2–5 mg intravenous morphine if not currently using opioids.
  - If using opioids, increase dose by 50–100%.
  - Maximize bowel regiment.
  - Add antinausea medications, as needed.

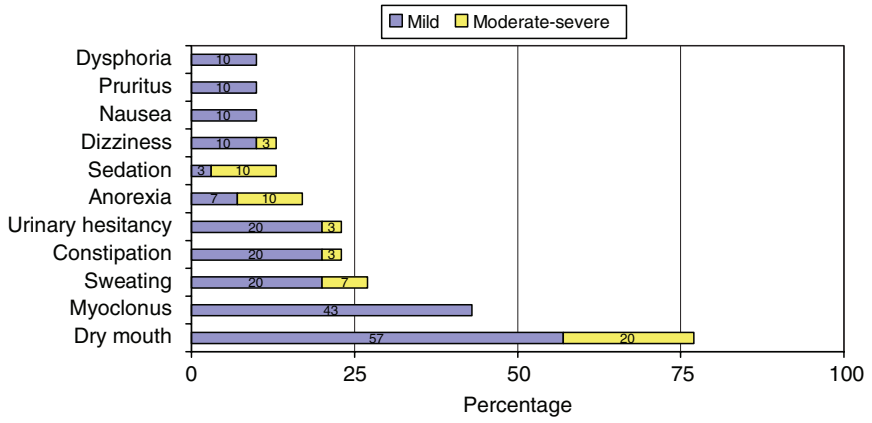


Fig. 13.4 Prevalence and severity of opioid-related side effects (based on Glare et al.[14]).

to severe side effects occur infrequently. Additionally, opioids are often restricted due to concerns about cognitive effects. While impaired mental status occurs frequently among cancer patients, especially in the final stages of illness,[15,16] uncontrolled pain also reduces cognitive ability. For example, a study of 130 consecutive

cancer patients showed greater impairment in neuropsychological testing from uncontrolled pain than chronic opioids.[17] It is important to recognize that adverse events occurring in opioid-treated patients may be caused by other conditions, including directly from cancer or indirectly from other non-opioid treatments.

Opioid-related side effects may be managed through symptomatic treatment or opioid adjustment (Table 13.4).[18] When switching between opioids, consider reducing the dose of the new opioid by 30–50% as patients are often incompletely cross-tolerant to a new opioid, which may result in unexpectedly increased sensitivity to the new opioid.

Table 13.4 Managing opioid-related side effects (based on Cherny et al.[18])

Symptom	Management strategies
Cognitive dysfunction	Antipsychotic for delirium
	Benzodiazepine for agitation
	Change specific opioid
Constipation	Laxative
	Stool softeners
	Convert to transdermal fentanyl
Myoclonus	Antispasmodic
	Change specific opioid
Nausea and vomiting	Antinausea medications
	Change specific opioid
	Convert from oral to subcutaneous dosing
Pruritis	Antihistamine
Sedation	Amphetamine psychostimulant
	Change specific opioid
	Convert from oral to subcutaneous dosing

Fears of promoting addiction among both healthcare providers and patients often limit effective pain control with opioids, even among patients with cancer-related pain. While the prevalence of addiction has been reported in as many as 50% of patients with chronic non-malignant pain, this number is substantially reduced to only as many as 8% among patients with cancer pain.[19] Frank discussions about addiction concerns should be initiated with patients and their families to prevent excessive medication restrictions due to exaggerated fears of abuse risk.

Breakthrough Pain

Breakthrough pain (BTP) is defined as a temporary severe pain flare occurring in patients with relatively well-managed baseline pain. BTP should not be diagnosed unless daily pain is reasonably well controlled. Frequent BTP episodes occurring more than four times daily suggest inadequately treated chronic cancer pain.[20] In

that case, a reassessment of daily pain and pain management strategies should be employed before initiating treatment for BTP.

Patients should be routinely queried about BTP due to an expectedly high prevalence of BTP among opioid-treated cancer patients. An international survey reported BTP in 65% of 1,095 cancer pain patients treated with chronic opioids.[21] BTP occurs most commonly in cancer patients with bone pain, local tumor invasion of soft tissues, and brachial plexopathy.[22] Those with bone pain located in the spine, back, and pelvis are most resistant to pain-relief therapies.

BTP can be divided into incident, end-of-dose, and idiopathic pain. Pain diaries can assist in determining the type of BTP to help determine the best treatment options (Table 13.5).[23] In addition to behavioral strategies, predictable incident BTP is often well managed with the administration of simple analgesics or short-acting opioids 30 minutes before participation in the usually triggering activities. Short-acting fentanyl is available in oral transmucosal and buccal tablet forms, both of which provide pain relief in about 15 minutes, with a duration of at least 1 hour.[24] Among cancer patients, 2 in 3 patients responded well to the management of BTP, while 1 in 3 are non-responders.[22]

Table 13.5 BTP categories and treatment

BTP category	Predictability and duration	Triggers	Treatments
Incident	Predictable Rapid onset (3–5 minutes) Brief pain duration (30 minutes)	Related to specific event or activity	Pre-activity stretching and analgesics Posture correction and pacing techniques
End-of-dose	Predictable Gradual onset Long duration	Prior to scheduled dose of long-acting opioid	Increasing maintenance of daily long-acting opioid dosage and/or shortening of dosing interval
Idiopathic	Unpredictable Rapid onset (3–5 minutes) Brief pain duration (30 minutes)	Unidentified	Lipophilic fentanyl

Radiation

Targeted radiation can provide symptomatic treatment for bone metastases. Tumor cell death is proportional to the radiation dose administered, with larger doses resulting in greater cell death and pain relief. Large, single-dose radiation may be as effective and more convenient for relieving pain as more frequent, lower-dosing fractionation schedules.[25]

Interventional Therapies

Spinal analgesia may offer cancer pain relief for select, refractory patients requiring high-dose opioid analgesia. Direct activation of spinal cord opioid receptors with spinal analgesia administered through epidural or intrathecal infusions more effectively reduces pain severity than receptor activation at higher centers using systemic drug administration. Consequently, cancer pain can be managed by using an intrathecal morphine dose that is about 1% of the systemic oral dose needed to achieve similar pain control. External pumps can be used to deliver drug in patients with limited life expectancy, with internal pumps generally preferred for patients expected to survive longer than 3 months. A randomized, controlled study showed a trend toward superior pain control and survival among cancer patients receiving intraspinal opioid through an implantable infusion system (Fig. 13.5).[26] In this study, 200 patients with advanced cancer and refractory pain were randomly assigned to pain treatment with intraspinal or oral opioids along with comprehensive medical management. The median daily systemic morphine oral equivalent dose at baseline was 250 mg for those randomized to intraspinal opioids and 272 mg for those randomized to continue oral therapy. One month after study entry, the median equivalent dose decreased to 50 mg in the intraspinal group and increased to 290 mg in the oral opioid group. Mean reductions in pain and 6-month survival showed trends toward superiority with intraspinal opioids ($P = 0.06$). Reduction in toxicity was significantly greater with intraspinal opioids ($P = 0.004$).

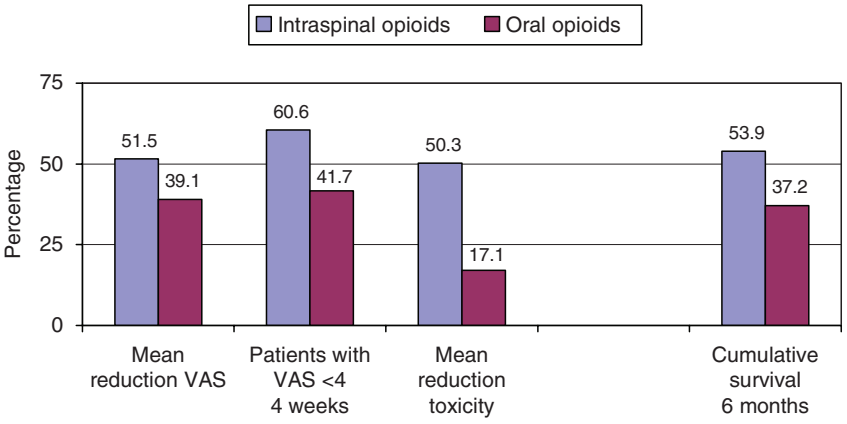


Fig. 13.5 Randomized study of intraspinal vs. oral opioids for refractory cancer pain (based on Smith et al.[26]). *VAS* visual analogue pain scale.

Neurolytic intervention may be considered when symptoms cannot be adequately controlled and life expectancy is limited. Neurolytic procedures are generally performed using fluoroscopic guidance after ensuring a desirable result with a local anesthetic block. Neurostimulators may also be helpful for cancer patients with refractory pain related to spinal, radicular, or plexus pathology. In addition, tumor debulking may effectively reduce pain by minimizing impingement on pain-provoking structures.

Summary

Patients diagnosed with cancer should be informed that about half of all cancer patients experience pain and that their healthcare providers will be regularly assessing them for pain complaints. Patients should understand that cancer pain is often caused directly by cancer, but may also occur due to cancer treatment effects and additional non-malignant conditions. Patients should not be afraid of discussing their pain symptoms for fear that their healthcare providers are too busy to address pain, that pain necessarily signifies disease progression, or that treatment will result in intolerable side effects or addiction. Cancer patients seek direct information about the cause(s), expected prognosis, and available treatment options for their cancer pain. Patients also need clear direction about who will be managing their pain complaints. Despite the frequent occurrence of pain in cancer patients, about half of all patients with cancer-related pain are under-treated for their pain. Although most patients with cancer pain will be treated with opioids, therapy should include additional non-opioid and adjuvant medications, along with multidisciplinary pain management treatments.

Test Your Knowledge

1. What percentage of cancer patients experience pain?

   a. 5%
   b. 25%
   c. 50%
   d. 85%
   e. 100%

2. What is the recommended optimal cut-off for moderate pain using a 0–10 pain severity scale?

   a. 3–5
   b. 3–6
   c. 4–7
   d. 5–6
   e. 5–7

3. Cancer patients seek additional information to understand which of the following:

   a. The cause of their pain
   b. Expected pain prognosis
   c. A full range of treatment options
   d. Who should be managing their pain
   e. All of the above

4. Opioid-related side effects may be managed by the following:

   a. Change in opioid dosage
   b. Switching to an alternative opioid
   c. Adding additional symptomatic treatment
   d. Switching route of opioid administration
   e. B and D
   f. All of the above

5. Addiction occurs in about how many patients treated with opioids for cancer pain:

   a. <10%
   b. 25%
   c. 35%
   d. 50%
   e. 65%
   f. 85%

6. Choose the correct statement about BTP:

   a. BTP is defined as any pain flare occurring in cancer patients.
   b. Frequent episodes of BTP occurring more than 5 times daily should be managed with intermittent dosing with short-acting opioids.
   c. BTP is uncommon in cancer patients treated with chronic opioids for bone pain.
   d. All of the above
   e. None of the above

Answers: 1c, 2d, 3e, 4f, 5a, 6e

References

1. Loscalzo MJ, Clark KL. Problem-related distress in cancer patients drives requests for help: a prospective study. Oncology 2007;21:1133–1138
2. Reid CM, Gooberman-Hill R, Hanks GW. Opioid analgesics for cancer pain: symptom control for the living or comfort for the dying? A qualitative study to investigate the factors influencing the decision to accept morphine for pain caused by cancer. Ann Oncol 2008;19:44–48
3. Pisani P, Bray F, Parkin DM. Estimates of the world-wide prevalence of cancer for 25 sites in the adult population. Int J Cancer 2002;97:72–81
4. Salminen E, Izewska J, Anreo P. IAEA's role in the global management of cancer-focus on upgrading radiotherapy services. Acta Oncol 2005;44:816–824
5. Van den Beuken-van Everdingen MJ, de Rijke JM, Kessels AG, Schouten HC, van Kleff M, Patijn J. Prevalence of pain in patients with cancer: a systematic review of the past 40 years. Ann Oncol 2007;18:1437–1449
6. Larue F, Colleau SM, Brasseur L, Cleeland CS. Multicentre study of cancer pain and its treatment in France. BMJ 1995;310:1034–1037
7. Caraceni A, Portenoy. An international survey of cancer pain characteristics and syndromes. Pain 1999;82:263–274

8. Vassiliou V, Kalogeropoulou C, Petsas T, Leotsinidis M, Kardamakis D. Clinical and radiological evaluation of patients with lytic, mixed and sclerotic bone metastases from solid tumors: is there a correlation between clinical status of patients and type of bone metastases? Clin Exp Metastasis 2007;24:49–56
9. Bernardi M, Catania G, Tridello G. Knowledge and attitudes about cancer pain management. A national survey of Italian hospice nurses. Cancer Nurs 2007;30:E20–E26
10. Li KK, Harris K, Hadi S, Crow E. What should be the optimal cut points for mild, moderate, and severe pain? J Palliative Med 2007;10:1338–1346
11. Bender JL, Hohendael J, Wong J, et al. What patients with cancer want to know about pain: a qualitative study. J Pain Symptom Manag 2008;35:177–187
12. http://www.nccn.org/professionals/physician_gls/default.asp (accessed September 10, 2007)
13. Beck SL, Falkson G. Prevalence and management of cancer pain in South Africa. Pain 2001;94:75–84
14. Glare P, Walsh D, Sheehan D. The adverse effects of morphine: a prospective survey of common symptoms during repeated dosing for chronic cancer pain. Am J Hosp Palliative Med 2006;23:229–235
15. Lawlor PG. The panorama of opioid-related cognitive dysfunction in patients with cancer: a critical literature appraisal. Cancer 2002;94:1836–1853
16. Leipzig RM, Goodman H, Gray G, Erle H, Reindenberg MM. Reversible, narcotic-associated mental status impairment in patients with metastatic cancer. Pharmacology 1987;35:47–54
17. Sjøgren P, Olsen AK, Thomsen AB, Dalberg J. Neuropsychological performance in cancer patients: the role of oral opioids, pain and performance status. Pain 2000;86:237–245
18. Cherny N, Ripamonti C, Pereira J, et al. Strategies to manage the adverse effects of oral morphine: an evidence-based report. J Clin Oncol 2001;19:2542–2554
19. Højsted J, Sjøgren P. Addiction to opioids in chronic pain patients: a literature review. Eur J Pain 2007;11:490–518
20. Payne R. Recognition and diagnosis of breakthrough pain. Pain Med 2007;8 (suppl 1): S3–S7
21. Caraceni A, Martini C, Zecca E, et al. Breakthrough pain characteristics and syndromes in patients with cancer pain. An international survey. Palliat Med 2004;18:177–183
22. Hwang SS, Chang VT, Kasimis B. Cancer breakthrough pain characteristics and responses to treatment at a VA medical center. Pain 2003;101:55–64
23. McCarberg BH. The treatment of breakthrough pain. Pain Med 2007;8 (suppl 1):S8–S13
24. Portenoy RK, Taylor D, Messina J, Tremmel L. A randomized, placebo-controlled study of fentanyl buccal tablet for breakthrough pain in opioid-treated patients with cancer. Clin J Pain 2006;22:805–811
25. Bezjak A, Dixon P, Brundage M, et al. Randomized phase III trial of single versus fractionated thoracic radiation in the palliation of patients with lung cancer. Int J Radiat Oncol Biol Phys 2002;54:719–728
26. Smith TJ, Staats PS, Deer R, et al. Randomized clinical trial of an implantable drug delivery system compared with comprehensive medical management for refractory cancer pain: impact on pain, drug-related toxicity, and survival. J Clin Oncol 2002;20:4040–4049

Chapter 14
Pediatric Pain

Key Chapter Points:

- Most chronic pain syndromes in children are not associated with significant, identifiable pathology or serious illness.
- Common pain syndromes in children and adolescents include musculoskeletal pain, headache, stomach ache, and chest pain.
- Chronic pain complaints in childhood tend to persist for at least 1 year and, therefore, require treatment.
- Pain in children and adolescents results in significant disability, including school absence.
- Psychosocial factors, including changes in family and school stress, are significant aggravating factors for pediatric pain.

Key Words Migraine, Irritable Bowel Syndrome, Recurrent Abdominal Pain, School, Stomach Ache

Case History

Sarah is a 12-year-old girl who comes to the pediatrician with her mother, who reports that Sarah has been missing school because of abdominal pain. The pain is located in the center of her abdomen around the belly button. She has had no change in weight or bowel habits, and eating does not affect her pain. The abdominal pain began approximately 2 weeks after Sarah started seventh grade. Sarah's mother is particularly concerned about school absences because Sarah is now attending junior high school, where the curriculum is more demanding than in elementary school. Sarah is a quiet girl who has always performed well academically, but does not participate in extracurricular activities and tends to have only one or two close friends. Significant stressors for Sarah are parental conflicts over an impending custody hearing and the recent loss of her best friend, whose family relocated to another state. Sarah's examination is unremarkable, with no focal tenderness or organomegaly. Sarah is questioned about sexual activity or abuse,

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

both of which she denies. Sarah's doctor reassures her mother that she is probably just having *growing pains*, which will resolve on their own.

Introduction

Children, like adults, may also suffer from chronic pain syndromes, especially musculoskeletal pain, headaches, and, as in Sarah's case, abdominal pain. When these pain complaints occur in children with no identifiable pathology, they may be termed *growing pains*, and expected to resolve spontaneously if disregarded. The poor credibility with which many healthcare providers hold pediatric pain complaints was evaluated in an interesting survey of school nurses treating students with recurrent abdominal pain, with one in three nurses attending >10 cases per month.[1] The vast majority of nurses believed that these chronic pain symptoms were not serious and reflected attention-seeking behavior or psychological distress (Fig. 14.1). As seen with Sarah, psychosocial stressors are frequently associated with pediatric pain, often advancing the impression that reports of pain are contrived or exaggerated. Treating pediatric pain complaints like a bad behavior that can be extinguished by ignoring it can result in persistent discomfort and school disability, and possibly increase risks for adult pain complaints.

The possible long-range effects of early pediatric pain experiences have been evaluated in both animal and human studies. Over the last decade, studies have suggested that exposure to repeated painful procedures during early development results in profound changes in sensitivity of nociceptive pathways, with both animal and human studies showing that perinatal pain experiences increase pain responses beyond the period of infancy.[2] For example, pain responses to routine injection at 4–6 months of age were rated using both facial action and cry duration in boys who had undergone postdelivery circumcision.[3] Pain reactions were about twice as high in those babies who had been previously circumcised without Emla anesthesia compared with those having the procedure with anesthesia ($P < 0.05$).

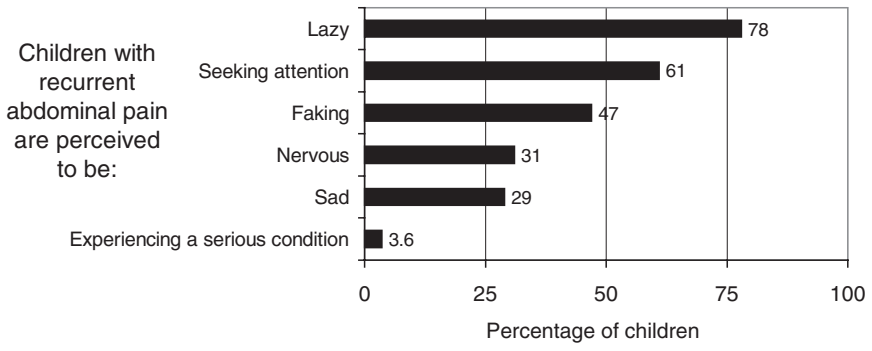


Fig. 14.1 School nurse perceptions of recurrent abdominal pain (based on Youssef[1]).

In another study with adolescents, 18 areas identified as typically tender in fibromyalgia patients were tested for pain response in adolescents who had been born prematurely and treated in a neonatal intensive care unit (NICU) and adolescents born at full term. Adolescents who had experienced more early painful procedures in the NICU reported significantly more tender areas (6.0 vs. 3.3; $P = 0.001$) and a lower threshold for tender points (4.2 vs. 4.8 kg; $P = 0.04$).[4] In a separate study, NICU experiences were associated with earlier onset (age 7.8 vs. 9.7 years; $P < 0.01$) pediatric migraine with a greater need for preventive therapies (65% vs. 25%) in comparison with pediatric migraineurs with no NICU exposure.[5] These data support an increased need to aggressively treat pediatric pain syndromes, in hopes of reducing adult chronic pain.

Pediatric pain complaints are common, with symptoms often persisting and resulting in interference at home and school. A survey of 749 school-aged children identified pain during the preceding 3 months in 83% of students, with one in three reporting ongoing pain for >6 months.[6] Pain occurred at least once per week in 35% of students. The most common pain locations were the head and abdomen (Fig. 14.2). Nearly half of those students reporting pain experienced school absences. Restrictions in activities of daily living were most likely to affect students with headache or abdominal pain.

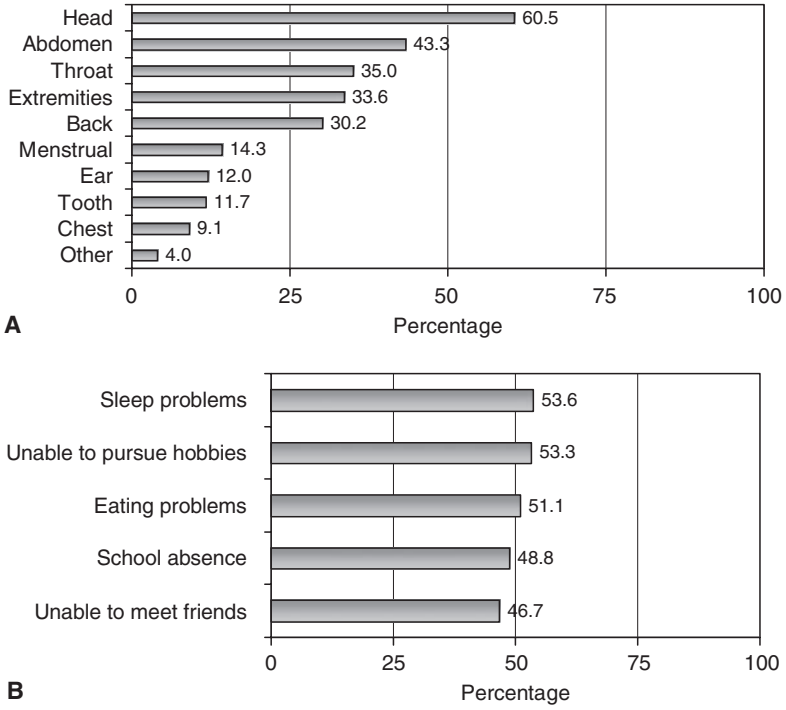


Fig. 14.2 Three-month pain prevalence in school children (based on Roth-Isigkeit[6]). (**A**) Pain location, (**B**) Pain impact.

Although there may be a tendency to expect children to *outgrow* their pain complaints, symptoms often persist and result in substantial disability, as we are beginning to see with our patient Sarah. Evaluation of 149 children (mean age = 11.8 years) with chronic pain lasting at least 3 months unrelated to a specific illness or diagnosis identified musculoskeletal pain, abdominal pain, and headache as the most common pediatric chronic pain conditions (Fig. 14.3).[7] Half of these children experienced school absences due to pain, with 14% missing school for 3 or more consecutive months. Social impairment and restriction of extracurricular activities also occurred frequently.

Because of the substantial impairment and interference with both academic and social development associated with childhood chronic pain, children with persistent or recurring pain complaints should be evaluated and managed, similar to adult pain patients. Sarah's consultation for chronic pain provides an important opportunity to develop strategies for minimizing both the discomfort and impact from her pain, as well as the important influence of psychosocial stressors, such as her feelings of isolation and abandonment with her parents' impending divorce and the loss of her closest friend. Because, in most circumstances, children do not readily outgrow

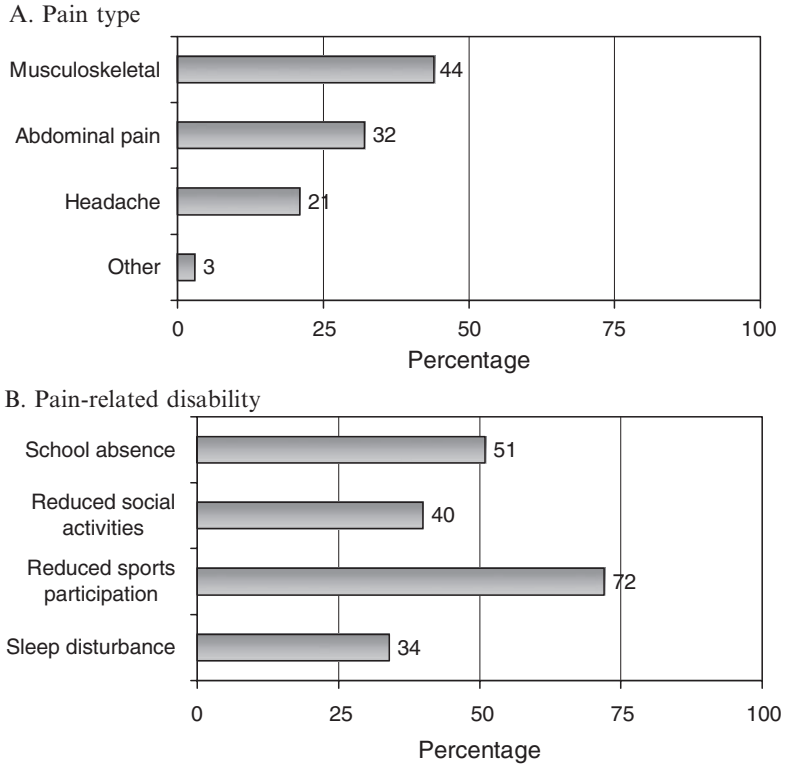


Fig. 14.3 Chronic pain in children (based on Konijnenberg[7]). (**A**) Pain type, (**B**) Pain-related disability.

pain complaints, failure to address these issues initially will likely result in prolonged dysfunction in school and social relationships, possibly setting the stage for chronic pain disability in adulthood.

Common Chronic Pain Syndromes in Children and Adolescents

Common chronic pain syndromes in children include musculoskeletal pain, headache, abdominal pain, and chest pain. A survey of children aged 7–17 years identified recurrent headache in 15%, stomach pain in 8%, and back pain in 5% (Fig. 14.4).[8] All pain complaints occurred more often in girls. Headache and back pain increased with age. Frequent episodes of pain in the head, stomach, and back occur in a significant minority of children (Fig. 14.5).[9]

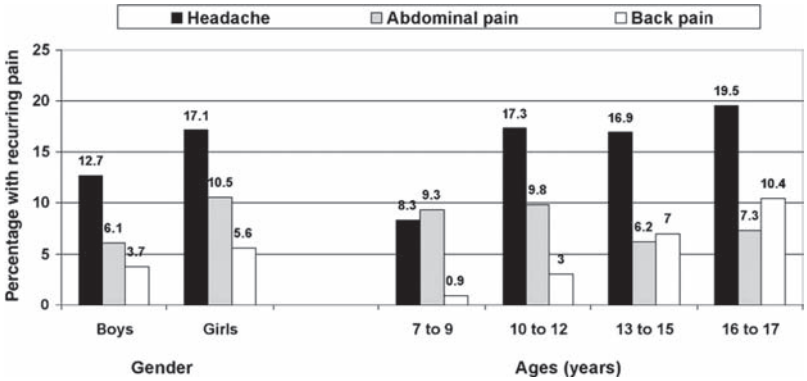


Fig. 14.4 Prevalence of recurring pain in children and adolescents. All pain complaints were more frequent in girls ($P<0.001$) and were affected by age ($P<0.01$) (based on Grøholt[8]).

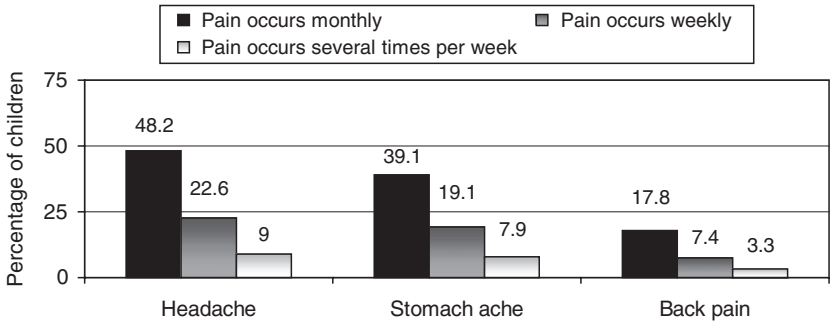


Fig. 14.5 Prevalence of frequent, recurring pain in young children (aged 6–13 years) (based on Petersen[9]).

Musculoskeletal Pain

A total of 1,113 asymptomatic school children (mean age = 10.8 years) were followed for 1 year for the development of musculoskeletal pain.[10] New episodes of musculoskeletal pain occurred in 21.5% of children. In order of descending frequency, the most commonly affected areas were the neck, lower extremity, back, upper extremity, and chest. Only one in five pain episodes was attributed to a specific trauma. A separate analysis of this same data pool showed that musculoskeletal pain persisted for 4 years into adolescence in 64% of those reporting childhood musculoskeletal pain.[11]

Back pain is one of the most common pain complaints in adulthood, and also affects a significant minority of children, especially adolescents. A survey of 7,542 students ages 13–15 years identified episodes of nonspecific low back pain in 20.5%.[12] Three in every four students with low back pain were evaluated by a healthcare provider, with 40% consulting more than one healthcare provider. One in three students needed to temporarily stop sports activities due to the pain. A twin study of 1,790 twin pairs (median age = 11.4 years) similarly identified low back pain occurring once a month in 15.7% of children and daily–weekly in 6.7%.[13] Genetics played only a minor role in the prevalence of low back pain. Several modifiable risk factors have been linked to increased risk for low back pain in adolescents (see Box 14.1).[14–16]

Box 14.1 Risk factors for low back pain in adolescents (based on Korovessis[14], Skoffer[15], and Skoffer[16])

- Assymetrical backpack
  - Wearing school bag on one shoulder
- General physical inactivity
- Participation in high-impact sports

Headache

Chronic headache often begins in childhood and adolescence and continues into adulthood. A prospective study collected 30-day headache diaries from 2,126 children aged 7–12 years.[17] Over half of all children reported having at least one headache episode during the preceding 30 days, with frequent headache in one in ten children (Fig. 14.6).

Childhood headache is important because children with headache lose an average of 7.8 days per school year, compared with 3.7 days per year lost for children without headaches.[18] Frequent school absenteeism is a significant stressor, resulting

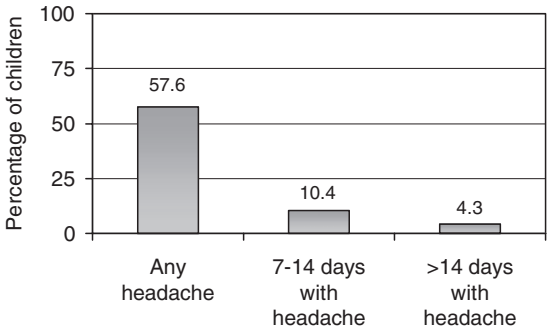


Fig. 14.6 Headache prevalence in children ages 7–12 (based on Lundqvist[17]).

in loss of academic performance, social interaction with peers, and self-esteem. These factors, themselves, often aggravate pain perception. For example, low self-esteem and depressive symptoms are premorbid predictors of adolescent headache in girls.[19] A survey of 5,562 children aged 8–16 years identified recurring headache in almost half of respondents (Fig. 14.7).[20] Similar to adults, migraine was diagnosed in 10% of children, with a female preponderance. Tension-type headache is much less common in children than in adults. This study also highlighted the important relationship between recurring headache and school stress. Children with chronic headaches characteristically report head pain during the school day and being headache-free for after-school activities, weekends, and school vacations. A survey of almost 2,000 adolescent migraineurs revealed that migraine most commonly occurred during school time, typically on Monday through Wednesday between 6 A.M and 6 P.M.[21] The strong influence of school stress on pediatric migraine frequently leads to the false interpretation by peers, teachers, and parents that reports of headache are fictitious excuses to avoid schoolwork rather than a physiological reaction to school-related stressors.

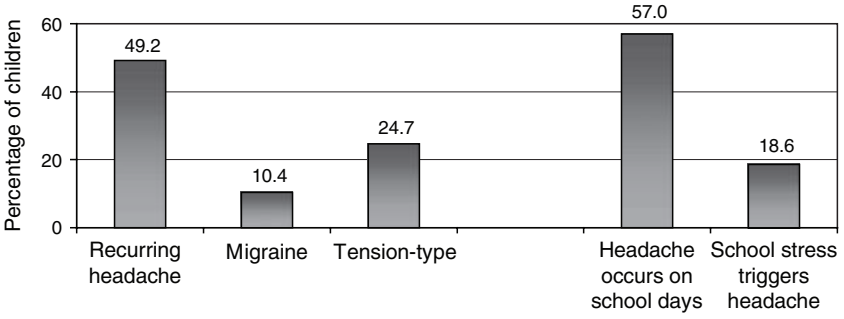


Fig. 14.7 Prevalence of recurring headache and relation to school in children aged 8–16 years old (based on Ozge[20]).

Headaches often change over time in pediatric patients. Headache activity and diagnoses were compared in 227 children and adolescents at an initial assessment and again at a long-term follow-up conducted an average of 6.6 years later (Fig. 14.8).[22] One in three children who had presented with migraine or tension-type headache became headache-free at long-term follow-up. One in four or five children shifted between migraine and tension-type headache diagnoses.

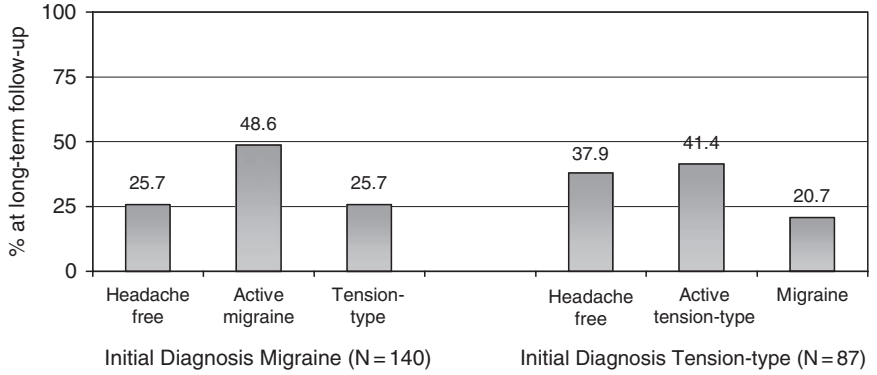


Fig. 14.8 Long-term prognosis of primary pediatric headache (based on Kienbacher[22]).

Recurrent Abdominal Pain

Recurrent abdominal pain is defined as chronic pain (>3 months) with three or more episodes of abdominal pain that are severe enough to interfere with activities.[23] Recurrent abdominal pain increases in prevalence during childhood, with a female predominance after adolescence (Fig. 14.9).[24,25] As seen in Sarah, recurrent abdominal

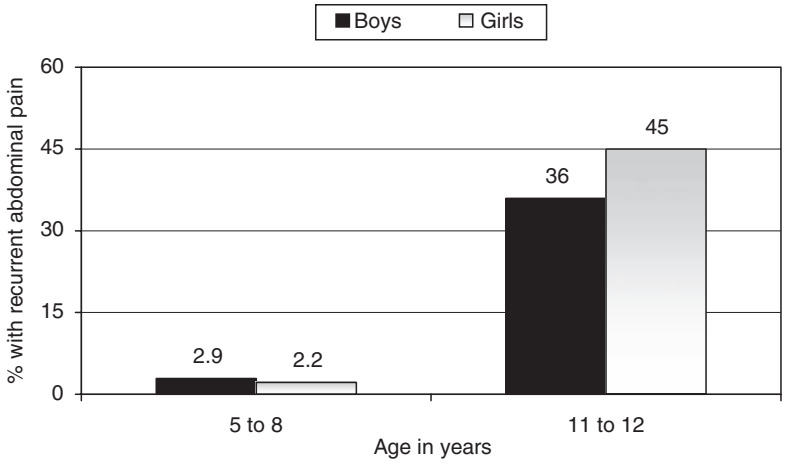


Fig. 14.9 Prevalence of recurrent abdominal pain. There is no sex preference for recurrent abdominal pain in early childhood. A female predominance develops in adolescence (based on Boey[25] and Bode[24]).

pain is typically experienced as episodic pain around the umbilicus that is unrelated to eating or activities. In addition, there should be no interference with nutrition or growth. Recurrent abdominal pain is often not associated with any identifiable pathology, although several treatable conditions may cause recurrent abdominal pain (see Box 14.2). An evaluation of 103 patients with recurrent abdominal pain (mean age = 10.0 years) showed that symptoms could be attributed to specific organic pathology in only one in three patients (see Table 14.1).[26] The most common single diagnosis was irritable bowel syndrome. Factors associated with non-organic and organic conditions were identified (see Table 14.2).

Recurrent abdominal pain and migraine are comorbid and may share common underlying pathological mechanisms. Compared with headache-free children, the risk of stomach ache in 5-year-old children with headache was almost nine times greater in children reporting infrequent headache and 14 times greater in children with frequent headache.[27] In addition, migraine is more likely to develop in adults

Box 14.2 Identifiable causes of some cases of recurrent abdominal pain

- Irritable bowel syndrome
- *Helicobacter pylori* gastritis
- Constipation
- Lactose intolerance
- Inflammatory bowel disease (especially early Crohn's disease)
- Abdominal migraine
- Gynecologic pathology
  - Endometriosis
  - Pelvic inflammatory disease
  - Ovarian cysts

Table 14.1 Causes of recurrent abdominal pain (based on El-Matary[26])

Pain diagnosis	Percentage
Non-organic diagnoses	
Irritable bowel syndrome	35.9
Functional	30.1
Constipation	2.9
Abdominal migraine	1.0
Organic diagnoses	
Gastroesophageal reflux	8.7
H. pylori gastritis	7.8
Crohn's disease	6.9
Celiac disease	3.6
Duodenal ulcer	1.0
Food allergy	1.0
Lactase deficiency	1.0

Table 14.2 Factors significantly linked to non-organic or organic diagnoses in children with recurrent abdominal pain ($P < 0.05$) (based on El-Matary[26])

Factors associated with	
Non-organic abdominal pain	Organic abdominal pain
Periumbilical pain location	Tenderness on exam
Low-fiber diet	Nocturnal pain
Partial evacuation	
Relief after defecation	

who had childhood recurrent abdominal pain; 36% with recurrent abdominal pain develop migraine compared with 14% without recurrent childhood abdominal pain.[28] Further support for a relationship between migraine and recurrent abdominal pain is the effectiveness of anti-migraine therapy for treating recurrent abdominal pain, including propranolol, cyproheptadine, and biofeedback.[29,30]

Abdominal pain symptoms of childhood may continue into adulthood. One study evaluated the outcome of childhood recurrent abdominal pain (mean age at diagnosis = 6.6 years) by re-evaluating these children when they became young adults (5–13 years after the initial diagnosis).[31] Adult irritable bowel symptoms were reported by 29% of these subjects at follow-up. Therefore, as with other types of chronic pain, recurrent abdominal pain in childhood should be treated to prevent continuation of symptoms into adulthood.

Chest Pain

Chronic chest pain in pediatrics is typically caused by costochondritis or some other musculoskeletal condition (Table 14.3). An evaluation of 50 children referred to a cardiologist for chest pain revealed noncardiac conditions in every patient, mainly musculoskeletal pain or costochondritis (76%).[32] In a similar survey of 161 pediatric patients seen in the emergency department with a chief complaint of chest pain, investigators found cardiac pathology (extrasystole) in only one patient.[33] In addition, the absence of associated symptoms (e.g., shortness of breath, palpitations, digestive complaints, and weight loss) correlated with musculoskeletal, idiopathic, or psychogenic causes of chest pain.

Assessment

Assessment of children and adolescents with pain focuses on ensuring the absence of specific pathology (e.g., rheumatologic disease, fractures, or tumors) and the identification of psychosocial contributors (e.g., school stress, bullying, depression, or major life changes). A thorough history and physical examination are necessary. Both patient and family should be included when obtaining a history. Historical

Table 14.3 Causes of pediatric chest pain (%) in patients referred to cardiologist or evaluated in an emergency department (based on Evangelista[32] and Larranaga[33])

	Cardiologist referred	Emergency department		
	Total	Total	No associated symptoms	Associated symptoms
Musculoskeletal, idiopathic, or psychogenic	80	86	97	72
Infectious	0	9	1	8
Asthma	12	3	0.6	2
Gastrointestinal	8	0.6	0	0.6
Cardiac	0	0.6	0	0.6

reports of pain, risk behaviors, trauma, and possible abuse will also need to be asked of the child separately. As in adults, childhood abuse has similarly been linked to increased risk for pain complaints in children.[34] Dissimilar reports of pain symptoms or severity between patient and parent should warrant further evaluation of family dynamics and psychosocial influences. Physical examination should include a screen for systemic illness (lymphadenopathy, organomegaly, livedo reticularis, or subcutaneous nodules), as well as a targeted evaluation of the painful area. Assessment of weight and height is also needed to ensure adequate nutritional status, especially in adolescent girls at risk for anorexia nervosa. As in adults, the presence of non-localized pain, superficial skin tenderness, sensory loss not affecting typical neurological patterns (e.g., dermatomes), and giveaway weakness suggest a nonspecific cause of pain complaints, with reduced need for extensive testing.[35]

Musculoskeletal Pain

Children with musculoskeletal pain should be evaluated for evidence of joint disease, such as arthritis or fracture, and neurological impairment. Musculoskeletal pain may be difficult to diagnose in children, who often misinterpret the origin of their pain. For example, children with hip pathology often describe thigh or knee pain. Therefore, the entire extremity needs to be thoroughly evaluated in children describing any joint area pain. Myofascial pain in children shares the same features seen in adult patients (see Chap. 11). Physical therapy evaluations may be helpful in patients with complex symptoms or reports of mechanical pain.

Headache

In children presenting with acute headache, infectious etiologies, such as viral illness and sinusitis, are common and should be considered.[36] Imaging studies of the head are best reserved for children who have experienced traumatic or progressive headache, have a history of neurological illness (e.g., hydrocephalus), or have an abnormal

neurological examination.[37] As in adult populations, children who experience a significant change in chronic headache pattern, chronic progressive headaches, or failure to respond to standard therapy may also need additional medical and neurological evaluations, including an imaging study.

The diagnosis of migraine in children differs from that in adults (Table 14.4). Children with migraine are less likely to endorse adult hallmark characteristics of migraine (Fig. 14.10).[39] Although both children and adults report disabling headaches, migraine is more likely to be bilateral, shorter in duration, and lack reports of photophobia and phonophobia in children.[38] Children often fail to verbally express migrainous features, such as sensitivities to noises and lights. A variety of migraine features that are not identified during clinical interview may first be recognized when headache diaries are reviewed. Migraine features that were initially unrecognized on interview but later identified after diary review in one study included aura (46%), vomiting (50%), nausea (31%), unilateral location (38%), throbbing quality (29%), photophobia (11%), and phonophobia (11%).[40] Thus, the

Table 14.4 Diagnostic distinctions between pediatric and adult migraine (based on The International Classification of Headache Disorders[38])

	Adult	Pediatric
Location	Unilateral	Usually bilateral. Occipital migraine is rare and warrants additional evaluation.
Duration	4–72 hours	1–72 hours
Associated symptoms	Photophobia and phonophobia are usually present	Children rarely verbalize sensitivity to noise and lights; photo- and phonophobia may be inferred from behavior (e.g., retreating to dark, quiet room; turning off television or computer).

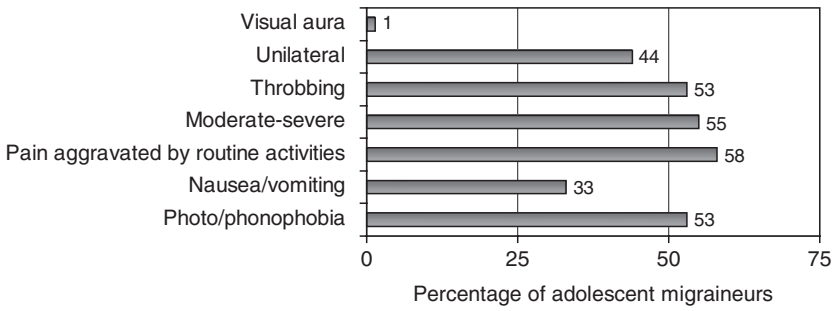


Fig. 14.10 Prevalence of migrainous features in adolescents with migraine (based on Shivpuri[38]).

use of diaries that instruct children to focus on certain symptoms improves the description of those headaches as migraine.

Headache diaries are important not only to establish headache diagnosis, but also to identify headache frequency in children. A comparison of impressions identified at a medical interview vs. review of a headache diary showed identification of frequent (weekly) headache in only 18% during interviews compared with 48% when diaries were reviewed.[41]

Asking children to draw a picture of their headaches is another useful diagnostic tool. In one study, diagnostic accuracy from children's headache drawings was compared with a standard clinical assessment.[42] Headache drawings were very effective in representing migraine features, with a diagnostic sensitivity of 93%, specificity of 83%, and positive predictive value of 87% (Fig. 14.11).

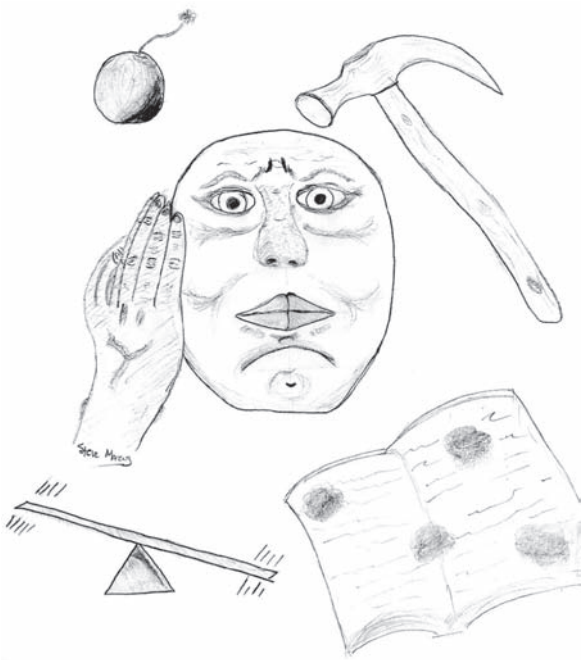


Fig. 14.11 Example of a child's headache drawing. This boy left class during an examination to go to the nurse, telling his teacher he could not take his test and felt like he was going to pass out. He vomited in the nurse's office and was tentatively diagnosed with a viral illness. His drawing of the episode tells a clear story of migraine. Severe pain on the side of his head felt like a hammer pounding and bomb exploding. His genuine inability to complete his test is shown by the drawing of visual scotomas, which obscured his view of the test paper. In addition, he noticed imbalance or vertigo with his episode, as shown by the teeter-totter, although he verbalized this as "feeling like I'm going to pass out."

Recurrent Abdominal Pain

Patients reporting features suggesting specific organic pathology (see Box 14.3) will require additional laboratory, stool, or radiographic testing (see Box 14.4). In general, imaging studies and endoscopy are reserved for patients with symptoms and signs suggesting specific pathology, such as inflammatory bowel disease or peptic ulcer disease. History of sexual activity should also be sought, with pregnancy or pregnancy complications considered as a cause for abdominal pain in adolescent girls.

Abdominal migraine and, less commonly, abdominal epilepsy should also be considered in the differential diagnosis of recurrent abdominal pain in patients with additional features of migraine or epilepsy. Anti-migraine prophylaxis may be useful for abdominal migraine. An electroencephalogram may help confirm the diagnosis of abdominal epilepsy.

Box 14.3 Symptoms of abdominal pain that suggest specific pathology

Pain location distant from the umbilicus	Relationship to diet or eating
Association with diarrhea and/or constipation	Vomiting
Weight loss	Fever

Box 14.4 Evaluation for recurrent abdominal pain

- Physical examination
  - Weight and height
  - Organomegaly
  - Focal abdominal tenderness
  - Rectal examination
  - Joint screen for inflammation
- Laboratory testing
  - Complete blood count
  - Urinalysis
  - Stool guiaic
  - Stool for ova and parasites if diarrhea is present

Chest Pain

In addition to history and physical examination, additional testing may be ordered in children with chest pain with associated symptoms.[33] Testing is most likely to identify nonmusculoskeletal pathology in children with associated symptoms (e.g., respiratory distress or palpitations) or signs (e.g., fever, respiratory distress, reduced breath sounds, wheezing, heart murmur, or abnormal rhythm) or the history

of trauma. Chest x-rays and electrocardiograms, as indicated, are beneficial in these patients to clarify the diagnosis.

Psychosocial Factors

Although psychosocial factors alone are unlikely to entirely explain chronic pain complaints, they often are significant aggravating factors that can markedly enhance pain perception. For example, a review of 100 cases of recurrent abdominal pain identified a significant role for stress in aggravating nonspecific abdominal pain complaints in 48% of cases.[43] The most common stress-provoking events included those seen in Sarah, starting school and parents' divorce. Screening for anxiety may be particularly important as parental and child anxieties have both been linked to the development and persistence of recurrent abdominal pain.[44,45] Furthermore, both low fruit intake and obesity have also been linked to recurrent abdominal pain, suggesting a role for dietary and weight assessment and intervention.[46]

Significant personal stressors (e.g., family separation, moving, and death) also occur within 12 months of headache onset in 73% of adolescents.[47] Migraine occurs more often in children reporting unhappiness, fear of failure at school, or fear of a teacher.[48] Depressive symptoms are identified on clinical interview in 86% of teenagers with daily headache.[49] In addition, being the victim of bullying is associated with frequent headache episodes in children aged 7–10 years.[50]

Quality of life may be significantly affected by chronic pain in children, as it is in adults. Impairments in quality of life in pediatric patients can be assessed using the Pediatric Quality of Life Inventory (PedsQoL), which is available online at the Website: www.pedsql.org. The PedsQoL has been used in pediatric patients with arthritis or migraine.[51–53]

Treatment

The same pharmacological and nonpharmacological treatments used for adult pain are generally effective in pediatric pain, although dosage adjustment is necessary. Chronic musculoskeletal, abdominal, and chest pain should be treated primarily with physical therapy exercises and psychological pain management skills, such as stress management and relaxation therapies. For example, treatment of 57 adolescents with chronic pain (mean duration = 4 years) with combined physical therapy and cognitive therapy resulted in significantly improved physical function and reduced catastrophizing, anxiety, and disability.[54] In addition, prior to treatment, only 55% of the adolescents were attending school, with 25% attending full time. Three months after treatment, 84% were attending school, with 52% attending full time.

The primary goal for treating any chronic pain syndrome in children is to ensure school attendance. In most circumstances, attending school will not aggravate the pain complaints and will serve as distraction from pain and the sick role. Prolonged

school absence results in isolation and fear of both academic and social deficiencies, additional stressors that may further aggravate pain complaints. The social and emotional development advantages of attending school cannot be duplicated with a homebound education environment. The longer school absence is maintained, the more difficult it is for children to return to school because of failure to maintain academic work and fear of isolation from peers on return to school. Treatment begins with resuming a regular routine. Good school participation must be the top priority. Family therapy will be necessary when parents are hesitant to insist on school attendance to help parents develop strategies for ensuring school participation, as well as identification of manipulative behaviors that erode parents' resolve to encourage activity normalization.

Headache Therapy

Both nonpharmacological and pharmacological therapies can effectively manage chronic headaches in children and adolescents (Table 14.5). Relaxation, stress management, and biofeedback are effective nonpharmacological headache therapies in pediatric patients.[55,56] Healthy lifestyle habits, including daily exercise, balanced meals, and adequate sleep, should be promoted. Sleep disturbances, including insufficient total sleep, occur in the majority of pediatric headache patients, especially those with migraine.[57,58] Scheduling should require regular times for retiring to bed with lights off and rising in the morning. Children and adolescents should not be permitted to watch television after bedtime. Analgesics and triptans are also effective in pediatric patients, although dose adjustments are needed.[59–64] Generally, triptans are administered at approximately half of the starting adult dose in adolescents. Orally disintegrating triptans may be particularly useful in children. Preventive therapy with antidepressants and antiepileptics is also effective in children.[65–68] Controlled trials have not evaluated selective serotonin reuptake inhibitors (SSRIs) for migraine prevention in pediatric patients. SSRIs have been linked to a small but significantly increased risk of suicidal ideation/attempt in pediatric patients treating mood disorders.[69] Consequently, careful monitoring is required when using SSRIs.

Table 14.5 Migraine treatments with proven efficacy in pediatric migraine

	Pharmacologic therapies	
Non-pharmacologic therapies	Acute care	Prevention
Relaxation plus stress management	Ibuprofen	Antidepressants
Biofeedback	Triptans	Amitriptyline
	Sumatriptan	Trazodone
	Zolmitriptan	Antiepileptics
	Rizatriptan	Valproate
		Topiramate

Summary

Common pain syndromes in children and adolescents include musculoskeletal pain, headache, stomach ache, and chest pain. In general, increased overall prevalence and a female predominance develop once children reach adolescence. Fortunately, most chronic pain syndromes in children are not associated with significant, identifiable pathology or serious illness. Similar to adult patients with pain, lack of obvious pathology in pediatric patients does not suggest that the pain is imaginary. Untreated pain in children and adolescents can result in significant disability, including school absence and social isolation. Because chronic pain complaints in childhood tend to persist for at least 1 year and often into adulthood, treatment of pediatric pain is necessary to minimize impact on academic, social, physical, and emotional development. Disability in children with pain should be minimized by requiring school attendance, as well as participation in physical education programs, unless significant structural pathology precludes specific activities. Psychosocial factors, including changes in family and school stress, are significant aggravating factors for pediatric pain and need to be identified and openly addressed as part of the treatment plan.

Test Your Knowledge

1. Common pain syndromes in pediatrics include the following:

    a. Musculoskeletal pain
    b. Headache
    c. Abdominal pain
    d. Chest pain
    e. All of the above

2. Which of the following statements is true?

    a. Most complaints of musculoskeletal pain should be considered growing pains.
    b. Over half of children with musculoskeletal pain will report pain persisting into adolescence.
    c. Musculoskeletal pain is usually endorsed to avoid unpleasant activities or homework.
    d. None of the above.

3. Choose the correct statement(s):

    a. Risk factors for low back pain in adolescents include low daily physical activity and routinely wearing a backpack on one shoulder.
    b. The most common cause of pediatric recurrent abdominal pain is irritable bowel syndrome.

c. School absences occur in about half of those children experiencing chronic pain.
d. None of the above.
e. All of the above.

4. Symptoms suggesting non-organic recurrent abdominal pain include the following:

a. Periumbilical location
b. Relief after bowel movement
c. Weight loss
d. A and B
e. All of the above

5. Which statistic is/are true?

a. About 6% of all visits to a pediatric clinic are for complaints of musculoskeletal pain.
b. About 10% of children have migraine headaches.
c. Nearly 30% of children with recurrent abdominal pain will experience irritable bowel symptoms as an adult.
d. All of the above
e. None of the above

6. Effective therapies for pediatric migraine include the following:

a. Relaxation therapy
b. Acupuncture
c. Ibuprofen
d. A and C
e. All of the above

Answers: 1e, 2b, 3e, 4d, 5d, 6d

References

1. Youssef NN, Murphy TG, Schuckalo S, Intile C, Rosh J. School nurse knowledge and perceptions of recurrent abdominal pain: opportunity for therapeutic alliance? Clin Pediatr 2007;46:340–344
2. Marcus DA. A review of perinatal acute pain: treating perinatal pain to reduce adult chronic pain. J Headache Pain 2006;7:3–8
3. Taddio A, Katz J, Ilersich AL, Gideon K. Effect of neonatal circumcision on pain response during subsequent routine vaccination. Lancet 1997;349:559–603
4. Buskila D, Neumann L, Zmora E, Feldman M, Bolotin A, Press J. Pain sensitivity in prematurely born adolescents. Arch Pediatr Adolesc Med 2003;157:1079–1082
5. Maneyapanda SB, Venkatasubramanian A. Relationship between significant perinatal events and migraine severity. Pediatrics 2005;116:e555–e558
6. Roth-Isigkeit A, Thyen U, Stöven H, Schwarzenberger J, Schmucker P. Pain among children and adolescents: restriction in daily living and triggering factors. Pediatrics 2005;115:e152–e162

7. Konijnenberg AY, Uiterwaal CM, Kimpen JL, van der Hoeven J, Buitelaar JK, de Graeff-Meeder ER. Children with unexplained chronic pain: substantial impairment in everyday life. Arch Dis Child 2005;90:680–686
8. Grøholt E, Stigum H, Nordhagen R, Köhler L. Recurrent pain in children, socio-economic factors and accumulation in families. Eur J Epidemiol 2003;18:965–975
9. Petersen S, Bergstrom E, Brulin C. High prevalence of tiredness and pain in young school-children. Scand J Public Health 2003;31:367–374
10. El-Metwally A, Salminen JJ, Auvinen A, Macfarlane G, Mikkelsson M. Risk factors for development of non-specific musculoskeletal pain in preteens and early adolescents: a prospective 1-year follow-up study. BMC Musculoskelet Disord 2007;8:46
11. El-Metwally A, Salminen JJ, Auvinen A, Kautiainen H, Mikkelsson M. Prognosis of non-specific musculoskeletal pain in preadolescents: a prospective 4-year follow-up study till adolescence. Pain 2004;110:550–559
12. Masiero S, Carraro E, Celia A, Sarto D, Ermani M. Prevalence of nonspecific low back pain in schoolchildren aged between 13 and 15 years. Acta Paediatr 2008;97:212–216
13. El-Metwally A, Mikkelsson M, Ståhl M, et al. Genetic and environmental influences on non-specific low back pain in children: a twin study. Eur Spine J 2008;17:502–508
14. Korovessis P, Koureas G, Zacharatos S, Papzisis Z. Backpacks, back pain, sagittal spinal curves and trunk alignment in adolescents: a logistic and multinominal logistic analysis. Spine 2005;30:247–255
15. Skoffer B. Low back pain in 15- to 16-year-old children in relation to school furniture and carrying of the school bag. Spine 2007;32:E713–E717
16. Skoffer B, Foldspang A. Physical activity and low-back pain in schoolchildren. Eur Spine J 2008;17:373–379
17. Lundqvist C, Clench-Aas J, Hofoss D, Bartonova A. Self-reported headache in schoolchildren: parents underestimare their children's headaches. Acta Pediatr 2006;95:940–946
18. Abu-Arafeh I, Russell G. Prevalence of headache and migraine in schoolchildren. BMJ 1994;309:765–769
19. Campo JV, Comer DM, Jansen-McWilliams L, Gardner W, Kelleher KJ. Recurrent pain, emotional distress, and health service use in childhood. J Pediatr 2002;141:76–83
20. Ozge A, Bugdayci R, Sasmaz T, et al. The sensitivity and specificity of the case definition criteria in diagnosis of headache: a school-based epidemiological study of 5562 children in Mersin. Cephalalgia 2003;23:138–145
21. Winner P, Putnam G, Saiers J, O'Quinn S, Asgharnejad M. Demographic and migraine characteristics of adolescent patients: the Glaxo Wellcome adolescent clinical trials database. Headache 2000;40:438
22. Kienbacher C, Wöber C, Zesch HE, et al. Clinical features, classification and prognosis of migraine and tension-type headache in children and adolescents: a long-term follow-up study. Cephalalgia 2006;26:820–830
23. Apley J. The child with abdominal pains, 2nd Ed. Oxford, UK: Blackwell Scientific; 1975
24. Bode G, Brenner H, Adler G, Rothenbacher D. Recurrent abdominal pain in children. Evidence from a population-based study that social and familial factors play a major role but not *Helicobacter pylori* infection. J Psychosom Res 2003;54:417–421
25. Boey CM, Yao SB. An epidemiological survey of recurrent abdominal pain in a rural Malay school. J Paediatr Child Health 1999;35:303–305
26. El-Matary W, Spray C, Sandhu B. Irritable bowel syndrome: the commonest cause of recurrent abdominal pain in children. Eur J Pediatr 2004;163:584–588
27. Sillanpaa M, Piekkala P, Kero P. Prevalence of headache at preschool age in an unselected child population. Cephalalgia 1991;11:239–242
28. Campo JV, Di Lorenzo C, Chiappetta L, et al. Adult outcomes of pediatric recurrent abdominal pain: do they just grow out of it? Pediatrics 2001;108:e1
29. Russell G, Abu-Arafeh I, Symon DN. Abdominal migraine: evidence for existence and treatment options. Paediatr Drugs 2002;4:1–8

30. Weydert JA, Ball TM, Davis MF. Systemic review of treatments for recurrent abdominal pain. Pediatrics 2003;111:e1–e11
31. Pace F, Zuin G, Di Giacomo S, et al. Family history of irritable bowel syndrome is the major determinant of persistent abdominal complaints in young adults with a history of pediatric recurrent abdominal pain. World J Gastroenterol 2006;12:3874–3877
32. Evangelista JK, Parsons M, Rennenburg AK. Chest pain in children: diagnosis through history and physical examination. J Ped Health Care 2000;14:3–8
33. Gastesi Larranaga M, Fernandez Landaluce A, Mintegi Raso S, Vazquez Ronco M, Benito Fernandez J. Dolor torácico en urgencies de pediatría: un proceso habitualamente benigno. An Pediatr 2003;59:234–238
34. Sachs-Ericsson N, Kendall-Tackett K, Hernandez A. Childhood abuse, chronic pain, and depression in the National Comorbidity Survey. Child Abuse Negl 2007;31:531–547
35. Song K, Morton AA, Koch KD, Herring JA, Browne RH, Hanway JP. Chronic musculoskeletal pain in childhood. J Pediatr Orthop 1998;18:576–581
36. Burton LJ, Quinn B, Pratt-Cheney JL, Pourani M. Headache etiology in a pediatric emergency department. Pediatr Emerg Care 1997;13:1–4
37. Kan L, Nagelberg J, Maytal J. Headaches in a pediatric emergency department: etiology, imaging, and treatment. Headache 2000;40:25–29
38. Headache Classification Committee of the International Headache Society. The international classification of headache disorders, 2nd Ed. Cephalalgia 2004;24 (Suppl 1):24–25
39. Shivpuri D, Rajesh MS, Jain D. Prevalence and characteristics of migraine among adolescents: a questionnaire survey. Indian Pediatr 2003;40:665–669
40. Metsähonkala L, Sillanpää M, Tuominen J. Headache diary in the diagnosis of childhood migraine. Headache 1997;37:240–244
41. Laurell K, Larsson B, Eeg-Olofsson O. Headache in schoolchildren: agreement between different sources of information. Cephalalgia 2003;23:420–428
42. Stafstrom CE, Rostasy K, Minster A. The usefulness of children's drawings in the diagnosis of headache. Pediatrics 2002;109:460–472
43. Alfvén G. One hundred cases of recurrent abdominal pain in children: diagnostics procedures and criteria for a psychosomatic diagnosis. Acta Paediatr 2003;92:43–49
44. Ramchandani PG, Stein, Hotopf M, Wiles NJ. Early parental and child predictors of recurrent abdominal pain at school age: results of a large population-based study. J Am Acad Child Adolesc Psychiatry 2006;45:729–736
45. Ramchandani PG, Fazel M, Stein A, Wiles N, Hotopf M. The impact of recurrent abdominal pain: predictors of outcome in a large population cohort. Acta Paediatr 2007;96:697–701
46. Malaty HM, Abudayyeh S, Fraley K, et al. Recurrent abdominal pain in school children: effect of obesity and diet. Acta Paediatr 2007;96:572–576
47. Kaiser RS, Primavera JP. Failure to mourn as a possible contributory factor to headache onset in adolescence. Headache 1993;33:69–72
48. Anttila P, Metsähonkala L, Helenius H, Sillanpää M. Predisposing and provoking factors in childhood headache. Headache 2000;40:351–356
49. Kaiser R. Depression in adolescent headache patients. Headache 1992;32:340–344
50. Williams K, Chambers M, Logan S, Robinson D. Association of common health symptoms with bullying in primary school children. BMJ 1996;313:17–19
51. Varni JW, Seid M, Smith Knight T, Burwinkle T, Brown J, Szer IS. The PedsQL in pediatric rheumatology: reliability, validity, and responsiveness of the Pediatric Quality of Life Inventory Generic Core Scales and Rheumatology Module. Arthritis Rheum 2002;46:714–725
52. Sawyer MG, Whitman JN, Robertson DM, Taplin JE, Varni JW, Baghurst PA. The relationship between health-related quality of life, pain and coping strategies in juvenile idiopathic arthritis. Rheumatology 2004;43:325–330
53. Powers SW, Patton SR, Hommel KA, Hershey AD. Quality of life in paediatric migraine: characterization of age-related effects using PedsQL 4.0. Cephalalgia 2004;24:120–127
54. Eccleston C, Malleson PN, Clinch J, Connell H, Sourbut C. Chronic pain in adolescents: evaluation of a programme of interdisciplinary cognitive behaviour therapy. Arch Dis Child 2003;88:881–885

55. Sartory G, Muller B, Metsch J, Pothmann R. A comparison of psychological and pharmacological treatment of pediatric migraine. Behav Res Ther 1998;36:1155–1170
56. Scharff L, Marcus D, Masek BJ. A controlled study of minimal-contact thermal biofeedback in children with migraine. J Pediatr Psychol 2002;27:109–119
57. Isik U, Ersu RH, Ay P, et al. Prevalence of headache and its association with sleep disorders in children. Pediatr Neurol 2007;36:146–151
58. Gilman DK, Palmero TM, Kabbouche MA, Hershey AD, Powers SW. Primary headache and sleep disturbances in adolescents. Headache 2007;47:1189–1194
59. Lewis DW, Kellstein D, Dahl G, et al. Children's ibuprofen suspension for the acute treatment of pediatric migraine. Headache 2002;42:780–786
60. Hershey AD, Powers SW, LeCates S, Bentti AL. Effectiveness of nasal sumatriptan in 5- to 12-year-old children. Headache 2001;41:693–697
61. Linder SL, Dowson AJ. Zolmitriptan provides effective migraine relief in adolescents. Int J Clin Pract 2000;54:466–469
62. Winner P, Lewis D, Visser WH, et al. Rizatriptan 5 mg for the acute treatment of migraine in adolescents: a randomized, double-blind, placebo-controlled study. Headache 2002;42:49–55
63. Ahonen K, Hämäläinen ML, Eerola M, Hoppu K. A randomized trial of rizatriptan in migraine attacks in children. Neurology 2006;67:1135–1140
64. Lewis DW, Winner P, Hershey AD, Wasiewski WW. Efficacy of zolmitriptan nasal spray in adolescent migraine. Pediatrics 2007;120:390–396
65. Battistella PA, Ruffilli R, Cernetti R, et al. A placebo-controlled crossover trial using trazodone in pediatric migraine. Headache 1993;33:36–39
66. Hershey AD, Powers SW, Bentti A, Degrauw T. Effectiveness of amitriptyline in the prophylactic management of childhood headache. Headache 2000;40:539–549
67. Serdaroglu G, Erhan E, Tekgul H, et al. Sodium valproate prophylaxis in childhood migraine. Headache 2002;42:819–822
68. Hershey AD, Powers SW, Vockell AB, et al. Effectiveness of topiramate in the prevention of childhood headaches. Headache 2002;42:810–818
69. Bridge JA, Iyengar S, Salary CB, et al. Clinical response and risk for reported suicidal ideation and suicide attempts in pediatric antidepressant treatment: a meta-analysis of randomized controlled trials. JAMA 2007;297:1683–1696

Chapter 15
Pregnancy and Pain

Key Chapter Points:

- Pain complaints occur in the majority of pregnant women.
- The lower back is the most common pain location during pregnancy.
- Compressive neuropathies occur more commonly during pregnancy because of changes in water retention, weight, and posture; they include Bell's palsy, carpal tunnel syndrome, and meralgia paresthetica.
- Premorbid headache, especially migraine, improves in the majority of women in early pregnancy. Headache does persist, however, throughout pregnancy for a significant minority of women.
- Persistent pain during pregnancy may require treatment with safe nonpharmacologic and pharmacologic therapies to minimize disability and the need to self-medicate.

Key Words American Academy of Pediatrics, Lactation, Nursing

Case History

Ms. Rogers is a healthy 29-year-old primigravida in her 7th month of pregnancy. Her pregnancy has been uncomplicated, except for a weight gain of 40 lb. Over the last 4 weeks, she reports a pain in her left thigh. Initially, this would only occur with prolonged sitting or riding in the car, or when waiting in exceptionally long lines in the store. Now she finds that she has nearly constant pain in her upper, outer thigh. Additionally, this painful area feels prickly when she touches it. This week, she has also noticed pain and tingling in her right thumb when she wakes up in the morning or scrubs the counters at her home. Her mother told her that these are the symptoms of multiple sclerosis, just like in a character on the mother's soap opera television show. A distraught and tearful Ms. Rogers shares her concerns with her primary care physician, who reassures her that pain, including compressive neuropathy, occurs in a significant number of women during pregnancy and that these symptoms usually go away after delivery.

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

Introduction

New pain, neurological complaints, or both during pregnancy are accompanied by special concerns for patient and doctor, both of whom worry about the fetal risks from maternal testing and treatment, as well as the effects of any new health problem on the ability of the new mother to care for her baby. Alterations in hormones, water distribution, and weight are all important factors in changing risk for pain from new and pre-existing pain syndromes during pregnancy. Understanding typical changes in common problems during pregnancy – such as headache, back pain, and compressive neuropathy – can allay fears and minimize the use of unnecessary testing.

Pregnancy is associated with increased risk for a variety of musculoskeletal and neuropathic pain complaints. In a prospective study of 200 pregnant women, investigators identified pain occurring during pregnancy in 166 women (85%), with new pain beginning during pregnancy in 137 (70%).[1] The most common body area affected by pain was the back, especially the lumbar and sacral areas (Fig. 15.1). In addition to the development of new pain during pregnancy, pre-existing pain conditions – such as low back pain and headache – are also often modified during pregnancy.

In this chapter, several commonly occurring painful conditions during pregnancy are reviewed. Evaluating and treating pain during pregnancy offers unique challenges because of concerns for the effects of testing and treatment interventions on the developing baby. Increased ability of the patient to identify common, self-limited, pregnancy-related pain complaints reduces the need to perform unnecessary testing during pregnancy and helps distinguish atypical conditions that may warrant additional evaluations.

Common Pain Syndromes During Pregnancy

Important pain syndromes during pregnancy include conditions that occur commonly in women of childbearing age (e.g., migraine) and pain complaints that occur more frequently during pregnancy (e.g., low back pain and compressive neuropathy). Pregnancy can change the severity of premorbid pain and the risk for developing new pain complaints. Understanding expected changes during pregnancy allows women with pre-existing chronic pain conditions to prepare for expected changes and develop safe and effective treatment strategies. Ready identification of common pain syndromes in pregnant women, as seen in Ms. Rogers, results in the alleviation of concerns for both patient and healthcare provider.

Headache

In addition to providing reproductive functions, sex hormones, including estrogen, act as important pain modulators.[2,3] The dramatic rise in estrogen during the early stages

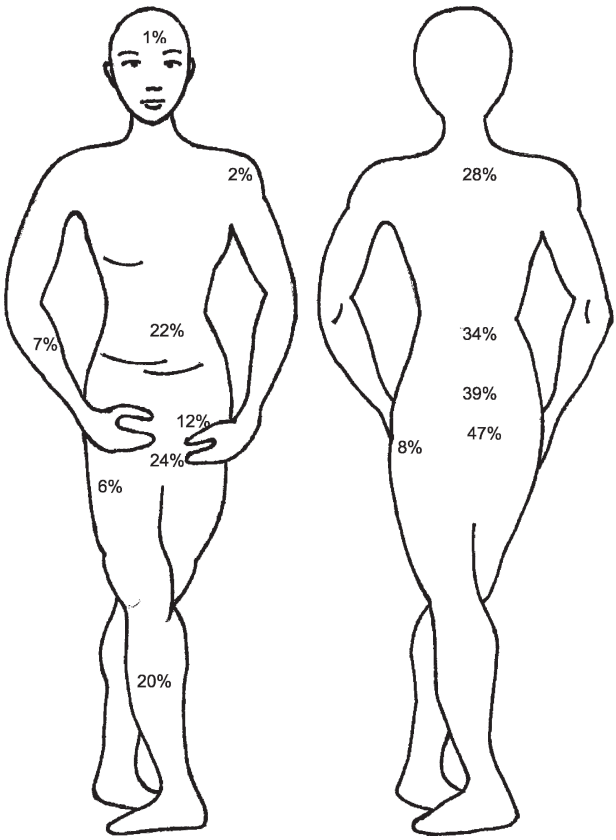


Fig. 15.1 Pain during pregnancy. Proportion of women reporting pain in different regions of the body during pregnancy (based on Kristiansson[1]).

of pregnancy offers a protective effect against common headaches (e.g., migraine and tension-type headache). Therefore, many women experience relief from pre-existing chronic headache during pregnancy. Headache is most likely to improve during the first trimester, when the rise in estrogen is greatest. As estrogen levels plummet after delivery, protection against headaches is lost and headaches tend to increase in frequency. A prospective study of 47 pregnant migraineurs (average week of gestation at study initiation = 11 weeks) showed that headache frequency decreased by at least 50% in more than half of the women during their first trimester and almost 90% by their third trimester (Fig. 15.2).[4] After delivery, migraine returned within 2 days for 4% of the study participants, within 1 week for 34%, and within 1 month for 55%. Bottle-feeding increased the risk for migraine recurrence.

Headache, however, does continue during pregnancy for a minority of women. This was demonstrated in another prospective study of women who were still reporting headache at the end of their first trimester.[5] Between the second and third trimesters, headache frequency was reduced by only 30%. Migraineurs were more likely

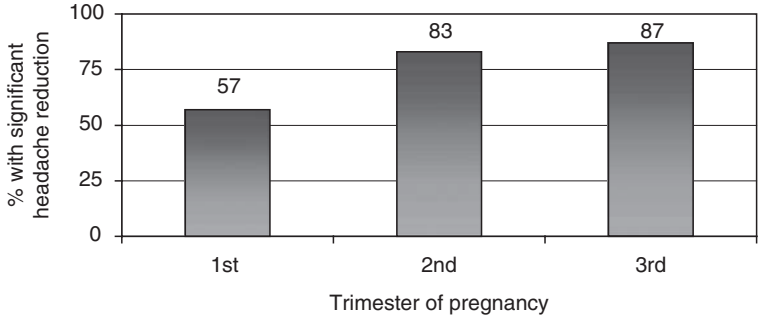


Fig. 15.2 Percentage of migraineurs with a significant (≥50%) reduction in headache activity during pregnancy (based on Sances[4]).

to experience headache improvement than women with tension-type headache (Fig. 15.3). These data suggest that headaches will probably continue without significant improvement in women who report ongoing headache activity at the end of the first trimester (typically around the time of the first visit to the obstetrician). In addition, improvement in headache symptoms during one pregnancy does not predict headache relief in subsequent pregnancies. Differences in age, sleep deprivation when caring for other young children, and stress may all contribute to these differences.

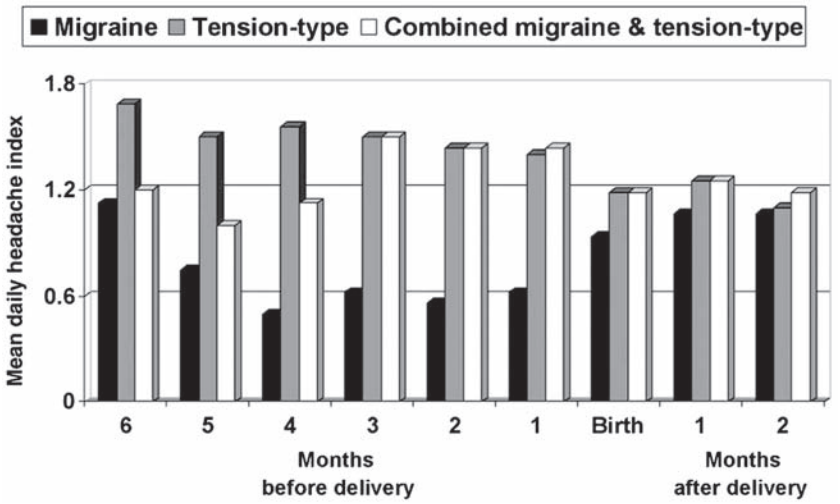


Fig. 15.3 Headache activity in women who report headaches at the end of the first trimester. The headache index is calculated as an average daily headache severity score and recorded four times daily. *No headache* has a score of 0; *incapacitating headache* has a score of 10. Headache activity decreased in migraineurs during pregnancy, returning to higher levels postpartum. Headache activity for tension-type and combined headaches were fairly stable throughout pregnancy (based on Marcus[5]).

Breastfeeding is unlikely to influence headache. In a large series of 2,500 migraineurs followed for 6 years, investigators noted only five pregnancies in which nursing resulted in changes in headache frequency.[6] These data strongly suggest that women should not be discouraged from breastfeeding because of concerns about aggravating headache.

In addition to changes in benign headache, pregnancy also increases the risk for headache related to intracranial pathology. Acute strokes, cerebral venous thrombosis, symptomatic brain tumor, benign intracranial hypertension (pseudotumor cerebri), and subarachnoid hemorrhage occur with increased frequency during pregnancy.[7] Pituitary adenomas and meningiomas also develop with increased frequency during pregnancy.[8,9] Some autoimmune disorders, such as systemic lupus erythematosus, are aggravated by pregnancy and may result in headache. Eclampsia is another cause of pregnancy-related headache. Interestingly, migraineurs are at increased risk for developing pregnancy-related hypertension. In a case-controlled study, primary headache was compared in 75 women with pregnancy-induced hypertension with proteinuria (preeclampsia) and 75 women with uncomplicated pregnancies, matched for age and parity.[10] Migraine was endorsed by 59% with eclampsia and 17% without. Tension-type headache, however, was unrelated, occurring in 4% with eclampsia and 7% without. A thorough history with detailed medical and neurological examinations, including a bedside fundoscopic examination, will usually help the clinician identify women who need additional testing to rule out pathological causes of headache.

Back Pain

Changes in posture of the spine and pelvis, along with increased joint laxity, result in increased risk for mechanical back pain during pregnancy. A community survey of more than 1,500 women identified back pain that was at least moderately severe in 35.5% during pregnancy.[11] A prospective study of 200 obstetrical patients identified back pain as a complaint during pregnancy in 149 (76%), with pain beginning during pregnancy in 119 (61%).[1] The prevalence of back pain was highest during the second and third trimesters and generally self-limited (Fig. 15.4).

The incidence of pregnancy-related back pain can be reduced by patient training in early pregnancy. In a prospective study, 301 nulliparous women (gestational age = 18 weeks) were randomized to pain prevention instruction or a control group.[12] Pain prevention included weekly, 1-hour group sessions for 12 weeks consisting of aerobic and pelvic muscle-strengthening exercises, light stretching, breathing and relaxation exercises, and ergonomic instruction. At 36-weeks gestation, lumbopelvic pain was significantly reduced in the group receiving training (44% vs. 56%, $P = 0.03$), with a trend toward better outcome with training 3 months after delivery (26% vs. 37%, $P = 0.06$).

In general, similar to the evaluation of back pain in the nonpregnant patient, imaging should be reserved during pregnancy for women with neurological loss or

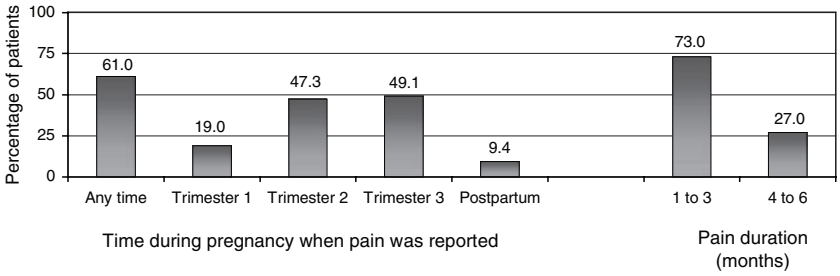


Fig. 15.4 New-onset back pain reported during pregnancy (based on Kristiansson[1]).

symptoms suggesting radiculopathy, myelopathy, or other nonmusculoskeletal types of pain. Electromyographic and nerve conduction velocity testing can be safely performed during pregnancy and can help localize pathology.

Neuropathy

Neuropathy may occur or be aggravated during pregnancy by changes in weight, posture, and fluid balance. Common types of compressive neuropathy that can arise during pregnancy include facial neuropathy (Bell's palsy), median neuropathy (carpal tunnel syndrome), and lateral femoral cutaneous neuropathy (meralgia paresthetica). Ms. Rogers describes symptoms typical for two types of compressive neuropathy – meralgia paresthetica causing thigh pain and carpal tunnel syndrome causing thumb pain.

Bell's palsy occurs from compression of the facial nerve, typically near the stylomastoid foramen or within the bony facial canal. Patients describe facial pain, followed by weakness. Bell's palsy is characterized by a wide-open eye on the affected side at rest, and weakness of facial muscles during attempted movement. Facial weakness is evident by lack of wrinkling of the forehead, inability to close the eye, and poor movement of the mouth. Bell's palsy is typically treated with eye protection (e.g., drops and patching) and prednisone. The incidence of Bell's palsy during pregnancy and the puerperium is about 0.04%, which is more than three times the incidence in nonpregnant women of comparable age.[13] Nearly 80% of cases occur during the third trimester, and most cases occur unilaterally. Fortunately, 72% of women experience complete resolution of symptoms within 10 weeks of symptom onset. A retrospective chart review compared Bell's palsy outcome in pregnant vs. nonpregnant women of comparable age. Most patients recovered from facial weakness, although the recovery was inferior in patients who had developed complete facial weakness and in pregnant women (Fig. 15.5).[14] Treatment with prednisone did not significantly affect the likelihood for recovery. Expectation for good recovery from Bell's palsy suggests that treatment should be primarily

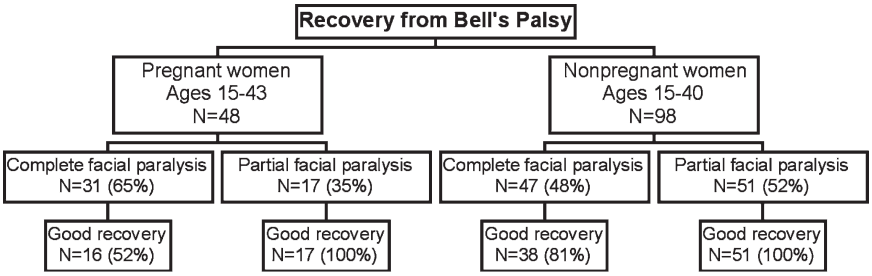


Fig. 15.5 Outcome of Bell's palsy in pregnant vs. nonpregnant women of childbearing age initially evaluated within 6 weeks of symptom onset (based on Gillman[14]).

supportive. Interestingly, pregnant patients with Bell's palsy have a fivefold increased risk of developing preeclampsia or gestational hypertension.[15] Consequently, women developing Bell's palsy should be carefully monitored for symptoms of preeclampsia or elevated blood pressure.

The median nerve supplies sensation to the lateral aspect of the hand, over the thumb and first two fingers (Fig. 15.6). This nerve also supplies motor function to the thenar eminence, allowing opposition of the thumb. Median nerve compression at the wrist under the carpal tunnel may occur during pregnancy, resulting in painful carpal tunnel syndrome. Pain and dysesthesia are typically aggravated by stretching the wrist, such as during hyperextension when scrubbing counters or floors. Carpal tunnel syndrome affects up to 2 in 3 pregnant women in the third trimester.[16]

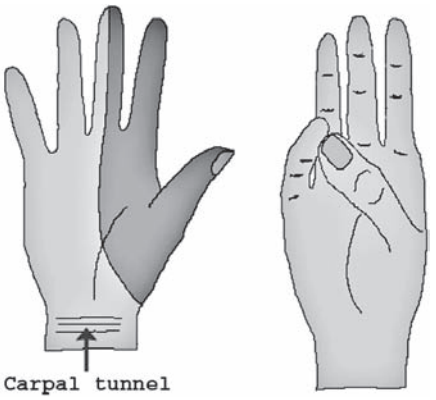


Fig. 15.6 Carpal tunnel syndrome. Area of sensation (dark gray in the left picture) and motor function (opposition of the thumb in the right picture) supplied by the median nerve.

Carpal tunnel syndrome symptoms during pregnancy usually include bilateral sensory and motor symptoms, with the most common time of onset during the third trimester (Fig. 15.7).[17] In comparison with nonpregnant women, women with carpal tunnel syndrome during pregnancy have symptoms that are of shorter duration, milder severity, more likely to be bilateral, and more likely to resolve

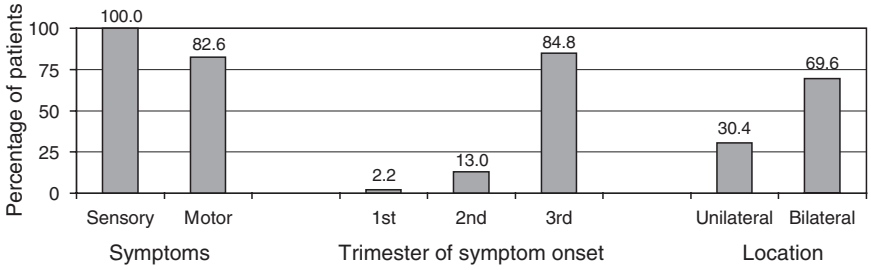


Fig. 15.7 Carpal tunnel symptoms during pregnancy (based on Turgut[17]).

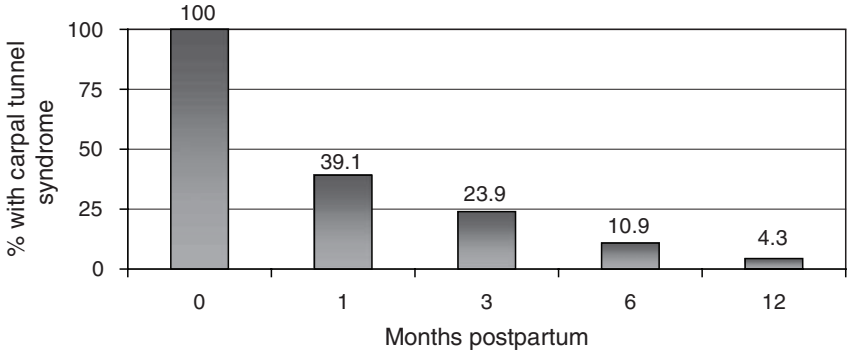


Fig. 15.8 Resolution of pregnancy-related carpal tunnel syndrome. Of 46 women who developed carpal tunnel syndrome during pregnancy, only 18 (39%) still had symptoms 1 month after delivery and 2 (4%) had them 1 year after delivery. Two women required decompressive surgery; the rest were treated conservatively (based on Turgut[17]).

($P < 0.05$).[18] Fortunately, carpal tunnel syndrome symptoms usually resolve after delivery (Fig. 15.8).[17] Postural correction and nighttime splints typically improve symptoms. Local steroid injections may also be considered, especially when motor loss is present.

The lateral femoral cutaneous nerve arises from the second and third lumbar roots. After passing under the inguinal ligament, the lateral femoral cutaneous nerve supplies sensation to the upper, outer thigh. Compression of this nerve may occur in the inguinal canal, often due to obesity or shifts in pelvic posture, with increased lumbar lordosis during pregnancy. Symptoms are typically unilateral and usually begin in gestational week 31,[20,21] although meralgia paresthetica has been reported during the first trimester.[22] Compression results in pain (meralgia) and numbness (paresthetica) in the upper, outer thigh (Fig. 15.9). Meralgia paresthetica incidence increases dramatically during pregnancy and, as seen in Ms. Roger's case, is often associated with carpal tunnel syndrome.[23] Symptoms can typically be well managed with postural exercises, anti-inflammatory analgesics in the second trimester, and, if necessary, local steroid injections.

Fig. 15.9 Meralgia paresthetica: pain and numbness in the distribution of the lateral femoral cutaneous nerve. Area of sensory supply by the lateral femoral nerve is shaded in darker gray.

Testing During Pregnancy

A thorough medical history and complete physical examination, including bedside neurological testing, are the best examination tools for distinguishing among the causes of pain complaints during pregnancy and in nonpregnant women. Women with a suspicious history or examination may need to be evaluated with laboratory or radiographic studies, as warranted by their signs and symptoms. In general, screening should be performed for medical conditions that would be treated during pregnancy. Laboratory testing and electromyography or nerve conduction tests (to identify neuropathy or radiculopathy) can be safely performed throughout pregnancy.

It is safe to obtain cerebral spinal fluid (CSF) for examination during pregnancy, and reliable results can be expected. Davis compared the CSF in asymptomatic women undergoing spinal anesthesia for delivery ($n = 44$) and tubal ligation ($n = 22$) and found no differences in opening pressure, cell count, or protein levels between the two groups.[24] In addition, active labor, length of gestation, and type of delivery (vaginal vs. cesarean section) did not influence CSF evaluation results. Abnormal CSF test results obtained during pregnancy, therefore, should not be attributed to the pregnancy itself.

Radiological studies are limited during pregnancy because of concerns for the developing baby. Ultrasonography is considered safe throughout pregnancy and is preferred to radiographic testing. Magnetic resonance imaging (MRI) is also considered relatively safe during pregnancy. Studies have failed to identify any specific sequelae of exposure to MRI during pregnancy,[25] including evaluations of the offspring of female MRI technicians and 3-year-old children who had been exposed

to MRI in utero.[26,27] Based on these data, the American College of Radiology recommends MRI as a preferred imaging study during pregnancy to avoid exposure to ionizing radiation when imaging studies are needed, and the results of testing may change patient care.[28] Gadolinium crosses the placenta and should generally be avoided during pregnancy. The 11th European Symposium on Urogenital Radiology reviewed available literature on iodinated and gadolinium contrast administration during pregnancy and lactation, identifying no fetal effects from intrauterine gadolinium exposure.[29] Furthermore, only small amounts of gadolinium are expected in breast milk. Consequently, this committee recommended using gadolinium when contrast agents are deemed necessary during pregnancy. Furthermore, they recommended no change in nursing schedule when using gadolinium in lactating women. Traditional radiographic studies should be considered when diagnostic information is necessary and cannot be obtained through ultrasonography or other safe testing, and may produce information that will change patient care. The maximum tolerated cumulative fetal dose exposure during pregnancy is 5 rad.[30] Most common radiographic studies, including plain x-rays and computed tomography, provide radiation doses well below this level.

Treatment

Although most women assert a desire to avoid medications during pregnancy, up to one-third self-medicate health symptoms, especially with analgesics.[31–33] Therapeutic benefit can be maximized by and the risk to the infant minimized by providing the safest treatments (Table 15.1). Nonpharmacological treatments – such as relaxation, biofeedback, and exercises – are safe during pregnancy. Under some circumstances, women will need additional medical therapy, particularly for chronic pain owing to a problem that predates the pregnancy. Risks from medications must be balanced against the risks of nontreatment, which may result in pain, distress, deconditioning, and disability.

Nonpharmacological Therapy

Pain management skills – such as relaxation, biofeedback, and stress management – effectively reduce pain during pregnancy.[34,35] Exercise should be low impact and focus on stretching. Transcutaneous electrical nerve stimulation and acupuncture are often restricted during pregnancy because of theoretical concerns about excessive nerve stimulation.

Women with pre-existing problems causing chronic pain who intend to attempt conception should maximize nonpharmacological therapy. The development of effective pain management skills (e.g., relaxation, stress management, and therapeutic exercises) before conception may minimize the need for medication. Pregnancy planning is also an excellent time to adopt healthy lifestyle habits that reduce

Table 15.1 Safe pain treatments during conception, pregnancy, and lactation

Treatment options	Pain flare treatments	Daily therapy
Psychological skills	Relaxation Biofeedback Distraction	Relaxation Biofeedback Distraction Stress management Cognitive restructuring
Physical therapy	Heat and ice Modalities Stretching exercises Oscillatory movements	Postural correction Stretching and aerobic exercise
Occupational therapy	Pacing	Body mechanics Workstation simplification Pacing
Healthy lifestyle	Naps during migraine	Nicotine cessation Regular nutrition Sleep hygiene
Medications during conception and pregnancy	Acetaminophen Caffeine NSAIDs – second trimester[b] Prednisone Opioids – limited use Antiemetics for migraine-related nausea – ondansetron preferred	Gabapentin – first and second trimesters[a] β-Blockers for migraine prevention
Medications when nursing	Acetaminophen Caffeine NSAIDs (preferably ibuprofen) Prednisone Sumatriptan for migraine Opioids – limited use, avoid repeat dosing Antiemetics for migraine-related nausea – ondansetron preferred	Tricyclic antidepressants Migraine prevention: propranolol, timolol, verapamil, valproate (if adequate contraception), magnesium, riboflavin

[a]Gabapentin should be discontinued in third trimester because of negative effects on fetal bony growth.

[b]NSAIDs may increase risk of miscarriage when used around conception or in early pregnancy

NSAID nonsteroidal anti-inflammatory drug

chronic pain, such as weight reduction for obese patients (see Chap. 18) and regular exercise, activity-pacing skills, body mechanics, and work simplification. Because nicotine affects the activity of a variety of pain modulators (including endorphins) and thus alters pain transmission[36–38] – thereby contributing to musculoskeletal pain, fibromyalgia, headache, and other chronic pain conditions[39–44] (Fig. 15.10) – smoking cessation should also be strongly recommended.

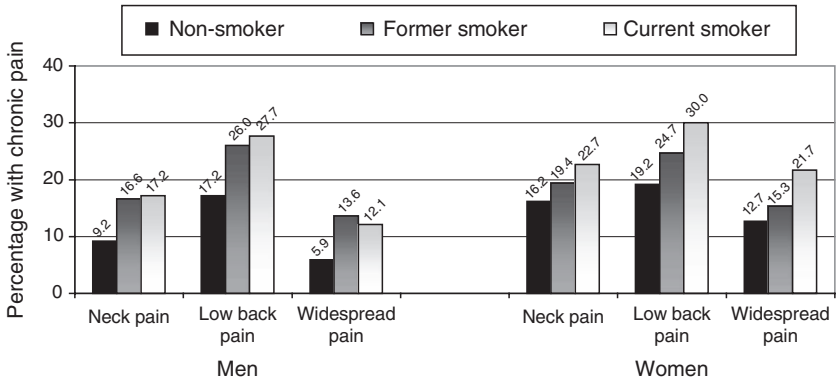


Fig. 15.10 Relationship between smoking and chronic pain (based on Andersson[41]).

Medications During Pregnancy and Lactation

Severe pain flares may be treated with acetaminophen and infrequent opioids. Medications that inhibit prostaglandin synthesis (e.g., nonsteroidal anti-inflammatory drugs [NSAIDs]) hamper implantation and should be avoided while conception is being attempted.[45,46] A post-hoc analysis of retrospectively collected data reported an 80% increased risk of miscarriage among NSAID users, with risk highest when NSAIDs were used around the time of conception.[47] Paracetamol/acetaminophen use was not linked to increased miscarriage risk. Because of concerns about miscarriage with early pregnancy use, the European Federation of Neurological Societies recently supported using acetaminophen/paracetamol throughout pregnancy, with NSAIDs restricted to the second trimester.[48] NSAID use during later stages of pregnancy is associated with premature closure of the fetal ductus arteriosus, and thus should be avoided after gestational week 32.[49–51] Opioids are best limited to infrequent, intermittent use. Codeine has been linked to increased risk for cleft palate and inguinal hernia,[52–54] although this association has not been confirmed in recent studies. Codeine is rarely useful during pregnancy because of its constipating effects; hydrocodone is usually better tolerated. Patients who have been using opioids daily during later stages of pregnancy must continue to use them because of the risks of premature labor associated with intrauterine fetal opioid withdrawal.[55] Analgesics used during pregnancy may continue to be used when breastfeeding (Table 15.1).

Acute migraine may require adjunctive therapy with antiemetics. Ondansetron is an effective antiemetic that is FDA risk category B and has been determined to be compatible with nursing.[56] Triptans are classified as FDA risk category C, suggesting that use during pregnancy should be limited unless benefits outweigh potential risks. Triptan exposure was not associated with a risk for malformations in a recent review of available literature or in data from voluntary registries collected by pharmaceutical companies.[57] Two European studies, however, reported

trends toward early delivery and lower birth weight in the offspring of women exposed to triptans.[58,59] Therefore, although significant concern is not warranted when triptans are inadvertently used during pregnancy, additional data are needed before the regular use of triptans during pregnancy can be recommended for most women. Most triptans are also restricted during lactation. Sumatriptan is excreted into breast milk, with only 0.24% of the maternal dosage recovered in breast milk.[60] Although initial recommendations for women using sumatriptan while nursing were to pump and discard milk for several hours after a sumatriptan dose, the American Academy of Pediatrics subsequently determined that sumatriptan is compatible with breastfeeding.[61]

Some antidepressants and antiepileptic medications may be used during pregnancy for long-standing neuropathic pain and chronic headache. Most antidepressants are listed as FDA risk category C; however, the selective serotonin reuptake inhibitor paroxetine (Paxil) was recently increased to category D, after identification of an increased risk of congential heart defects. β-Blockers may be used daily to prevent headache. Pregnancy-related compressive neuropathy is usually self-limited and should initially be treated with postural correction. Neuropathic medications are generally not needed.

Summary

Pain complaints are reported by the majority of women during pregnancy. The most common area of the body affected is the low back. Various types of compressive neuropathy – e.g., Bell's palsy, carpal tunnel syndrome, and meralgia paresthetica – also occur more frequently during pregnancy. By identifying common complaints, the healthcare provider can alleviate fears of serious illness, provide advice about the expected course of pain, and recommend effective and safe types of treatment. Pain complaints occurring during pregnancy should be evaluated with testing that minimizes risks to the baby, while information necessary to direct patient care during pregnancy is obtained. Patients with premorbid chronic pain that continues or worsens during pregnancy will often need to use nonpharmacological and pharmacological therapies. Pain complaints that develop during pregnancy are generally self-limited and resolve postpartum.

Test Your Knowledge

1. What percentage of women will typically report pain during pregnancy?

   a. 70–80%
   b. 30–40%
   c. 15–25%
   d. 2–5%

2. Which chronic pain syndrome typically improves during pregnancy?

   a. Migraine
   b. Low back pain
   c. Carpal tunnel syndrome
   d. All of the above

3. Safe testing during pregnancy includes the following:

   a. Physical examination
   b. Blood tests
   c. Ultrasound
   d. Electromyography/nerve conduction studies
   e. A–C
   f. A–D

4. Safe treatments during pregnancy include the following:

   a. Propranolol
   b. Valproate for migraine prevention
   c. Relaxation and biofeedback
   d. A and C
   e. All of the above

5. Common compressive neuropathies during pregnancy include the following:

   a. Bell's palsy
   b. Carpal tunnel syndrome
   c. Meralgia paresthetica
   d. Tarsal tunnel syndrome
   e. A–C
   f. All of the above

6. Carpal tunnel syndrome occurring during pregnancy:

   a. Tends to be more severe than carpal tunnel syndrome in nonpregnant women
   b. Is usually unilateral
   c. Tends to occur during the third trimester
   d. Requires surgical correction in about 30% of cases

Answers: 1a, 2a, 3f, 4d, 5e, 6c

References

1. Kristiansson P, Svärdsudd K, von Schoultz B. Back pain during pregnancy: a prospective study. Spine 1996;21:702–708
2. Marcus DA. Interrelationships of neurochemicals, estrogen, and recurring headache. Pain 1995;62:129–139
3. Marcus DA. Sex hormones and chronic headache. Exp Opin Pharmacother 2001;2:1839–1848

4. Sances G, Granella F, Nappi RE, et al. Course of migraine during pregnancy and postpartum: a prospective study. Cephalalgia 2003;23:197–205
5. Marcus DA, Scharff L, Turk D. Longitudinal prospective study of headache during pregnancy and postpartum. Headache 1999;39:625–632
6. Wall VR. Breastfeeding and migraine headaches. J Hum Lact 1992;8:209–212
7. Marcus DA. Headache in pregnancy. Curr Pain Headache Rep 2003;7:288–296
8. Azpilcueta A, Peral C, Giraldo I, Chen FJ, Contreras G. Meningioma in pregnancy. Report of a case and review of the literature. Ginecol Obstet Mex 1995;63:349–351
9. Saitoh Y, Oku Y, Izumoto S, Go J. Rapid growth of a meningioma during pregnancy: relationship with estrogen and progesterone receptors – case report. Neurol Med Cir 1989;29: 440–443
10. Facchinetti F, Allais G, D'Amico R, Benedetto C, Volpe A. The relationship between headache and preeclampsia: a case-control study. Eur J Obstet Gynecol Reprod Biol 2005;121:143–148
11. Stapleton DB, MacLennan AH, Kristiansson P. The prevalence of recalled low back pain during and after pregnancy: a South Australian population survey. Aust N Z J Obstet Gynaecol 2002;42:482–485
12. Mørkved S, Salvesen K?, Schei B, Lydersen S, Bø K. Does group training during pregnancy prevent lumbopelvic pain? A randomized clinical trial. Acta Obstet Gynecol 2007;86:276–282
13. Cohen Y, Lavie O, Granovsky-Grisaru S, Aboulafia Y, Diamant Y. Bell palsy complicating pregnancy: a review. Obstet Gynecol Surv 2000;55:184–188
14. Gillman GS, Schaitkin BM, May M, Klein SR. Bell's palsy in pregnancy: a study of recovery outcomes. Otolaryngol Head Neck Surg 2002;126:26–30
15. Shmorgun D, Chan WS, Ray JG. Association between Bell's palsy in pregnancy and preeclampssia. QJM 2002;95:359–362
16. Pazzaglia C, Caliandro P, Aprile I, et al. Multicenter study on carpal tunnel syndrome and pregnancy incidence and natural course. Acta Neurochir Suppl 2005;92:35–39
17. Turgut F, Cetinsahin M, Turgut M, Bölükbasi O. The management of carpal tunnel syndrome in pregnancy. J Clin Neurosci 2001;8:332–334
18. Mondelli M, Rossi S, Monti E, et al. Prospective study of positive factors for improvement of carpal tunnel syndrome in pregnant women. Muscle Nerve 2007;36:778–783
19. Mondelli M, Rossi S, Monti E, et al. Long term follow-up of carpal tunnel syndrome during pregnancy: a cohort study and review of the literature. Electromyogr Clin Neurophysiol 2007;47:259–271
20. Peterson PH. Meralgia paresthetica related to pregnancy. Am J Obstet Gynecol 1952;64: 690–691
21. Rhodes P. Meralgia paresthetica in pregnancy. Lancet 1957;273:831
22. Ferra Verdera M, Ribera Leclerc H, Garrido Pastor JP. Two cases of paresthetic meralgia of the femoral cutaneous nerve. Rev Esp Anestesiol Reanim 2003;50:154–156
23. Van Slobbe AM, Bohnen AM, Bernsen RM, koes BW, Bierma-Zeinstra SM. Incidence rates and determinants in meralgia paresthetica in general practice. J Neurol 2004;251:294–297
24. Davis LE. Normal laboratory values of CSF during pregnancy. Arch Neurol 1979;36:443
25. Levine D, Barnes PD, Edleman RR. Obstetric MR imaging. Radiology 1999;211:609–617
26. Kanal E, Gillen J, Evans J, Savitz D, Shellock F. Survey of reproductive health among female MR workers. Radiology 1993;187:395–399
27. Baker P, Johnson I, Harvey P, Mansfield P. A three-year follow-up of children imaged in utero using echo-planar magnetic resonance. Am J Obstet Gynecol 1994;170:32–33
28. Kanal E, Barkovich AJ, Bell C, et al. ACR guidance document for safe MR practices: 2007. Am J Roentgenol 2007;188:1447–1474
29. Webb JW, Thomsen HS, Morcos SK. The use of iodinated and gadolinium contrast media during pregnancy and lactation. Eur Radiol 2005;15:1234–1240
30. Toppenberg KS, Hill A, Miller DP. Safety of radiographic imaging during pregnancy. Am Fam Physician 1999;59:1813–1818, 1820
31. Gomes KR, Moron AF, Silva R, Siqueira AA. Prevalence of use of medicines during pregnancy and its relationship to maternal factors. Rev Saude Publ 1999;33:246–254

32. Damase-Michel C, Lapeyre-Mestre M, Moly C, Fournie A, Montastruc JL. Drug use during pregnancy: survey in 250 women consulting at a university hospital center. J Gynecol Obstet Biol Reprod 2000;29:77–85
33. Fonseca MR, Fonseca E, Bergsten-Mendes G. Prevalence of drug use during pregnancy: a pharmacoepidemiological approach. Rev Saude Publ 2002;36:205–212
34. Marcus DA, Scharff L, Turk DC. Nonpharmacologic management of headaches during pregnancy. Psychosom Med 1995;57:527–533
35. Scharff L, Marcus DA, Turk DC. Maintenance of effects in the nonmedical treatment of headaches during pregnancy. Headache 1996;36:285–290
36. Pomerleau OF. Endogenous opioids and smoking – a review of progress and problems. Psychoneuroendocrinolgy 1998;23:115–130
37. Mansbach RS, Rovetti CC, Freeland CS. The role of monoamine neurotransmitters system in the nicotine discriminative stimulus. Drug Alcohol Depend 1998;23:115–130
38. Wewers ME, Dhatt RK, Snively TA, Tejwani GA. The effect of chronic administration of nicotine on antinociception, opioid receptor binding and met-enkephalin levels in rats. Brain Res 1999;822:107–113
39. Payne TJ, Stetson B, Stevens VM, Johnson CA, Penzien DB, Van Dorsten B. Impact of cigarette smoking on headache activity in headache patients. Headache 1991;31:329–332
40. Aarnodt AH, Stovner LJ, Hagen K, Bråthen G, Zwart J. Headache prevalence related to smoking and alcohol use. The Head-HUNT Study. Eur J Neurol 2006;13:1233–1238
41. Andersson H, Ejlertsson G, Leden I. Widespread musculoskeletal chronic pain associated with smoking. An epidemiological study in a general rural population. Scan J Rehabil Med 1998;30:185–191
42. Yunus MB, Arslan S, Aldag JC. Relationship between fibromyalgia features and smoking. Scand J Rheumatol 2002;31:301–305
43. Luo X, Edwards CL, Richardson W, Hey L. Relationships of clinical, psychological, and individual factors with the functional status of neck pain patients. Value Health 2004;7:61–69
44. Omokhodion FO, Sanya AO. Risk factors for low back pain among office workers in Ibadan, Southwest Nigeria. Occup Med 2003;53:287–289
45. Carp HJ, Fein A, Nebel L. Effect of diclofenac on implantation and embryonic development in the rat. Eur J Obstet Gynecol Reprod Biol 1988;28:273–277
46. Kanayama K, Osada H, Nariai K, Endo T. Inhibitory effects of indomethacin on implantation and its related phenomena. J Int Med Res 1996;24:258–262
47. Li DK, Liu L, Odouli R. Exposure to non-steroidal anti-inflammatory drugs during pregnancy and risk of miscarriage: population based cohort study. BMJ 2003;327:368
48. Evers S, Áfra J, Frese A, et al. EFNS guideline on the drug treatment of migraine – report of an EFNS task force. Eur J Neurol 2006;13:560–572
49. Momma K, Hagiwara H, Konishi T. Constriction of fetal ductus arteriosus by non-steroidal anti-inflammatory drugs: study of additional 34 drugs. Prostaglandins 1984;28:527–536
50. Rein AJ, Nadjari M, Elchalal U, Nir A. Contraction of the fetal ductus arteriosus induced by diclofenac. Case report. Fetal Diagn Ther 1999;14:24–25
51. Zenker M, Klinge J, Kruger C, Singer H, Scharf J. Severe pulmonary hypertension in a neonate caused by premature closure of the ductus arteriosus following maternal treatment with diclofenac: a case report. J Perinat Med 1998;26:231–234
52. Bracken MB, Holford TR. Exposure to prescribed drugs in pregnancy and association with congenital malformations. Obstet Gynecol 1981;58:336–344
53. Saxen I. Association between oral cleft and drugs taken during pregnancy. Int J Epidemiol 1975;4:37–44
54. Saxen I. Epidemiology of cleft lip and palate: an attempt to rule out chance correlations. Br J Prev Soc Med 1975;29:103–110
55. Drug use and dependence: opioids. The Merck Manual of Diagnostics and Therapeutics, 18th edition, Psychiatric Disorders section. Available at www.merck.com/pubs (accessed January 2007)
56. Mahadevan U, Kane S. American Gastroenterological Association Institute medical position statement on the use of gastrointestinal medications in pregnancy. Gastroenterology 2006;131:283–311

57. Loder E. Safety of sumatriptan in pregnancy: a review of the data so far. CNS Drugs 2003;17:1–7
58. Olesen L, Steffensen FH, Sorensen HT, et al. Pregnancy outcome following prescription for sumatriptan. Headache 2000;40:20–24
59. Kallen B, Lygner PE. Delivery outcome in women who used drugs for migraine during pregnancy with special reference to sumatriptan. Headache 2001;41:351–356
60. Wojnar-Horton RE, Hackett LP, Yapp P, et al. Distribution and excretion of sumatriptan in human milk. Br J Clin Pharmacol 1996;41:217–221
61. American Academy of Pediatric Committee on Drugs. The transfer of drugs and other chemicals into human milk. Pediatrics 2001;108:776–789

Chapter 16
Geriatrics and Chronic Pain

Key Chapter Points:

- Chronic pain affects almost one-third of the elderly.
- Risk of musculoskeletal pain syndromes increases with aging, and includes arthritis, osteoporosis with fractures, and lumbar stenosis.
- Migraine becomes less prevalent with aging.
- Headache beginning after age 50 should be fully evaluated to rule out important causes of secondary headache, including giant-cell (temporal) arteritis, intracranial tumor, subdural hematoma, and cervical spine disease.
- Pharmacological and nonpharmacological therapies used in younger patients are effective in older patients, although drug selection and dosage must be adjusted to minimize adverse events and drug interactions.

Key Words Arteritis, Polymyalgia rheumatica, Stenosis, Trigeminal neuralgia

Case History

Mr. Williams is a healthy, active 72-year-old man who plays par golf 3 days a week. He is also a regular volunteer in his church and at a local nursing home. He comes to the doctor complaining of pain in his low back, buttock, and leg when he walks approximately two blocks. Often, the leg goes numb as well. Once he gets the pain, it only goes away after he sits down. Because of the pain, he has had to discontinue golfing and most of his volunteer activities. He recently started riding a bicycle to keep up his activity level, and reports that he can ride for several miles without any pain. The only time he can walk without developing severe buttock and leg pain is when he helps his wife by pushing the shopping cart in the grocery store. Mr. Williams also notes that the residents at the nursing home where he helps serve meals have begun to tease him, saying, "You're getting old, Bob. You're looking more and more like an old man everyday. Look how you stoop when you walk!" Mr. Williams' physical examination shows excellent forward flexion of his back, although he reports discomfort with back extension. His neurological examination is normal

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

and he briskly walks up and down the hallway in the office without complaint. Mr. Williams is reminded that he is "not a kid anymore," and his doctor suggests he to develop an interest in more sedentary activities.

Introduction

The prevalence of chronic pain increases with age, affecting nearly 30% of the elderly (Fig. 16.1).[1] Chronic pain in elderly patients should not be considered *a normal part of the aging process*. As seen with Mr. Williams, untreated chronic pain can result in decreased functional ability, loss of independence, reduced quality of life, and depression. Therefore, pain complaints in elderly patients should be accorded the same importance as similar complaints in younger patients.

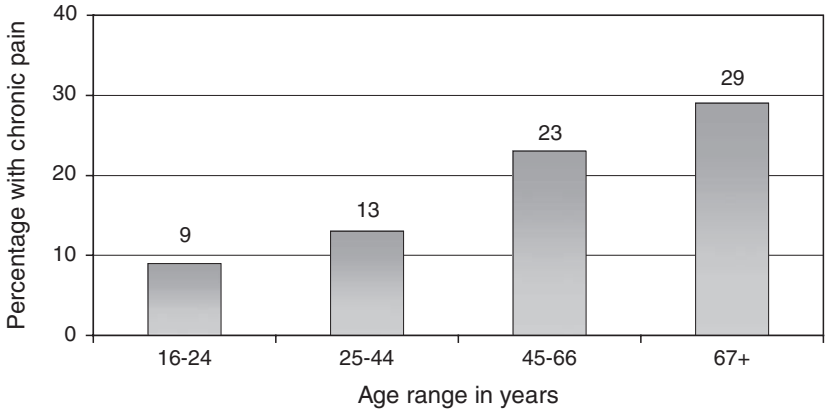


Fig. 16.1 Prevalence of chronic pain in a population-based survey (based on Eriksen et al.[1]).

Over the next several decades, pain management practices will need to shift to increase emphasis on addressing pain in the elderly. A United Nations' survey has identified a worldwide aging trend in both developed and less developed regions (Fig. 16.2).[2] The percentage of the world population aged 60 or older was 8% in 1950 and 10% in 2000, and is projected to reach 21% by 2050. In addition, individuals aged 80 or older represent the fastest growing age group worldwide. As the population continues to age, healthcare providers will be increasingly confronted with chronic pain complaints and will need to be knowledgeable about pain syndromes that commonly occur in elderly patients (see Box 16.1).

Mr. Williams presents a common history of the healthy, active senior who develops a pain complaint. Often, reports of pain in elderly patients are misinterpreted as expressions of depression or are considered to represent the normal aging process. Mr. Williams' story is typical of spinal stenosis, a treatable and usually reversible cause of pain. Failure to address pain complaints in the elderly can result in

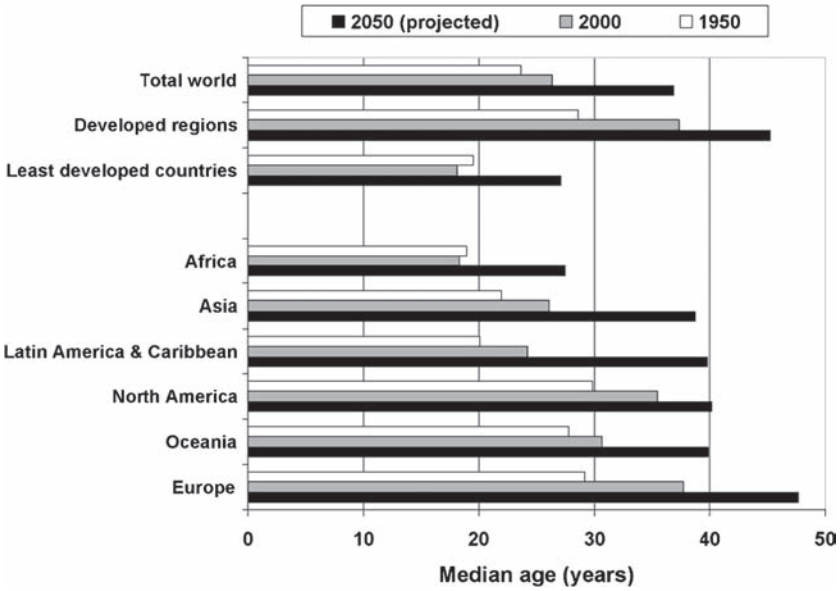


Fig. 16.2 Aging trends in world populations (based on United Nations Population Information Network[2]).

Box 16.1 Common geriatric pain syndromes

- Musculoskeletal
  - Arthritis
  - Osteoporosis with compression fractures
  - Myofascial pain
- Neuropathic pain
  - Postherpetic neuralgia
  - Trigeminal neuralgia
  - Peripheral neuropathy
- Spinal stenosis pain

unnecessary restrictions in activity that may result in increased disability and reduced independence long term. Although many of the same pain complaints that affect younger patients may also occur in older individuals, prevalence of pain conditions changes with aging. Understanding common pain syndromes in the elderly, such as spinal stenosis, can improve making a correct diagnosis and reduce the development of unnecessary restrictions in activities.

Common Chronic Pain Complaints

Patients may continue to describe long-standing chronic pain complaints that persist into their older years or, like Mr. Williams, develop new pain complaints with aging. Although many elderly individuals will not have work disability related to pain, losing the ability to maintain a healthy, active lifestyle and participate in social activities significantly impairs quality of life for seniors. Recognition of common pain syndromes in elderly patients improves the chance for an accurate diagnosis and reduces the risk for disability. Two of the most important types of pain that are significantly modified in elderly patients are musculoskeletal pain and headache.

Musculoskeletal Pain

Musculoskeletal abnormalities become more prevalent with advancing age, representing a significant risk for pain, disability, and loss of independence.[3] As seen with Mr. Williams, musculoskeletal pain can significantly restrict household, employment, or volunteer activities, as well as leisure and social participation. Common painful musculoskeletal conditions include arthritis and osteoporosis with resultant fractures (Fig. 16.3). These conditions occur more commonly in women than in men. Interestingly, the prevalence of chronic low back pain does not increase with aging.

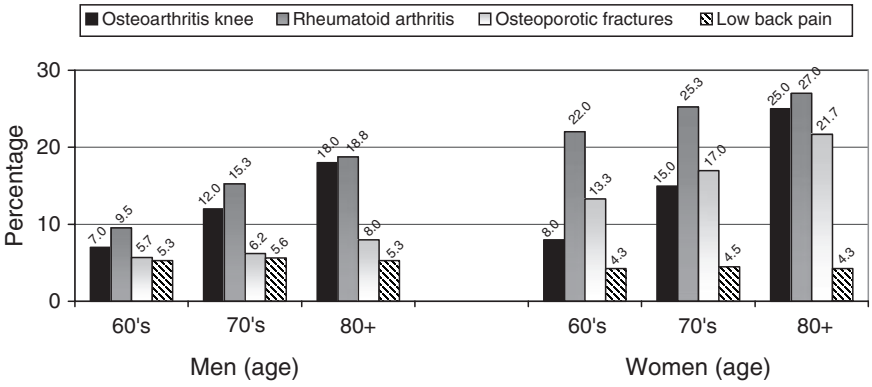


Fig. 16.3 Prevalence of musculoskeletal abnormalities in the elderly in developed countries (based on Woolf and Pfleger[3]).

Osteoporosis and Fractures

The prevalence of osteoporosis increases with advancing age in both men and women (Fig. 16.4).[4] The relative risk of a hip fracture is nearly five times greater in both older men and women with osteoporosis compared with individuals without osteoporosis (Fig. 16.4). Osteoporosis also increases the risk for vertebral compression fractures, which occur in 23% of ambulatory women aged 75 or more.[5]

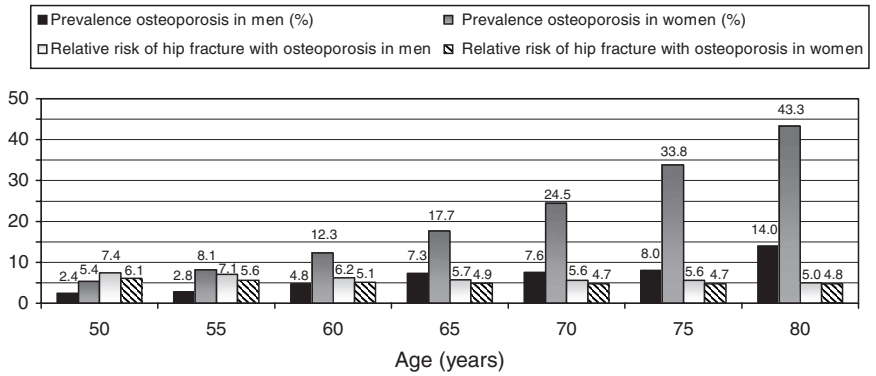


Fig. 16.4 Risk of osteoporosis and hip fracture with increasing age. Risk for osteoporosis is greater in women than in men. The occurrence of osteoporosis in both men and women results in an approximately five times increased risk of hip fracture after age 50 (based on Kanis et al.[4]).

Lumbar Stenosis

Lumbar spinal stenosis is characterized by pain in the back, buttocks, and leg that occurs with standing or walking. Because the diameter of the lumbar canal compresses with back extension and opens with flexion, patients like Mr. Williams tend to stoop while walking to minimize pain and also report pain relief after sitting (which is also associated with lumbar flexion). Vascular claudication also occurs with walking, but is related more to activity rather than posture. Although the pain of vascular claudication typically resolves while standing after discontinuing walking, patients with lumbar stenosis usually need to sit to achieve relief. Reports of longer walking tolerance when shopping in the grocery store (where stooping is assisted by using a shopping cart) suggest lumbar stenosis. Family members may also comment, "The longer Dad walks, the more he stoops forward." Neurological deficits in the extremities may occur in severe cases, although patients are typically normal when examined at rest. The natural history of lumbar stenosis was reviewed in a small series of 33 individuals.[6] While improvements occurred in average reduction in pain and walking disability, most people continued to remain symptomatic after 18 months (Fig. 16.5). Initial pain severity did not predict outcome, although the average baseline pain score in this sample was fairly low.

Headache

The prevalence of headache continues to be higher in elderly women than in men, although the prevalence of migraine decreases with advancing age. A survey of more than 1,000 community-dwelling adults 65 years or older revealed three or more headache episodes during the preceding year in 22%.[7] The overall prevalence of headache was higher in women. Migraine was particularly sensitive to reduction with advancing age, with a lower prevalence when compared with a similar survey of young adults (Fig. 16.6).[8]

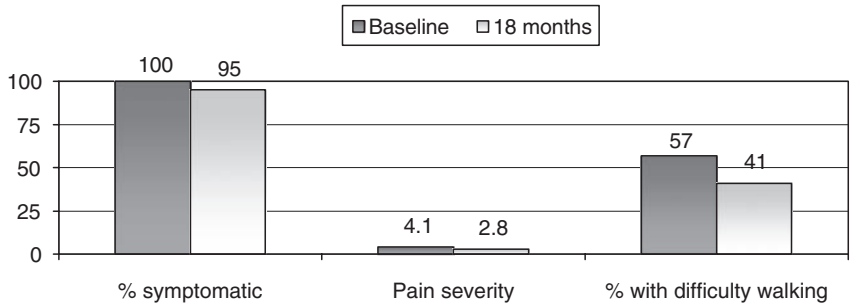


Fig. 16.5 Natural history of spinal stenosis (based on Haig et al.[6]).

Fig. 16.6 Prevalence of recurring headache in elderly (mean age = 75 years) and young adults (mean age = 22 years) (based on Camarda and Monastero[7] and Deleu et al.[8]).

New-onset headache or head pain should always be fully investigated in older adults. It is unusual for common benign headaches seen in young adults, like migraine, to begin after age 50. The presence of intracranial pathology (e.g., tumors or subdural hematomas) and cervical disease (e.g., arthritis) should be considered in elderly patients with new-onset headache. Two other important head pains that typically affect seniors are giant-cell (temporal) arteritis and trigeminal neuralgia.

Giant-cell (also called temporal) arteritis may occur as an isolated head pain syndrome or as part of a more systemic picture of polymyalgia rheumatica (Table 16.1).[9] Giant-cell arteritis typically occurs at or after age 50, occurring most commonly in people >70-years old.[10] Incidence is reported as 18.8 cases per 100,000 persons ≥50-years old, with women affected over twice as often as men.[11]

Giant-Cell (Temporal) Arteritis

Giant-cell (temporal) arteritis is a medical emergency that should be considered in the differential diagnosis of new headache in elderly patients because of the

Table 16.1 Prevalence of symptoms in giant-cell (temporal) arteritis and polymyalgia rheumatica

Giant-cell arteritis	Polymyalgia rheumatica
Head pain/scalp tenderness – 66%	Proximal limb pain and stiffness
Fatigue with chewing (jaw claudication) – 50%	70–95% shoulders
Polymyalgia rheumatica – 40%	50–70% hip and neck
Visual loss/disturbance – 20%	Systemic symptoms – 30%
Low-grade fever – 15%	Fever
Cough – 10%	Fatigue
	Anorexia
	Weight loss

Based on Salvarani et al.[9]

significant risk for vision loss and stroke. Visual ischemic complications occur in 26% and irreversible blindness in 15% of patients with biopsy-proven giant-cell arteritis.[12] Stroke, usually in the vertebrobasilar distribution, occurs in approximately 3% of patients with giant-cell arteritis.[13]

Evaluation begins with a hematocrit and erythrocyte sedimentation rate (ESR) or C-reactive protein. Patients with strong presumptive diagnoses of giant-cell arteritis or anterior ischemic neuropathy should be treated with steroids presumptively, immediately after blood work has been obtained. Treatment should not be delayed until blood test results or a temporal artery biopsy has been obtained. Biopsy should, however, be performed within 2–3 days of initiating steroid therapy.

Trigeminal Neuralgia

Trigeminal neuralgia is an excruciating, lancinating facial pain, typically triggered by stimulating the skin over the affected area, such as by touching, talking, or chewing. Patients sometimes also report a dull facial pain between severe paroxysms. Pain most commonly affects the second or third divisions of the trigeminal nerve, causing pain over the cheek or jaw. Interestingly, the right trigeminal nerve is more likely to be involved than the left. The overall incidence of trigeminal neuralgia in the general population is 0.004%.[14] A recent review of primary care patients reported 27 incident cases per 100,000 person-years.[15] Risk increases with age, and women are twice as likely to be affected as men.

Assessment Tools

Although the same general pain assessments used in younger patients may be applied to elderly patients, additional tools have been developed to allow convenient and appropriate assessment of pain severity and its impact in elderly populations. Tools that focus on disability for activities appropriate to the lifestyles of seniors are most appropriate. Two geriatric assessment tools that incorporate both pain severity and associated disability are the Geriatric Pain Measure questionnaire and the 6-minute walk test.

The Geriatric Pain Measure is a validated assessment tool of pain severity and impact that can be easily administered in the office (see Table 16.2).[16] After completion, this form may be placed in the patient's chart to serve as documentation of pain severity. Patients can complete additional questionnaires at follow-up appointments to document treatment response.

Table 16.2 Geriatric pain measure

I. Please put a "YES" or "NO" check for each item. Answer each question considering the impact that PAIN has on your ability to do or enjoy activities.

	YES	NO
Do or would you have pain with any of the following activities:		
Running, lifting heavy objects, or strenuous sports		
Moving a heavy table, vacuuming, bowling, or golfing		
Lifting or carrying groceries		
Climbing more than 1 flight of stairs		
Climbing only a few steps		
Walking more than 1 block		
Walking 1 block or less		
Bathing or dressing		
Does or would pain cause you to:		
Reduce work or other activities		
Accomplish less than you expect		
Limit the type of work or activities you do		
Use extra effort for work or other activities		
Have trouble in sleeping		
Miss attending religious functions		
Lack enjoyment in non-religious social or recreational activities		
Be unable to travel or use standard transportation		
Feel fatigued or tired		
Do you have pain:		
That never goes away completely		
Every day		
At least several times a week		
In the last week, has your pain caused you to feel sad or depressed		
Total		

II. Rate your pain severity on a scale from 0 (no pain) to 10 (the worst pain imaginable):

A. How severe is your pain TODAY?

0 1 2 3 4 5 6 7 8 9 10

B. What was your AVERAGE pain severity over the LAST WEEK?

0 1 2 3 4 5 6 7 8 9 10

Scoring: Add total number of "YES" checks and two numbers from section II. Multiply sum by 2.38 to produce a score ranging from 0 to 100.

Interpretation: <30 is mild pain, 30–69 is moderate pain, >70 is severe pain.

Based on Ferrell et al.[16]

The 6-minute walk test is a standardized, easy-to-employ measure of functional ability in elderly patients.[17] After marking 100-foot distances in a hallway, patients are asked to walk back and forth in the hallway at a comfortable pace, with rest breaks permitted, while an examiner records the number of laps (i.e., total distance) completed in 6 minutes (mean expected distance: 362 meters [1,188 feet] for men; 332 meters [1,089 feet] for women). This test can help document functional impairment at baseline (based on walking less than the expected distance) and provide a follow-up efficacy response measure after treatment.

Treatment

The same nonpharmacological and pharmacological therapies used in younger adults are also used for elderly patients with chronic pain. Medication selection and dosing are more complicated in older patients because of the increased prevalence of comorbid medical illness and increased sensitivity to medication side effects.

Nonpharmacological Therapy

Nonpharmacological therapy retains good efficacy in elderly patients. Effective pain control in elderly patients has been demonstrated with biofeedback, cognitive-behavioral therapy, progressive exercise, and Tai Chi.[18–21] Similar to findings in younger patients with chronic pain, the addition of nonpharmacological therapy to pharmacotherapy enhances both pain relief and functional improvement (Fig. 16.7).[19]

Exercise recommendations for musculoskeletal pain in elderly patients are modified for comorbid illness and baseline physical capabilities. Exercises for

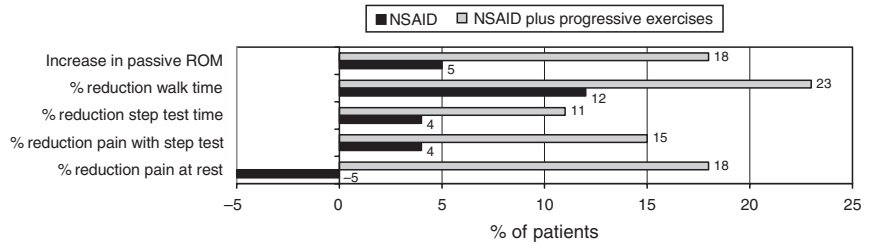


Fig. 16.7 Treatment of knee osteoarthritis with medication vs. medication plus progressive exercise. Patients older than 65 years with painful knee osteoarthritis were randomized to 8 weeks of 1,200-mg oxaprozin per day plus stretches without resistance or progression (NSAID) or oxaprozin plus progressive home range of motion and resistance exercises (NSAID plus progressive exercise). Pain and functional measures were all superior in patients treated with supplemental progressive exercise ($P < 0.05$). *NSAID* nonsteroidal anti-inflammatory drug, *ROM* range of motion (based on Petrella and Bartha[19]).

chronic pain should include stretching and reconditioning exercises. For example, stationary bicycling three times a week for 25 minutes each session resulted in reduced pain and improved functional ability in elderly patients with knee osteoarthritis, as indicated by the 6-minute walk test.[22]

A longitudinal study evaluated the effect of regular exercise at least 4 days/week in patients aged 70, specifically their ability to perform activities of daily living (ADLs) independently at age 77.[23] Individuals who participated in regular exercise at age 70 were significantly more likely to be able to perform ADLs with ease at age 77 years than those who did not do regular exercise. This difference was still seen after adjusting for diabetes, hypertension, chronic back pain, loneliness, ease of performing ADLs at age 70, and health deterioration from age 70 to 77. Exercise is, therefore, an important recommendation for elderly patients to reduce pain and maximize long-term independence.

Medications

The same medications used in younger adults are used for pain syndromes in elderly individuals. Drug selection and dosage must be adjusted in elderly patients to minimize adverse events and drug interactions. A review of outpatient visits from two large national, ambulatory care surveys in the United States revealed the use of at least one inappropriate drug in elderly patients at 3.8% of visits.[24] The major categories of drug offenders were pain relievers and central nervous system drugs, which are routinely used for pain management in younger patients.

Focal pain complaints in the elderly may be treated with local treatments, which minimize systemic effects. These may include topical capsaicin or 5% lidocaine, trigger-point injections for myofascial pain, and epidural steroid injections for lumbar stenosis.

Diffuse pain complaints may require systemic medications. Analgesics are less tolerated in the elderly than in younger patients. Risk for gastric toxicity related to nonsteroidal anti-inflammatory agents (NSAIDs) increases in elderly patients, especially when long-acting NSAIDs are used.[25,26] Gastric toxicity may be reduced by limiting NSAID use to short-acting NSAIDs.[27] Renal effects are also more problematic in older patients, including concerns about the interference of NSAIDs with the efficacy of diuretics. Opioids require careful monitoring to minimize sedating and cognitive effects, as well as constipation. High-fiber diets, regular exercise, and the use of lactulose and senna are appropriate for minimizing medication-induced constipation. Acetaminophen is well tolerated and is particularly useful in patients with comorbid medical illnesses. The combination of tramadol 37.5 mg and acetaminophen 325 mg [Ultracet] is an effective and generally well-tolerated alternative for elderly patients to provide flare analgesia.[28]

Neuropathic medications should also be used in low doses. Antiepileptic drugs (AED) are also effective therapy for neuropathic pain in elders. Gabapentin [Neurontin] is the most effective AED agent for neuropathic pain, having fewer cognitive effects in seniors.[29] Use of tricyclic antidepressants (TCAs) should be limited in elderly patients. Trazodone [Desyrel] has fewer cardiovascular effects

than TCAs, as well as good efficacy for deafferentation pain.[30] Selective serotonin reuptake inhibitors (SSRIs) are less effective than TCAs, but provide superior tolerability. SSRIs have not been linked to increased suicide risk in elderly patients.[31] Results from a recent study suggest that any antidepressant may need to be used cautiously in seniors. This study reported an increase in white matter lesions on brain magnetic resonance scanning among elderly patients treated with antidepressants; while the significance of this finding is unclear, these finding support limiting antidepressant exposure in non-depressed elder patients.[32]

Drug dosage should be lower in older patients to minimize the risk for adverse events. For example, the muscle relaxant tizanidine [Zanaflex] is tolerated in an elderly population, but its sedating side effects limit the dosing level.[33] Low doses of tizanidine (1 mg) should be initiated at bedtime and increased slowly to a maximum of 2–4 mg twice daily, as tolerated.

Osteoporosis and Fractures

The results of large-scale controlled clinical trials indicate that the treatment of osteoporosis with bisphosphonates such as risedronate or alendronate consistently reduces the 3-year risk of developing vertebral and non-vertebral fractures by approximately 40%.[34] Muscle-strengthening exercises also reduce the risk for fractures in the elderly. Sinaki et al. randomized 65 healthy, postmenopausal women to an exercise program designed to promote progressive strengthening of the back extensor muscles or a control group.[35] After 2 years, exercise was discontinued. Participants were then reassessed 8 years later with radiographs. The incidence of vertebral compression fracture was significantly lower in women who performed the back exercises (1.6%) compared with controls (4.3%; $P = 0.03$).

Lumbar Stenosis

Lumbar stenosis is typically treated with extension exercises, epidural steroid injections, and, for more severe symptoms, surgical decompression. Reconditioning exercises should be performed in the flexed position (e.g., stationary bicycling or as aqua therapy). Adding manual physical therapy, exercise, and body weight-supported treadmill walking significantly improves both short- and long-term benefits.[36] The addition of epidural injections often further enhances benefits from physical therapy. A recent small study of patients with bilateral radicular pain from lumbar stenosis reported pain reduction by at least half in 2 of every 3 patients immediately following fluoroscopically guided caudal epidural steroid injections and half of patients after 1 year.[37]

In a recent study, 94 patients with lumbar stenosis (mean age = 62.5 years) were randomized to surgery or conservative therapy consisting of physical therapy and as needed nonsteroidal anti-inflammatory drugs.[38] Improvement in subjectively reported pain and disability was superior with surgical treatment ($P < 0.05$), although objectively measured improvement in walking was similar with either

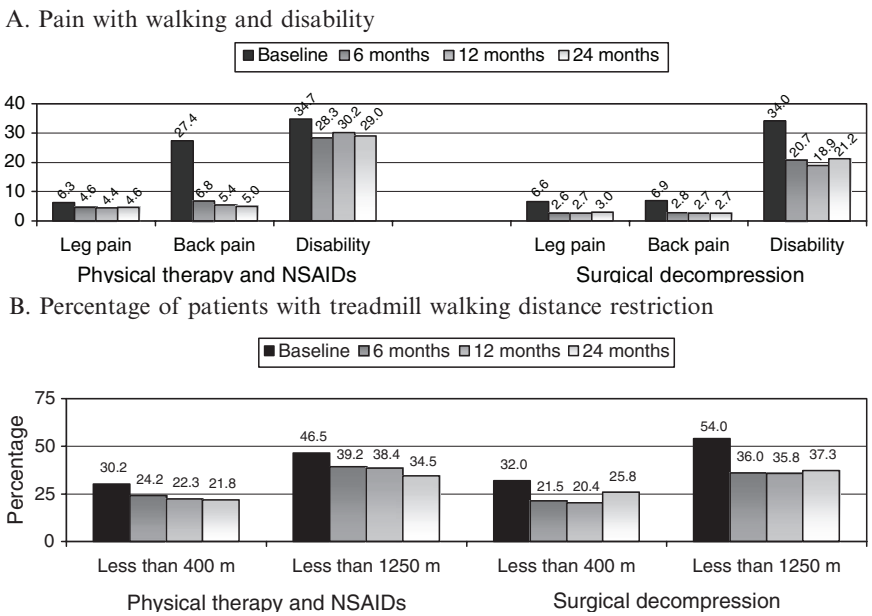


Fig. 16.8 Comparison of outcome after surgical or non-surgical treatment of lumbar stenosis. (**A**) Pain with walking and disability (pain was measured from 0 [no pain] to 10 [excruciating pain]. Disability was measured using the Oswestry Disability Index with possible scores ranging from 0 [no disability] to 100 [severe disability]). *NSAIDs* nonsteroidal anti-inflammatory drugs, (**B**) Percentage of patients with treadmill walking distance restriction (based on Malmivaara et al.[38])

treatment (Fig. 16.8). An earlier long-term study comparing results from surgery or conservative treatment similarly reported superior short- and long-term results with surgery, although patients initially assigned to conservative treatment later achieved relief with surgery similar to that of patients treated initially with decompression.[39] Thus, initial treatment of mild to moderate symptoms with conservative measures is not harmful because a delay in surgery does not significantly hinder outcome.

Surgical results are similarly good in elderly patients with lumbar stenosis, with no increased risk of surgical complications (Fig. 16.9).[40] Good outcome with reduced complications may be facilitated by using minimally invasive surgical techniques.[41–43] Conservative therapy should be used as first-line therapy in elderly patients with comorbid medical illnesses, because the surgical outcome is negatively influenced by comorbid disease, such as diabetes.[44]

Giant-Cell (Temporal) Arteritis

Glucocorticoids are first-line treatment for giant-cell arteritis, effectively relieving clinical symptoms and preventing ischemic complications in most patients.[45]

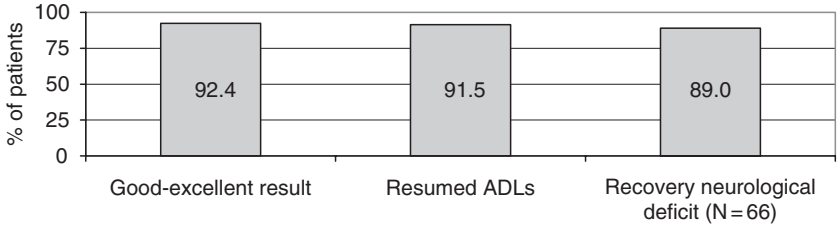


Fig. 16.9 Long-term outcome for 118 patients with lumbar stenosis aged 70 or more treated with surgery. Mean follow-up time: 7 years. Neurological deficits were present before surgery in 66 patients (56% of the total sample). *ADLs* activities of daily living (based on Ragab et al.[40]).

Glucocorticoid complications occur frequently in patients treated for giant-cell arteritis (see Table 16.3).[46] In order to minimize exposure to glucocorticoids, several studies have recently evaluated the benefit from methotrexate [Rheumatrex, Trexall], azathioprine [Imuran], anti-tumor necrosis factor-α monoclonal antibody infliximab [Remicade], and low-dose aspirin. Controlled trial data are sparse with each of these therapies, with conflicting results reported.[45]

Table 16.3 Incidence of glucocorticoid-related complications in patients treated for giant-cell arteritis

Complication	Percentage
Any glucocorticoid side effect	86
Posterior subcapsular cataract	41
Any fracture	38
Vertebral fracture	23
Hip fracture	16
Infection	31
Hypertension	22
Diabetes	9
Gastrointestinal bleeding	4

Based on Proven et al.[46]

Patients presenting with visual complaints are initially treated with intravenous steroids (e.g., 1,000-mg methylprenisolone daily pulsed in two to four divided doses for several days). Otherwise, the initial treatment is typically prednisone 60–100 mg daily. Headache should resolve within several days after initiating steroids. The prednisone dosage should be gradually tapered during the first month of treatment; thus, most patients will be taking approximately 40 mg daily after 4 weeks. Prednisone should be continued for approximately 6–18 months, with the dosage decreased by 10% per week or 2.5–5.0 mg every 1–2 weeks until a maintenance dosage of 10–20 mg/day is reached. The tapering schedule is dependent on continuation of symptomatic control and reduction in ESR. Small increases in ESR often occur during steroid tapering and do not require an increase in steroids if the patient

remains asymptomatic. Because treatment is started before a diagnosis is verified, the treating physician must not feel obligated to maintain a full 6- to 18-month course of treatment when the diagnosis has been ruled out (e.g., negative ESR and negative biopsy). This is particularly true because of the serious adverse events associated with chronic steroid use (see Table 16.3).

Trigeminal Neuralgia

Trigeminal neuralgia may be treated with AEDs (e.g., phenytoin [Dilantin] or carbamazepine [Tegretol]), baclofen [Kemstro, Lioersal], peripheral glyercol injections, stereotactic radiosurgery, or microvascular decompression. Carbamazepine and oxcarbazepine [Trileptal] are considered first-line therapy for trigeminal neuralgia (see Table 16.4).[47] While oxcarbazepine is generally less effective than carbamazepine, tolerability is typically superior. Phenytoin is less well tolerated, however, patients can achieve effective blood levels more quickly by using initial loading doses. Baclofen is likewise consistently effective for trigeminal neuralgia. Gabapentin may also be used in patients who are unable to tolerate other AEDs, although its efficacy is inferior. A review of 92 patients with trigeminal neuralgia being treated with gabapentin showed complete or nearly complete pain relief in 27% and partial pain relief in 20%; pain relief was sustained in 63%.[48] Recently, open-label treatment with pregabalin [Lyrica] 150–600 mg daily showed significant pain relief after 8 weeks in 49% of patients, with complete pain relief in 25%.[49] Among patients experiencing early pain relief, relief lasted for 1 year in 85%. Patients often experience pain-free periods lasting months to years, so medication tapering may be attempted after the patient has been pain-free for several months.

Table 16.4 First-line medication therapy for trigeminal neuralgia

Drug	Initiation dosage	Dosage after titration
Carbamazepine [Tegretol]	100 mg/day	200 mg four times daily
Oxcarbazepine [Trileptal]	150 mg/day	600 mg two times daily
Phenytoin [Dilantin]	200 mg/day	300–500 mg/day
Baclofen [Kemstro, Lioresal]	5–10 mg three times daily	20 mg four times daily

Patients failing to respond to or achieve a maintained response with medication therapy may be treated with rhizotomy, stereotactic (gamma knife) radiosurgery, or microvascular decompression. Rhizotomy typically produces good acute pain relief, although surgery is often complicated by postoperative facial numbness and symptom recurrence.[50] Stereotactic radiosurgery consistently produces good immediate and long-term pain relief,[51–53] with persistent paresthesia reported in 16% of patients in one study.[54] Retromastoid microvascular decompression cushions the trigeminal nerve by placing a pad between the trigeminal nerve near its root and

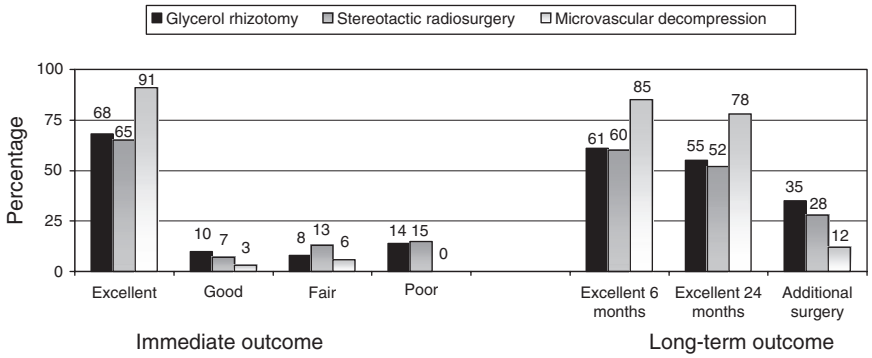


Fig. 16.10 Surgical response with trigeminal neuralgia. Postoperative response was termed excellent (no pain and no medications), good (no pain with low-dose medication), fair (>50% pain reduction), and poor (≤50% pain reduction) (based on Pollock and Ecker[57]).

nearby blood vessels. Microvascular decompression offers the most complete and persistent pain relief and should be considered first-line surgical treatment for patients able to receive general anesthesia. For example, a recent long-term study showed a pain-free response after microvascular decompression in 91% one year after surgery and 73% fifteen years after surgery.[55,56] Postoperative outcome was directly compared in 126 trigeminal neuralgia patients treated with a total of 153 separate surgical procedures: glycerol rhizotomy ($N = 51$), stereotactic radiosurgery ($N = 69$), or microvascular decompression ($N = 33$) (Fig. 16.10).[57] Patients were followed for an average of 2 years after surgery. An excellent outcome was more likely to be achieved and maintained at 6 and 24 months after microvascular decompression compared with the other two surgeries ($P < 0.01$).

Summary

Chronic pain continues to be a significant problem in elderly patients, with chronic pain affecting almost one-third of seniors. Chronic pain is not an expected symptom of aging and should be evaluated and treated in elderly patients. Although chronic pain may not interfere with work performance in an elderly population, important consequences of untreated chronic pain may ensue, including discomfort, disability, depression, and possible loss of independence. Most common pain problems can be effectively treated in this age group. Exercise, cognitive restructuring, and biofeedback continue to be effective pain management tools for older adults. Medications may also enhance pain control, although drug selection and dosages need to be adjusted to minimize the risk for adverse events and drug–drug interactions.

Test Your Knowledge

1. Common pain syndromes in elderly patients include the following:

   a. Arthritis
   b. Migraine
   c. Osteoporosis with fracture
   d. A and C
   e. All of the above

2. Which statement(s) about musculoskeletal pain in the elderly is/are true?

   a. The prevalence of low back pain increases with aging.
   b. Osteoporosis increases risk of hip fracture five times in elderly patients.
   c. Vertebral fractures occur in over 50% of ambulatory women ≥75-years old.
   d. Lumbar stenosis pain is relieved by back extension.
   e. All of the above

3. Which statement about headaches in elderly patients is true?

   a. Migraine becomes more frequent with aging.
   b. New-onset headache may be observed for 6 months before a work-up.
   c. Symptoms of giant-cell or temporal arteritis often include head pain, scalp tenderness, and jaw claudication.
   d. Gabapentin is the most effective treatment for trigeminal neuralgia.

4. Effective and tolerated pain management therapies in the elderly include the following:

   a. Stationary bicycling
   b. Tai Chi
   c. Biofeedback
   d. Tramadol
   e. All of the above

5. Preferred treatment(s) for trigeminal neuralgia include the following:

   a. Gabapentin
   b. Microvascular decompression
   c. Glycerol rhizotomy
   d. TCAs
   e. A and B

6. Choose the correct statement(s) about treating lumbar stenosis:

   a. Improvement is generally superior with surgical decompression.
   b. Temporarily postponing surgery to attempt conservative treatment typically results in worse recovery compared with patients initially treated surgically.
   c. Effective physical therapy treatments include exercise and body weight-supported treadmill walking.

d. A and B
e. A and C
f. All of the above

Answers: 1d, 2b, 3c, 4e, 5b, 6e

References

1. Eriksen J, Jensen MK, Sjøgren P, Ekholm O, Rasmussen NK. Epidemiology of chronic non-malignant pain in Denmark. Pain 2003;106:221–228
2. United Nations Population Information Network. World population prospects: the 2002 revision. Available at: http://www.un.org/popin (accessed March 2008)
3. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. Bull World Health Organ 2003;81:646–656
4. Kanis JA, Johnell O, Oden A, Jonsson B, De Laet C, Dawson A. Risk of hip fracture according to the World Health Organization criteria for osteopenia and osteoporosis. Bone 2000;27:585–590
5. Grados F, Marcelli C, Dargent-Molina P, et al. Prevalence of vertebral fractures in French women older than 75 years from the EPIDOS study. Bone 2004;34:362–367
6. Haig AJ, Tong HC, Yamakawa KS, et al. Predictors of pain and function in persons with spinal stenosis, low back pain, and no back pain. Spine 2006;31:2950–2957
7. Camarda R, Monastero R. Prevalence of primary headaches in Italian elderly: preliminary data from the Zabút Aging Project. Neurol Sci 2003;24:S122–S124
8. Deleu D, Khan MA, Humaidan H, Al Mantheri Z, Al Hashami S. Prevalence and clinical characteristics of headache in medical students in Oman. Headache 2001;41:798–804
9. Salvarani C, Cantini F, Boiardi L, Hunder GG. Medical progress: polymyalgia rheumatica and temporal arteritis. NEJM 2002;347:261–271
10. González-Gay MA, Garcia-Porrua C, Rivas MJ, Rodriguez-Ledo P, Llorca J. Epidemiology of biopsy proven giant cell arteritis in northwestern Spain: trend over an 18 year period. Ann Rheum Dis 2001;60:367–371
11. Salvarani C, Corwson CS, O'Fallon M, Hunder GG, Gabriel SE. Reappraisal of the epidemiology of giant cell arteritis in Olmsted County, Minnesota, over a fifty-year period. Arthritis Rheum 2004;51:264–268
12. Gonzalez-Gay MA, Garcia-Porrua C, Llorca J, et al. Visual manifestations of giant cell arteritis. Trends and clinical spectrum in 161 patients. Medicine 2000;79:283–292
13. Gonzalez-Gay MA, Blanco R, Rodriguez-Valverde V, et al. Permanent visual loss and cerebrovascular accidents in giant cell arteritis. Arthritis Rheum 1998;41:1497–1504
14. Katusic S, Beard CM, Bergstralh E, Kurland LT. Incidence and clinical features of trigeminal neuralgia, Rochester, Minnesota, 1945–1984. Ann Neurol 1990;27:89–95
15. Hall GC, Carroll D, Parry D, McQuay HJ. Epidemiology and treatment of neuropathic pain: the UK primary care perspective. Pain 2006;122:156–162
16. Ferrell BA, Stein WM, Beck JC. The Geriatric Pain Measure: validity, reliability and factor analysis. J Am Geriatr Soc 2000;48:1669–1673
17. Enright PL, McBurnie MA, Bittner V, et al. The 6-min walk test: a quick measure of functional status in elderly adults. Chest 2003;123:387–398
18. Arena JG, Hannah SL, Bruno GM, Meador KJ. Electromyographic biofeedback training for tension headache in the elderly: a prospective study. Biofeedback Self Regul 1991;16:379–390
19. Petrella RJ, Bartha C. Home based exercise therapy for older patients with knee osteoarthritis: a randomized clinical trial. J Rheumantol 2000;27:2215–2221
20. Reid MC, Otis J, Barry LC, Kerns RD. Cognitive-behavioral therapy for chronic low back pain in older persons: a preliminary study. Pain Med 2003;4:223–230

21. Song R, Lee EO, Lam P, Bae SC. Effects of tai chi exercise on pain, balance, muscle strength, and perceived difficulties in physical functioning in older women with osteoarthritis: a randomized clinical trial. J Rheumatol 2003;30:2039–2044
22. Mangione KK, McCully K, Gloviak A, Lefebvre I, Hofmann M, Craik R. The effects of high-intensity and low-intensity cycle ergometry in older adults with knee osteoarthritis. J Gerontol A Biol Sci Med Sci 1999;54:M184–M190
23. Stessman J, Hammerman-Rozenberg R, Maaravi Y, Cohen A. Effect of exercise on ease in performing activities of daily living and instrumental activities of daily living from age 70 to 77: the Jerusalem Longitudinal Study. J Am Geriatr Soc 2002;50:1934–1938
24. Goulding MR. Inappropriate medication prescribing for elderly ambulatory care patients. Arch Intern Med 2004;164:305–312
25. Johnson AG, Day RO. The problems and pitfalls of NSAID therapy in the elderly (Part I). Drugs Aging 1991;1:130–143
26. Scharf S, Kwiatek R, Ugoni A, Christophidis N. NSAIDs and faecal blood loss in elderly patients with osteoarthritis: is plasma half-life relevant? Aust N Z J Med 1998;28:436–439
27. Bell GM, Schnitzer TJ. Cox-2 inhibitors and other nonsteroidal anti-inflammatory drugs in the treatment of pain in the elderly. Clin Geriatr Med 2001;17:489–502
28. Rosenthal NR, Silverfield JC, Wu SC, Jordan D, Kamin M. Tramadol/acetaminophen combination tablets for the treatment of pain associated with osteoarthritis flare in an elderly patient population. J Am Geriatr Soc 2004;52:374–380
29. Martin R, Meador K, Turrentine L, et al. Comparative cognitive effects of carbamazepine and gabapentin in healthy senior adults. Epilepsia 2001;42:764–771
30. Ventafridda V, Caraceni A, Saita L, et al. Trazodone for deafferentation pain. Comparison with amitriptyline. Psychopharmacology 1988;95 (suppl):S44–S49
31. Rahme E, Dasgupta K, Turecki C, Nedjar H, Galbaud du Fort G. Risks of suicide and poisoning among elderly patients prescribed selective serotonin reuptake inhibitors: a retrospective cohort study. J Clin Psychiatry 2008;69:349–357
32. Steffens DC, Chung H, Krishnan KR, et al. Antidepressant treatment and worsening white matter on serial cranial magnetic resonance imaging in the elderly: the Cardiovascular Health Study. Stroke 2008;39:857–862
33. Vilming ST, Lyberg T, Lataste X. Tizanidine in the management of trigeminal neuralgia. Cephalalgia 1986;6:181–182
34. Ettinger MP. Aging bone and osteoporosis: strategies for preventing fractures in the elderly. Arch Intern Med 2003;163:2237–2246
35. Sinaki M, Itoi E, Wahner HW, et al. Stronger back muscles reduce the incidence of vertebral fractures: a prospective 10 year follow-up of postmenopausal women. Bone 2002;30:836–841
36. Whitman JM, Flynn TW, Childs JD, et al. A comparison between two physical therapy treatment programs for patients with lumbar spinal stenosis: a randomized clinical trial. Spine 2006;31:2541–2549
37. Botwin K, Brown LA, Fishman M, Rao S. Fluoroscopically guided caudal epidural steroid injections in degenerative lumbar spine stenosis. Pain Physician 2007;10:547–558
38. Malmivaara A, Slätis P, Heliövaara M, et al. Surgical or nonoperative treatment for spinal stenosis? A randomized controlled trial. Spine 2007;32:1–8
39. Amundsen T, Weber H, Nordal HJ, Magnes B, Abdelnoor M, Lilleås F. Lumbar spinal stenosis: conservative or surgical management? A prospective 10-year study. Spine 2000;25:1424–1436
40. Ragab AA, Fye MA, Bohlman HH. Surgery of the lumbar spine for spinal stenosis in 118 patients 70 years of age or older. Spine 2003;28:348–353
41. Podichetty VK, Spears J, Issacs RE, Booher J, Biscup RS. Complications associated with minimally invasive decompression for lumbar spinal stenosis. J Spinal Disord Tech 2006;19:161–166
42. Costa F, Sassi M, Cardia A, et al. Degenerative lumbar spinal stenosis: analysis of results in a series of 374 patients treated with unilateral laminotomy for bilateral microdecompression. J Neurosurg Spine 2007;7:579–586
43. Rosen DS, O'Toole JE, Eichholz KM, et al. Minimally invasive lumbar spinal decompression in the elderly: outcomes of 50 patients aged 75 years and older. Neurosurgery 2007;60:503–510

44. Arinzon Z, Adunsky A, Fidelman Z, Gepstein R. Outcomes of decompression surgery for lumbar spinal stenosis in elderly diabetic patients. Eur Spine J 2004;13:32–37
45. Pipitone N, Salvarani C. Improving therapeutic options for patients with giant cell arteritis. Curr Opin Rheumatol 2008;20:17–22
46. Proven A, Gabriel SE, Orces C, OFallon M, Hunder GG. Glucocorticoid therapy in giant cell arteritis: duration and adverse outcomes. Arthritis Care Res 2003;49:703–708
47. Chloe R, Patil R, Degwekar S, Bhowate R. Drug treatment of trigeminal neuralgia: a systematic review of the literature. J Oral Maxillofac Surg 2007;65:40–45
48. Cheshire WP. Defining the role for gabapentin in the treatment of trigeminal neuralgia: a retrospective report. J Pain 2002;3:137–142.
49. Obermann M, Yoon MS, Sensen K, et al. Efficacy of pregabalin in the treatment of trigeminal neuralgia. Cephalalgia 2008;28:174–181.
50. Henson CF, Goldman HW, Rosenwasser RH, et al. Glycerol rhizotomy versus gamma knife radiosurgery for the treatment of trigeminal neuralgia: an analysis of patients treated at one institution. Int J Radiat Oncol Biol Phys 2005;63:82–90
51. Jawahar A, Wadhwa R, Beck C, et al. Assessment of pain control, quality of life, and predictors of success after gamma knife surgey for the treatment of trigeminal neuralgia. Neurosurg Focus 2005;18:E8
52. Sheehan J, Pan HC, Stroila M, Steiner L. Gamma knife surgery for trigeminal neuralgia: outcomes and prognostic factors. J Neurosurg 2005;102:434–441
53. Longhi M, Rizzo P, Nicolato A, et al. Gamma knife radiosurgery for trigeminal neuraliga: results and potentially predictive parameters, Part 1: idiopathic trigeminal neuralgia. Neurosurgery 2007;61:1254–1260
54. Fountas KN, Smith JR, Lee GP, et al. Gamma knife stereotactic radiosurgical treatment of idiopathic trigeminal neuraliga: long-term outcome and complications. Neurosurg Focus 2007;23:E8
55. Sindou M, Leston J, Decullier E, Chapuis F. Microvascular decompression for primary trigeminal neuralgia: long-term effectvienss and prognostic factors in a series of 362 consecutive patients with clear-cut neurovascular conflicts who underwent pure decompression. J Neurosurg 2007;107:1144–1153
56. Sindou M, Leston J, Howeidy T, Decullier E, Chapuis F. Micro-vascular decompression for primary trigeminal neuralgia (typical or atypical). Long-term effectiveness on pain – prospective study with survival analysis in a consecutive series of 362 patients. Acta Neurochir 2006;148:1235–1245
57. Pollock BE, Ecker RD. A prospective cost-effectiveness study of trigeminal neuralgia surgery. Clin J Pain 2005;21:317–322

Chapter 17
Gender and Ethnic Differences in Pain Experience

Key Chapter Points:

- Women are more sensitive to pain, with a lower pain threshold and tolerance than men.
- Women are less responsive than men to analgesic therapy, including therapy with ibuprofen and morphine.
- Pain perception is similar among ethnic groups; however, pain tolerance is reduced in African-Americans, Asians, and Hispanics. Pain-related psychological distress and disability is also higher in African-Americans.
- Physicians are more likely to prescribe nonspecific analgesics and lower opioid dosages to non-Caucasians.
- Patient selection of alternative or complementary therapy varies by ethnicity.

Key Words African-American, Asian, female, Hispanic, male, race

Case History

Mrs. Thomas is a 65-year-old Mexican-American woman who has lived in the United States with her family for the past 30 years. She is troubled with disabling arthritis in her lower extremities, which interferes with her ability to perform household chores and care for her three active grandchildren. She comes to the doctor in tears, asking if there is some additional therapy she can use besides ibuprofen. Mrs. Thomas' daughter and two of the grandchildren accompany her to the appointment and also describe Mrs. Thomas' severe pain, explaining that she is often heard praying for relief and moaning with pain. Her daughter also notes that Mrs. Thomas has talked about seeing a *curandero*, a traditional healer in their community, if the doctor cannot offer any additional therapy. Mrs. Thomas' doctor feels annoyed at what he perceives to be a threat of seeking care with an additional practitioner, hearing the message, "Even someone with no real medical training would be better than you!" He is concerned that Mrs. Thomas is exaggerating the severity of her pain complaints in order to obtain opioid prescriptions, and recommends that she continue using ibuprofen.

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

Introduction

Caring for patients with chronic pain requires knowledge of patient gender and cultural experiences, which may color the pain experience, presentation, and response to therapy. Physician biases can interfere with understanding the impact of pain complaints and the need for therapy. Research studies are available that explore differences in pain perception based on gender and ethnicity, with fewer studies exploring differences in physician responses and treatment practices. In addition, studies have shown important differences in medication response between genders, which should be considered when selecting treatment.

Large-scale samples of chronic pain sufferers show differences in pain, based on gender and ethnicity. For example, review of severe knee and hip pain in older adults participating in the third National Health and Nutrition Examination Survey showed increased prevalence of severe pain in women overall, as well as non-Caucasian women (Fig. 17.1).[1,2] Like Mrs. Thomas, older Mexican-American women have a higher prevalence of severe knee and hip pain compared with men and Caucasian women.

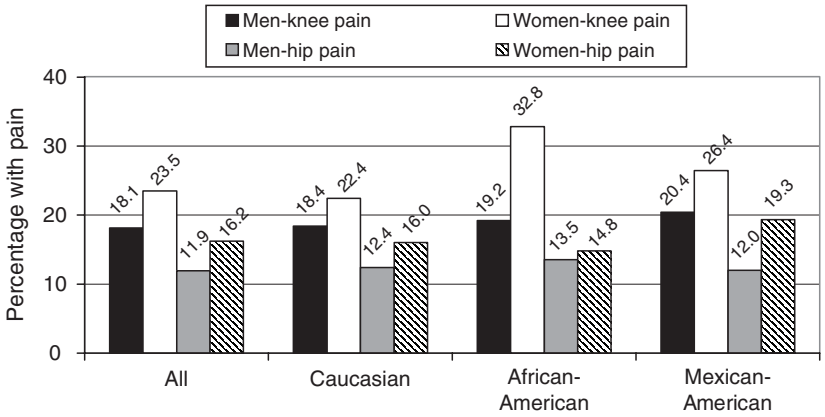


Fig. 17.1 Prevalence of severe knee or hip pain occurring on most days in adults ≥60 years old. Both gender and ethnicity influence likelihood of experiencing severe knee or hip pain. (Based on Andersen[1] and Christmas[2]).

Understanding gender and ethnic differences in pain perception and treatment response helps doctors successfully tailor treatment programs to maximize therapy acceptability and efficacy. Invalid cultural stereotypes may color clinicians' views when selecting treatment, resulting in inadequate care. For example, doctors may misinterpret pain severity if they routinely assume Asian patients are stoic, with a high pain tolerance, whereas Hispanics are dramatic, with a low pain tolerance. Although further studies are needed to fully understand pain perception and response differences between genders and among ethnic groups, current studies do provide a framework for beginning to understand that important gender and ethnic differences do exist.

Gender Differences in Pain Experience

Epidemiological studies of community samples demonstrate important gender differences in chronic pain perception, with increased pain prevalence and severity in women. A statewide Australian health survey of more than 17,500 adults identified chronic pain in 20% of women and 17% of men.[3] Of the 13% of the sample reporting interference in activities of daily living (ADLs) from pain, 60% were female. In addition, females with chronic pain (with or without interference) reported increased psychological distress, compared with females without chronic pain. Men only reported increased psychological distress if they experienced both chronic pain and interference with ADLs. Similar findings were obtained in a cross-sectional survey of 1,051 adults in Hong Kong.[4] Chronic pain was identified in 11%, with a female preponderance (56%). Female gender was identified as an independent risk factor for chronic pain (odds ratio [OR] = 1.5). In this sample, women did not report more pain interference than men; however, women were more likely to seek medical advice than men (81 vs. 63%).

Pain Perception Differs Between Genders

Pain perception and response differ between men and women, with a lower pain threshold, pain tolerance, and analgesic response after exposure to experimental pain in women compared with men.[5,6] Perception of experimental electrical stimulation as painful (threshold) and the greatest tolerable pain level (tolerance) were tested in 20 healthy adults.[7] Both pain threshold and tolerance were significantly higher in men ($P < 0.05$) (Fig. 17.2).

Gender differences in pain experience can be at least partially attributed to neural influences of sex hormones. In addition to providing reproductive functions, sex hormones, like estrogen, also act as important pain modulators. Chronic exposure to estrogen increases the risk for developing chronically painful conditions and results

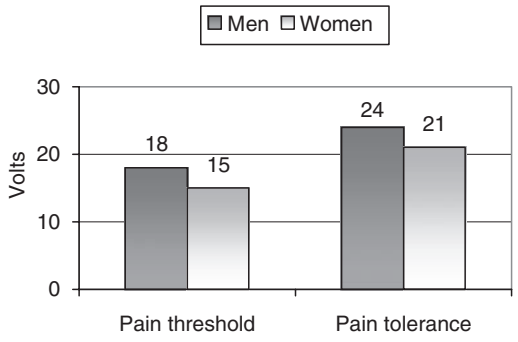


Fig. 17.2 Pain sensitivity by gender (Based on Walker[35]).

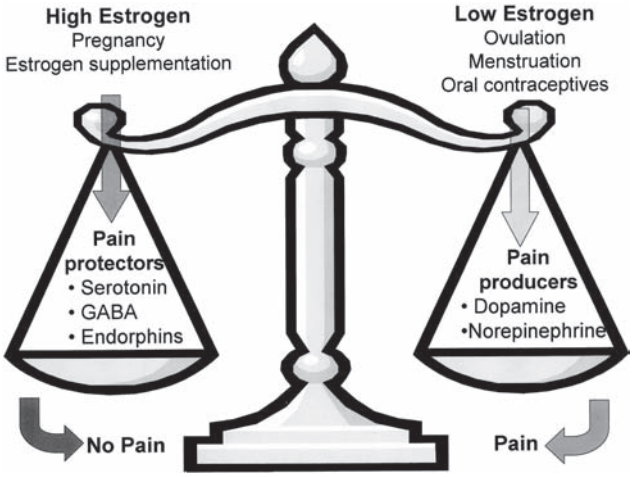


Fig. 17.3 Changing levels of pain-modulating neurochemicals in response to estradiol cycling. These neurochemicals change in response to cycling estradiol. Elevations in estradiol, such as during pregnancy or with estrogen supplementation (such as low-dose hormonal therapy of menstrual migraine [Chap. 5]), result in increases in pain-blocking neurotransmitters. When estradiol drops from a high to a low level, such as with ovulation, menses, or during the placebo week of oral contraceptives, pain-activating neurotransmitter activity increases. GABA, γ-aminobutyric acid.

in increased pain sensitivity.[8] In addition to an overall pattern of increased pain susceptibility in women due to chronic hormonal exposure, cycling estrogen levels cause regular and predictable variations in pain perception.

As estrogen cycles, important pain-modulating neurotransmitters, including serotonin, γ-aminobutyric acid, endorphins, norepinephrine, and dopamine, change in response.[9] High estrogen results in an increase in pain-blocking neurochemicals, whereas pain-activating neurochemicals increase when estrogen falls to low levels (Fig. 17.3). This direct link between pain modulation and changing estrogen levels results in increases in pain threshold with rising estradiol in both rodents[10] and humans.[11] For example, pain threshold increases as estradiol levels rise during the normal menstrual cycle.[5] When estradiol levels drop with menstruation, 60% of women with chronic headache and 40% with irritable bowel syndrome will notice predictable aggravation of pain symptoms.[12] Rheumatoid arthritis (RA) symptoms also cycle with menstruation, with cyclical changes in joint swelling, morning stiffness, pain, and grip strength.[13,14]

Pregnancy is associated with consistently reduced chronic pain complaints when estrogen levels are high, and increased complaints following estrogen withdrawal postpartum (Fig. 17.4).[10] Headache improvement occurs during pregnancy for 50–80% of migraineurs[15–17] and worsens in the early postpartum period for 50%.[18,19] Similarly, the incidence of RA decreases during pregnancy (OR = 0.64), and increases during the first 3 months postpartum (OR = 3.4).[20] Joint improvement occurs during the third trimester with reduced pain in 66% and reduced swelling in 64%.[21] Joint pain worsens during the first 6 months postpartum for about 77%.

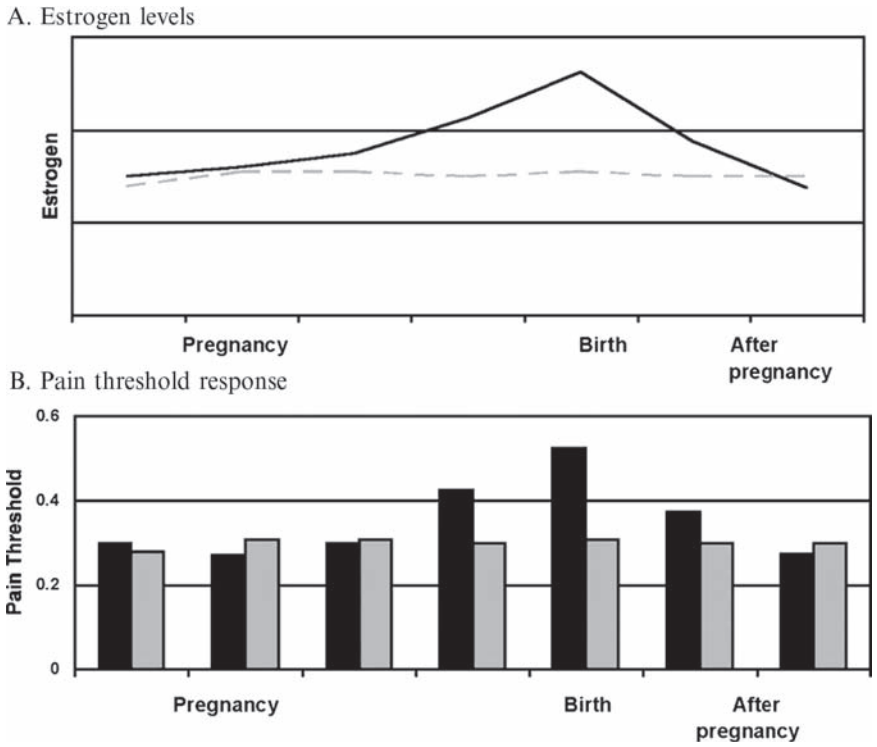


Fig. 17.4 (A) Estrogen levels; (B) Pain threshold response. Response of pain threshold to estradiol changes with pregnancy. In this novel experiment, gonadectomized rodents were treated with placebo (*dotted line* and *gray bars*) or changing doses of estradiol that simulated normally occurring levels during pregnancy (*solid line* and *black bars*). Pain threshold experiments were completed over the month of the normal rodent pregnancy. Pain threshold was constant in the placebo-treated rodents, but changed in conjunction with changing estradiol levels in the estradiol-treated rodents. Pain threshold reached its peak at maximum estradiol dosage, occurring at the time of birth, and decreased once estradiol levels dropped postpartum. (Based on Dawson-Basoa[10]).

Psychological Differences in Pain Perception

Thoughts about the pain experience significantly influence pain perception and chronicity. Catastrophizing describes a tendency to exaggerate the impact of pain and the inability of the patient to cope with pain. This would include feelings like, "My pain is never going to improve," "I am helpless to reduce my pain," and "Pain makes life so it's not worth living."

Unrealistic, negative thoughts about pain, like catastrophizing, increase pain severity and persistence.[22,23] Additionally, functional magnetic resonance imaging testing shows increased activation of sensory, attention, and emotional areas of the brain during exposure to pressure sensations in patients with higher catastrophic thinking, resulting in increased pain perception.[24] Scores on scales that measure catastrophic

thinking in pain patients are one and one-half to more than twice as high in women compared with men.[25,26] These psychological differences in the cognitive response to the pain experience may also contribute to increased pain perception in women.

Gender and Chronic Pain Treatment

Gender differences in chronic pain can perhaps be most easily noticed when spouses are interviewed together. Husbands and wives often report different pain reactions and severity after exposure to similar pain-provoking situations. Additionally, they often report differing responses to common pain management strategies, such as distracting themselves from pain or even common analgesic medications. These anecdotal reports reflect important physiological differences in pain processing between genders.

Gender Differences in Seeking Treatment

Women are over-represented in chronic pain patient samples, with the female predominance in patient samples in excess of what would be predicted from community samples of gender differences in pain prevalence. Women are more likely than men to seek medical care for all medical problems, including chronic pain. Men are less likely to seek medical treatment overall,[27,28] and they delay evaluation until symptoms become severe.[29,30] Therefore, men seen in the clinic for pain complaints have greater pain severity, interference, and disability than men with the same condition evaluated in community samples.[31,32]

Psychological comorbidity also increases treatment-seeking behavior. For example, comorbid psychological distress associated with fibromyalgia is significantly greater in treatment-seeking patients compared with community samples.[33] Higher prevalence of psychological distress in women in general population samples may also increase the likelihood of seeking treatment.[34]

Gender-Specific Response to Pain Therapy

Response to pain therapy is additionally modulated by gender. In an experimental pain model, ibuprofen effectively reduced pain threshold in men, while performing no better than placebo in women (Fig. 17.5).[35] Moreover, response to opioids is gender-specific. μ-opioids (e.g., morphine) provide a greater analgesic response in men, whereas κ-opioids (e.g., butorphanol) provide greater analgesic response in women.[36,37] A study comparing postoperative pain and analgesic response prospectively in 423 women and 277 men showed the requirement for 30% higher dosing with morphine in women to achieve an analgesic response comparable to men.[38] These studies are supported by positron emission tomography testing, which shows

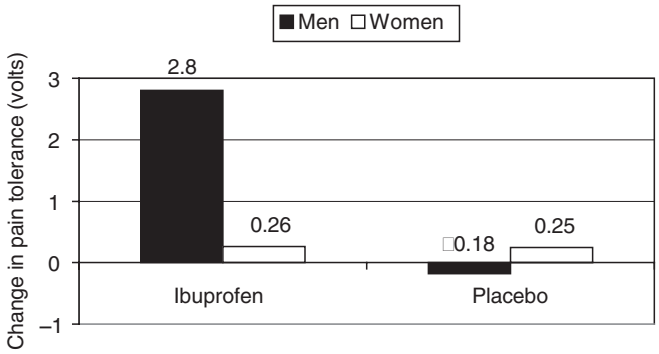


Fig. 17.5 Change in pain threshold after treatment with ibuprofen or placebo. Pain threshold was significantly reduced with ibuprofen in men ($P < 0.05$) and not different between ibuprofen and placebo in women. (Based on Walker[38]).

objective gender differences in activation of μ-opioid receptors in the brain after exposure to experimental pain.[39]

Response to nonpharmacological therapies also shows gender preferences.[40] For example, attentional focusing on experimental pain resulted in a 39% reduction in sensory pain score in men, with no reduction of pain in women.[41] Personality differences also dictate different responses to nonpharmacological therapy. For example, women often respond well to visualization and imagery techniques in relaxation training, whereas men typically prefer the use of an external monitoring device (e.g., biofeedback) to assess the relaxation response. Furthermore, a survey comparing benefits from self-care behaviors for relieving pain showed that women reported significantly better relief from using exercise compared with men ($P = 0.02$), with a trend toward superior benefit from massage ($P = 0.08$).[42]

Ethnic/Cultural Differences in Pain Experience

Studies are beginning to identify important ethnic and cultural differences in pain tolerance, pain impact, and treatment response. Most studies have compared Caucasians and African-Americans, with fewer studies evaluating other ethnic groups. Recent studies are beginning to evaluate important differences in Hispanic and Asian populations, providing a broader context for understanding ethnic influences on the pain experience.

Pain Perception and Ethnicity

Identifying a stimulus as painful (pain threshold) has consistently been shown to be similar among ethnic groups, although a lower pain tolerance and a greater perception

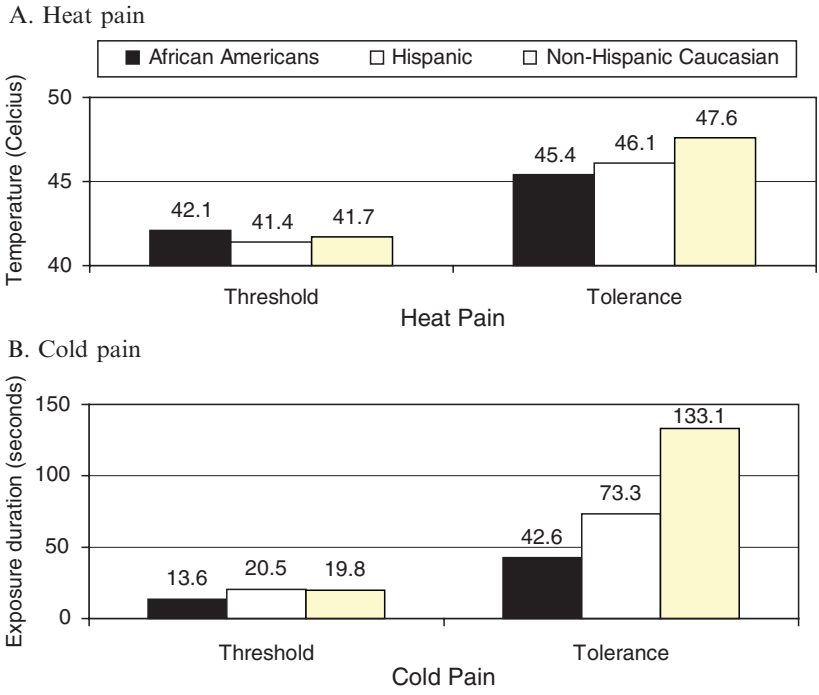


Fig. 17.6 (A) Heart pain; (B) Cold pain. Differences in pain response by race (Based on Rahim-Williams[46]). Heat pain was measured using a heat stimulus that increased by 0.5 °C per second. Cold pain was measured by testing duration of exposure to limb immersion in 5 °C temperature water.

of pain stimuli as unpleasant occurs in African-Americans and Hispanics compared with Caucasians.[43–45] Figure 17.6 shows experimental pain responses in healthy adults representing three ethnic groups: African-Americans ($N = 63$), Hispanic Americans ($N = 61$), and non-Hispanic Caucasian Americans ($N = 82$).[46] Both heat and cold pain tolerances were similar for African-Americans and Hispanics and significantly lower in both ethnic groups compared with non-Hispanic Caucasians ($P < 0.05$). Reduced pain tolerance to experimental pain in African-Americans supports findings in a population of chronic pain patients that showed similar pain intensity but increased perception of pain unpleasantness in African-Americans compared with Caucasians.[47] Asians similarly demonstrate increased sensitivity to pain.[48]

Studies comparing pain and associated symptoms in African-Americans and Caucasians show increased symptoms of depression and posttraumatic stress disorder in African-Americans.[49] Large samples of patients with chronic pain show increased pain-related depression, anxiety, anger, fear, and disability in African-Americans compared with Caucasians ($P < 0.05$).[50,51] Fewer studies have evaluated other ethnic groups. A large study of 4,700 participants in a health survey identified significantly higher scores on screening for depression in Hispanics, African-Americans, and American Indians in comparisons with Caucasians.[52] Further studies are needed to determine whether this same trend would be seen in patients with chronic pain.

Treatment Selection and Ethnicity

Treatments may vary by ethnicity because of differences in physician prescribing practices, as well as variations in acceptability of treatments among different ethnic groups. For example, Mrs. Thomas described using prayer when pain was severe. Although the doctor interpreted prayer as a sign of hopelessness or catastrophizing, religion is an important coping tool for Hispanic patients.[53] Hispanics view prayer as an effective, active coping strategy that results in enhanced psychological well-being. Rather than negating the value of religion as a coping tool for Mrs. Thomas, her physician should reinforce this practice as a way to help minimize pain impact.

Medications

A study asking doctors to determine therapy for patients with different ethnic backgrounds based on clinical vignettes showed no difference based on patient ethnicity.[54] Similarly, a comparison of pain management for acute fracture in the emergency room showed similar use of analgesics in Caucasians, Hispanics, African-Americans, and Asians.[55] This study, however, only looked at whether analgesic therapy was prescribed and did not compare analgesic type or dosage. Actual physician prescribing practices, however, do show important ethnic differences in drug selection (Fig. 17.7).[56] A study assessing analgesic dosing in patients after surgery for fracture showed higher morphine-equivalent analgesic daily dosages in Caucasians (22 mg) compared with African-Americans (16 mg) and Hispanics (13 mg; $P < 0.01$).[57] An earlier study of postoperative pain similarly showed that, although opioid self-administered through patient-controlled analgesia immediately after surgery was similar among ethnic groups, physician-prescribed dosing was lower after conversion to oral dosing in Hispanics and Asians compared with Caucasians and African-Americans.[58]

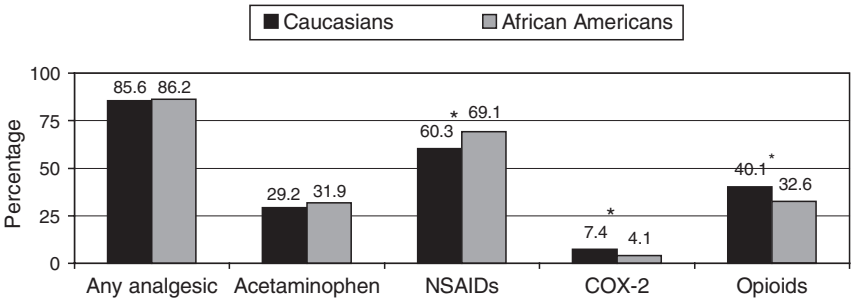


Fig. 17.7 Racial differences in treatment of osteoarthritis. Use of nonspecific nonsteroidal anti-inflammatory drugs (NSAIDs) was higher in African-Americans, whereas Caucasians were more likely to be prescribed selective cyclooxygenase inhibitors (COX-2) or opioids ($^{*}P < 0.001$). (Based on Dominick[56]).

The role of ethnicity in selecting co-analgesic therapy in patients with pain has been less well studied. One study evaluating the use of antidepressants for depression and chronic pain in Hispanic and non-Hispanic patients showed no significant ethnic differences.[59]

Ethnicity may also influence use of prescribed therapy. In one study, although Caucasian and African-American patients with osteoarthritis were prescribed the same number of medications, the number of prescriptions that were actually filled were significantly lower for African-Americans ($P < 0.001$).[56] In another study, prescribed medications were not purchased by 11% of Caucasians, 16% of Hispanics, and 20% African-Americans.[60] Reasons for failure to obtain prescribed medications may include cost constraints, misunderstanding or fear about prescribed therapy, or failure of the prescribed therapy to correspond to treatment expectations.

Complementary and Alternative and Medicine

In a population-based survey of adults with chronic pain, 18% reported using an alternative therapist during the preceding year and 16% used alternative medications.[61] The use of complementary and alternative medicine (CAM) is highest in Caucasians, although selection of individual therapies varies by ethnic group (Figs. 17.8 and 17.9).[62,63] For example, Hispanics, like Mrs. Thomas, in comparison with non-Hispanics, are 10 times more likely to use traditional folk medicine.[64] A survey of Hispanic pediatric patients identified use of traditional healers by 20% of the children.[65]

Seniors have increased use of CAM. One survey identified use of CAM in 48% of the elderly, most frequently dietary supplements (47%), chiropracty (16%), home remedies (16%), acupuncture (15%), and Oriental medicine (13%).[66] Choice of individual therapy was predicted by ethnic group, with Caucasians more likely to use chiropracty, massage, vitamins, diet, and psychospiritual therapy; Hispanics

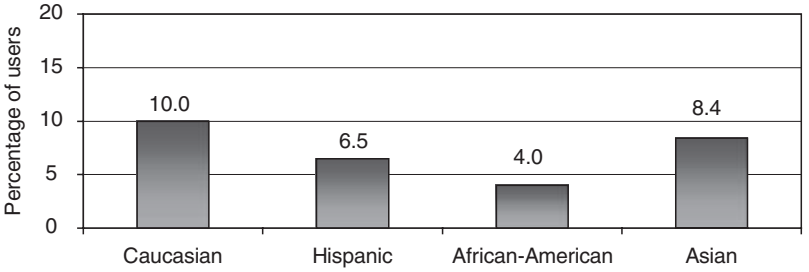


Fig. 17.8 Use of complementary and alternative medicine. Complementary and alternative medicine was used by 9% of the US adult population during 1996. Odds ratio for using these therapies was related to ethnic group: Caucasian = 1.0; Hispanic = 0.58; African-American = 0.46; and Asian = 0.66. (Based on Bausell[62]).

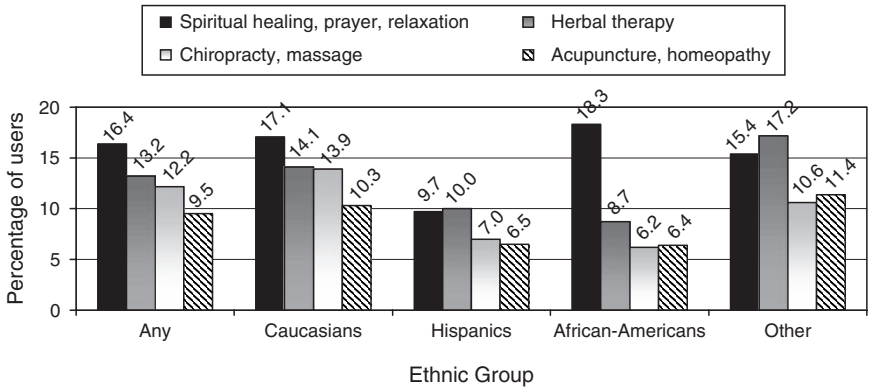


Fig. 17.9 Use of types of complementary and alternative medicine. (Based on Ni[63]).

more likely to use dietary supplements, home remedies, and folk healers; and Asians more likely to use acupuncture and Oriental medicine.

Summary

Gender and ethnicity significantly influence pain tolerance and therapeutic response. False gender and ethnic stereotypes can color healthcare providers' assessment and treatment practices, resulting, as in the case of Mrs. Thomas, in miscommunication, frustration, and poor pain control. Consistent, scientifically studied variations in the pain experience between men and women and among ethnic groups should be considered when making clinical practice decisions, so that pain evaluation and treatment is maximized for all patients.

Studies have shown that women are more sensitive to pain, with a lower pain threshold and tolerance. In addition, women are less responsive than men to analgesic therapy, including therapy with ibuprofen and morphine. These differences are mediated in part by estradiol, as demonstrated by similar pain differences in humans and rodent pain models in response to changing estradiol levels. Pain perception is similar among ethnic groups; however, pain tolerance is reduced in African-Americans, Asians, and Hispanics. Pain-related psychological distress and disability is also higher in African-Americans.

Although physicians report using similar treatment strategies with case vignettes regardless of ethnicity, actual prescribing patterns identify important differences, with non-Caucasians more likely to receive prescriptions for nonspecific analgesics and lower dosages of opioids. The resultant possible under-treatment of chronic pain is further compounded by the fact that non-Caucasians are also less likely to fill prescriptions. This tendency to under-treatment non-Caucasians who have greater pain distress and disability must be corrected in clinical practice.

Test Your Knowledge

1. In comparison to men tested with experimental pain, women have:

   a. A higher pain threshold
   b. A greater pain tolerance
   c. A lower response to analgesic medication
   d. a and b
   e. All of the above

2. Osteoarthritis of the knee and hip occur more commonly in elderly:

   a. Men
   b. Women
   c. Caucasians
   d. Hispanics
   e. A and C
   f. B and D

3. Which of the following statement(s) is/are true?

   a. Physicians believe they prescribe similarly to different ethnic groups.
   b. Physicians are less likely to prescribe COX-2 specific antiinflammatory medications to non-Caucasians.
   c. Physicians are more likely to prescribe lower doses of opioids to non-Caucasians.
   d. None of the above
   e. All of the above

4. Which statement(s) is/are true:

   a. Non-Caucasians have a higher pain threshold.
   b. Because the pain threshold is higher in non-Caucasians, they require lower doses of analgesics.
   c. Acceptability of complementary and alternative medicine is similar among ethnic groups.
   d. None of the above
   e. All of the above

Answers: 1c; 2f; 3e; 4d

References

1. Andersen RE, Crespo CJ, Ling SM, Bathon JM, Bartlett SJ. Prevalence of significant knee pain among older Americans: results from the Third National Health and Nutrition Examination Survey. J Am Geriatr Soc 1999;47:1435–1438

2. Christmas C, Crespo CJ, Franckowiak SC, Bathon JM, Bartlett SJ, Andersen RE. How common is hip pain among older adults?: results from the third National Health and Nutrition Examination Survey. J Fam Pract 2002;51:345–348
3. Blyth FM, March LM, Brnabic AM, et al. Chronic pain in Australia: a prevalence study. Pain 2001;89:127–134
4. Ng KJ, Tsui SL, Chan WS. Prevalence of common chronic pain in Hong Kong adults. Clin J Pain 2002; 18:275–281
5. Hellstrom B, Lundberg U. Pain perception to the cold pressor test during the menstrual cycle in relation to estrogen levels and a comparison with men. Integr Physiol Behav Sci 2000;35:1377–1379
6. Keogh E, Herdenfeldt M. Gender, coping and the perception of pain. Pain 2002;97:195–201
7. Walker JS, Carmody JJ. Experimental pain in healthy human subjects: gender differences in nociception and in response to ibuprofen. Anesth Anal 1998;86:1257–1262
8. Coyle DE, Sehlhorst CS, Behbehani MM. Intact female rats are more susceptible to the development of tactile allodynia than ovariectomized female rats following partial sciatic nerve ligation (PSNL). Neurosci Lett 1996;203:37–40
9. Marcus DA. Interrelationships of neurochemicals, estrogen, and recurring headache. Pain 1995;62:129–139
10. Dawson-Basoa MB, Gintzler AR. 17-Beta-estradiol and progesterone modulate an intrinsic opioid analgesic system. Brain Res 1993;601:241–245
11. Cogan R, Spinnato JA. Pain and discomfort thresholds in late pregnancy. Pain 1986;27:63–68
12. Lee OY, Mayer EA, Schmulson M, Chang L, Naliboff B. Gender-related differences in IBS symptoms. Am J Gastroenterol 2001;96:2184–93
13. Latman NS. Relation of menstrual cycle phase to symptoms of rheumatoid arthritis. Am J Med 1983;74:957–60
14. Rudge SR, Kowanko IC, Drury PL. Menstrual cyclicity of finger joint size and grip strength in patients with rheumatoid arthritis. Ann Rheum Dis 1983;42:425–430
15. Callaghan N. The migraine syndrome in pregnancy. Neurology 1968;18:197–199
16. Granella F, Sances G, Zanferrari C, et al. Migraine without aura and reproductive life events: a clinical epidemiological study in 1300 women. Headache 1993;33:385–389
17. Maggioni F, Alessi C, Maggino T, et al. Primary headaches and pregnancy. Cephalalgia 1995;15:54
18. Stein GS. Headaches in the first post partum week and their relationship to migraine. Headache 1981; 21:201–205
19. Stein GS, Morton J, Marsh A, et al. Headaches after childbirth. Acta Neurol Scand 1984; 69:74–79
20. Lansink M, de Boer A, Dijkmans BA, et al. The onset of rheumatoid arthritis in relation to pregnancy and childbirth. Clin Exp Rheumatol 1993;1:171–174
21. Barrett JH, Brennan P, Fiddler M, Silman AJ. Does rheumatoid arthritis remit during pregnancy and relapse postpartum? Results from a nationwide study in the United Kingdom performed prospectively from late pregnancy. Arthritis Rheum 1999;42:1219–1227
22. Jensen MP, Ehde DM, Hoffman AJ, Patterson DR, Czerniecki JM, Robinson LR. Cognitions, coping and social environment predict adjustment to phantom limb pain. Pain 2002;95:133–142
23. Haythornthwaite JA, Clark MR, Pappagallo M, Raja SN. Pain coping strategies play a role in the persistence of pain in post-herpetic neuralgia. Pain 2003;106:453–460
24. Gracely RH, Geisser ME, Giesecke T, et al. Pain catastrophizing and neural responses to pain among persons with fibromyalgia. Brain 2004,127:835–843
25. Keefe FJ, Lefebvre JC, Egert JR, Affleck G, Sullivan MJ, Caldwell DS. The relationship of gender to pain, pain behavior, and disability in osteoarthritis patients: the role of catastrophizing. Pain 2000;87:325–334
26. Sullivan ML, Tripp DA, Santor D. Gender differences in pain and pain behavior: the role of catastrophizing. Cognitive Ther Res 2000;24:121–134

27. Linet MS, Celentano DD, Stewart WF. Headache characteristics associated with physician consultation: a population-based survey. Am J Prev Med 1991;7:40–46
28. Davies J, McCrae BP, Frank J, et al. Identifying male college students' health needs, barriers to seeking help, and recommendations to help men adopt healthier lifestyles. J Am Coll Health 2000; 48:259–267
29. Ottesen MM, Kober L, Jorgensen S, Torp-Pedersen C. Determinants of delay between symptoms and hospital admission in 5978 patients with acute myocardial infarction. Eur Heart J 1996;17:429–437
30. Johansson E, Long NH, Diwan VK, Winkvist A. Gender and tuberculosis control. Perspectives on health seeking behaviour among men and women in Vietnam. Health Pol 2000;52:33–51
31. Marcus DA. Gender differences in treatment-seeking chronic headache sufferers, Headache 2001;41:698–703
32. Marcus DA. Gender differences in chronic pain in a treatment-seeking population. J Gend Specif Med 2003;6:19–24
33. Aaron LA, Bradley LA, Alarcon GS, et al. Psychiatric diagnoses in patients with fibromyalgia are related to health care-seeking behavior rather than to illness. Arthritis Rheum 1996;39:436–445
34. Carroll LJ, Cassidy JD, Cote P. The Saskatchewan Health and Back Pain Survey: the prevalence and factors associated with depressive symptomatology in Saskatchewan adults. Can J Public Health 2000;91:459–464
35. Walker JS, Carmody JJ. Experimental pain in healthy human subjects: gender differences in nociception and in response to ibuprofen. Anesth Analg 1998;86:1257–1262
36. Gear RW, Miaskowski C, Gordon NC, et al. Kappa-opioid produce significantly greater analgesia in women than in men. Nat Med 1996;2:1248–1250
37. Miller PL, Ernst AA. Sex differences in analgesia: a randomized trial of mu versus kappa opioid agonists. South Med J 2004;97:35–41
38. Cepeda MS, Carr DB. Women experience more pain and require more morphine than men to achieve a similar degree of analgesia. Anesth Analg 2003;97:1464–1468
39. Zubieta JK, Dannals RF, Frost JJ. Gender and age influences on human brain mu-opioid receptor binding measured by PET. Am J Psychiatr 1999;156:842–848
40. Jensen IB, Bergstrom G, Ljungquist T, Bodin L, Nygren AL. A randomized controlled component analysis of a behavioral medicine rehabilitation program for chronic spinal pain: are the effects dependent on gender? Pain 2001;91:65–78
41. Keogh E, Hatton K, Ellery D. Avoidance versus focused attention and the perception of pain: differential effects for men and women. Pain 2000;85:225–230
42. Dannecker EA, Knoll V, Robinson ME. Sex differences in muscle pain: self-care behaviorsand effects on daily activities. J Pain 2008;9:200–209
43. Edwards RR, Fillingim RB. Ethnic differences in thermal pain responses. Psychosomatic Med 1999;61:346–354
44. Sheffield D, Biles PL, Orom H, Maixner W, Sheps DS. Race and sex differences in cutaneous pain perception. Psychosom Med 2000;62:517–523
45. Edwards RR, Doleys DM, Fillingim RB, Lowery D. Ethnic differences in pain tolerance: clinical implications in a chronic pain population. Psychosom Med 2001;63:316–323
46. Rahim-Williams FB, Riley JL, Herrera D, et al. Ethnic identity predicts experimental pain sensitivity in African Americans and Hispanics. Pain 2007;129:177–184
47. Riley JL, Wade JB, Myers CD, Sheffield D, Papas RK, Price DD. Racial/ethnic differences in the experience of chronic pain. Pain 2002;100:291–298
48. Watson PJ, Latif RK, Rowbotham DJ. Ethnic differences in thermal pain responses: a comparison of South Asian and white British healthy males. Pain 2005;118:194–200
49. Green CR, Baker TA, Smith EM, Sato Y. The effect of race in older adults presenting for chronic pain management: a comparative study of black and white Americans. J Pain 2003;4:82–90
50. McCracken LM, Matthews AK, Tang TS, Cuba SL. A comparison of blacks and whites seeking treatment for chronic pain. Clin J Pain 2001;17:249–255

51. Riley JL, Wade JB, Myers CD, Sheffield D, Papas RK, Price DD. Racial/ethnic differences in the experience of chronic pain. Pain 2002;100:291–298
52. Plant EA, Sachs-Ericsson N. Racial and ethnic differences in depression: the roles of social support and meeting basic needs. J Consult Clin Psychol 2004;72:41–52
53. Abraído-Lanza AF, Vásquez E, Echeverría SE. En las manos de Dios [in God's hands]: religious and other forms of coping among Latinos with arthritis. J Consult Clin Psychol 2004;72:91–102
54. Tamayo-Sarver JH, Dawson NV, Hinze SW, et al. The effect of race/ethnicity and desirable social characteristics on physicians' decisions to prescribe opioid analgesics. Acad Emerg Med 2003;10:1239–1248
55. Fuentes EF, Kohn MA, Neighbor ML. Lack of association between patient ethnicity or race and fracture analgesia. Acad Emerg Med 2002;9:910–915
56. Dominick KL, Dudley TK, Grambow SC, Oddone EZ, Bosworth HB. Racial differences in health care utilization among patients with osteoarthritis. J Rheumatol 2003;30:2201–2206
57. Ng B, Dimsdale JE, Shragg GP, Deutsch R. Ethnic differences in analgesic consumption for postoperative pain. Psychosom Med 1996;58:125–129
58. Ng B, Dimsdale JE, Rollnick JD, Shapiro H. The effect of ethnicity on prescriptions for patient-controlled analgesia for post-operative pain. Pain 1996;66:9–12
59. Sleath BL, Rubin RH, Huston SA. Antidepressant prescribing to Hispanic and non-Hispanic white patients in primary care. Ann Pharmacother 2001;35:419–423
60. Reed M, Hargraves JL. Prescription drug access disparities among working-age Americans. Issue Brief Cent Study Health Syst Change 2003;73:1–4
61. Haetzman M, Elliott AM, Smith BH, Hannaford P, Chambers WA. Chronic pain and the use of conventional and alternative therapy. Fam Pract 2003;20:147–154
62. Bausell RB, Lee W, Berman BM. Demographic and health-related correlates of visits to complementary and alternative medical providers. Med Care 2001;39:190–196
63. Ni H, Simile C, Hardy AM. Utilization of complementary and alternative medicine by United States adults. Results from the 1999 National Health Interview Survey. Med Care 2002;40:353–358
64. Palinkas LA, Kabongo ML. The use of complementary and alternative medicine by primary care patients: a SURF®NET study. J Fam Pract 2000;49:1121–1130
65. Risser AL, Mazur LJ. Use of folk remedies in a Hispanic population. Arch Pediatr Adolesc Med 1995;149:978–981
66. Najm W, Reinsch S, Hoehler F, Tobis J. Use of complementary and alternative medicine among the ethnic elderly. Altern Ther Health Med 2003;9:50–57

Chapter 18
Lifestyle and Psychological Issues

Key Chapter Points:

- Obesity, nicotine use, sleep disturbance, and psychological distress have all been linked to increased pain occurrence and severity.
- Nicotine use and sleep deprivation have been linked to reduce response to analgesic effects from pain medications.
- Weight reduction effectively reduces chronic pain complaints.
- Insomnia affects half of chronic pain patients and is linked to increased pain-related disability and depression.
- About half of chronic pain patients treated at specialty clinics and 25% treated through primary care have depression. Anxiety similarly affects about half of chronic pain patients treated at specialty clinics. Psychological distress predicts the development and persistence of chronic pain.

Key Words Abuse, Anxiety, Depression, Nicotine, Obesity, Smoking

Case History

Ms. Jeffrey is a 47-year-old woman who complains of low back and knee pain for the last 10 years. This pain has been increasingly troublesome and limits her ability to perform laundry, cooking, and prolonged driving. On evaluation, her primary care physician (PCP) notes that she is obese. She is 5′7″ tall, weighs 192 lbs, and has a body mass index (BMI) of 30.1 kg/m^{-2}. She reports being slender most of her life, then gaining weight when she was in her mid-30s. Her weight has been stable for the last 5 years, and she reports no additional constitutional complaints. Ms. Jeffrey states that she's "too busy running her kids to their different school and sports events to exercise." She has tried numerous diets without success. Although she feels unattractive with her weight, she does not view her weight as a major concern and is primarily interested in pain control. Ms. Jeffrey's PCP tells her that her excess weight is causing her pain, and the first thing she needs to do is to lose weight. He suggests that Ms. Jeffrey should lose about 15 lbs then undergo a

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

reassessment to see if any additional pain treatment will be necessary. Ms. Jeffrey becomes angry, feeling that her pain complaints are being ignored and she arranges to see a new doctor.

Introduction

Lifestyle and psychological issues are significant contributors to pain impact and disability. For example, a survey of 1,021 primary care patients with arthritis showed that depression, poor social support, and obesity were each significant risk factors for disability.[1] Although these and other lifestyle factors are usually not the initial cause of pain complaints, they can substantially impact pain severity, persistence, and treatment response. Therefore, lifestyle modification is often an important component of comprehensive pain management.

Obesity

National estimates show that about two in every three adults are overweight, with one in three obese.[2,3] Obesity is increasingly recognized as an important risk factor for a wide variety of health problems, including diabetes, cardiovascular disease, gallstones, and cancer.[4] As recognized by Ms. Jeffrey's doctor, excessive weight is also a risk factor for chronic pain.

Obesity and Chronic Pain Comorbidity

Excess weight is linked to both the prevalence and incidence of chronic pain. Chronic pain is more frequent in individuals as weight category increases (Fig. 18.1).[5–7]

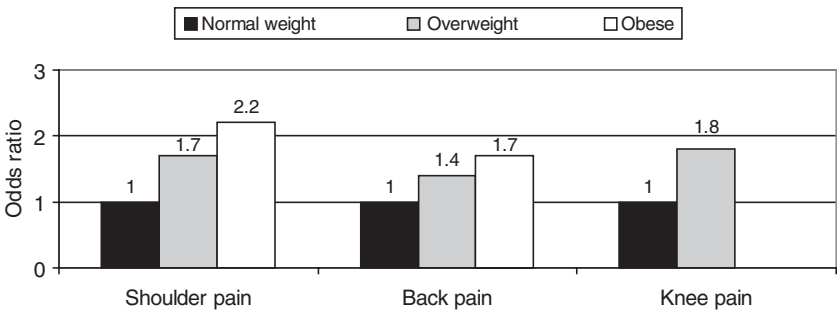


Fig. 18.1 Odds ratio for pain by weight category (Based on Miranda[5], Jinks[6], Webb[7]).

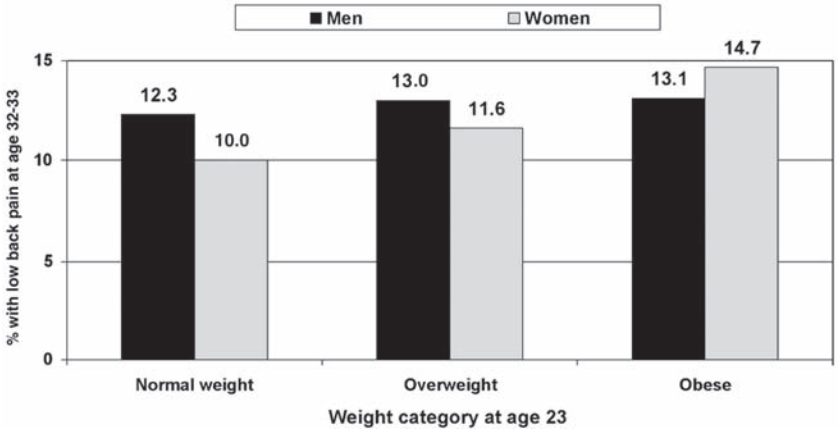


Fig. 18.2 Percentage of adults who develop new low back pain between ages 32 and 33 years, based on body mass index at age 23 years. Difference among weight categories for women is significant ($P = 0.02$). (Based on Lake[8]).

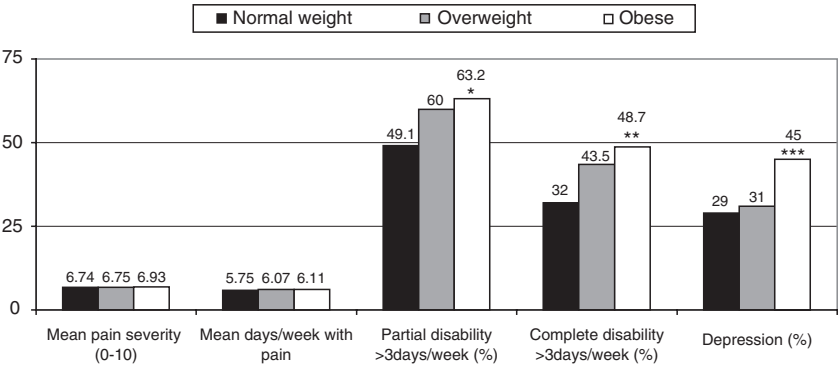


Fig. 18.3 Impact of obesity on pain, disability, and mood for patients with chronic pain. Significant difference among weight categories: $^{*}P < 0.05$; $^{**}P < 0.01$. Significant difference between normals and obese: $^{***}P < 0.01$. (Based on Marcus[10]).

Furthermore, early adulthood obesity predicted subsequent chronic back pain in women in a sample of almost 9,000 adults (Fig. 18.2).[8] In another study, the risk of an acute work injury developing into chronic pain qualifying the worker for workers' compensation benefits was increased in patients with excessive weight.[9] The odds ratio for the development of chronic, compensable pain was 1.00 in workers with a normal weight, 1.56 in overweight workers, and 1.85 in obese workers ($P = 0.01$).

Pain impact is also negatively affected by increased weight. A study of 372 patients attending a specialty pain clinic revealed similar pain complaints in patients with different weight categories, although disability and depression were greater with increased weight (Fig. 18.3).[10] Primary care patients with osteoarthritis

(N = 978) similarly showed a significant link between excess weight and pain impact.[11] Pain severity, disability, and psychological distress worsened as weight increased beyond a normal BMI, with greater impairments among obese individuals.

Obesity may influence pain by a variety of factors. Excessive weight negatively influences arthritis through mechanical load on joints, particularly in the lower extremities.[12] In addition, obesity increases the release of proinflammatory cytokines that promote joint destruction.[13,14] Obesity has also been linked to depression, anxiety, and psychological disability, which are also connected to increased prevalence of chronic pain.[15–17]

Obesity Assessment

Obesity assessment and management are important aspects of chronic pain care. Measures of obesity, including the BMI and percentage body fat, are influenced by both gender and age.[18] The BMI is recommended by a consensus panel from the National Heart, Lung, and Blood Institute (Boxes 18.1 and 18.2). BMI is also an important weight marker because it accurately predicts health morbidity. For example, a BMI exceeding 24 kg/m^2 predicts an increased risk for hypertension, diabetes, and dyslipidemia.[19]

Box 18.1 Calculating BMI

BMI produces a number with the unit kg/m^2. BMI can be calculated using English or metric units.

- Using pounds and inches

$$\text{BMI} = 703 \times \frac{\text{weight in pounds}}{\text{height in inches} \times \text{height in inches}}$$

- Using kilograms and meters

$$\text{BMI} = \frac{\text{weight in kilograms}}{\text{height in meters} \times \text{height in meters}}$$

- Using kilograms and centimeters

$$\text{BMI} = 10{,}000 \quad \frac{\text{weight in kilograms}}{\text{height in centimeters} \times \text{height in centimeters}}$$

Box 18.2 Interpreting BMI

- Underweight < 18.5 kg/m^2
- Normal 18.5–24.9 kg/m^2
- Overweight 25.0–29.9 kg/m^2
- Obese ≥30 kg/m^2

Obesity Treatment for Patients with Chronic Pain

Weight reduction reduces chronic pain affecting a wide variety of body regions. A longitudinal study of the relationship of obesity and musculoskeletal pain was conducted in 2,460 men and 3,868 women in Sweden.[20] The prevalence of musculoskeletal pain was significantly greater in obese individuals compared with controls for both men (58% of obese men vs. 32% of controls) and women (68% vs. 37%) (Fig. 18.4A). Obese individuals were treated with either surgical or conventional therapy (diet, exercise, medications) and followed longitudinally. Weight reduction was significantly higher in obese individuals treated with surgery compared with non-surgical methods for both men (-29.5 kg with surgery vs. -0.4 kg with conventional treatment; $P < 0.001$) and women (-27.6 kg vs. -0.3 kg; $P < 0.001$). Recovery from musculoskeletal pain after 2 years was significantly greater in both men and women after weight loss with surgery for every body area ($P < 0.05$) (Fig. 18.4B). These data suggest that weight reduction may be an effective therapeutic intervention for patients with musculoskeletal pain. Several other studies have demonstrated a similar amount of pain reduction after weight loss, using surgical or non-surgical techniques.[21–23]

Weight reduction is usually not successfully achieved or maintained through diet alone. Exercise offers therapeutic benefits for chronic pain and is the best predictor of successful weight loss.[24] Exercise capacity, however, is reduced in obese women because of complaints of musculoskeletal pain.[25] Therefore, alternative exercise programs in conjunction with weight reduction may be necessary for obese patients with chronic pain to maximize treatment compliance and benefit. Recommendations for initial exercise programs for overweight and obese individuals to improve success are shown in Box 18.3.

Healthcare provider encouragement significantly impacts the success of weight reduction. A survey of overweight and obese arthritis patients revealed that only 46% had been advised by their healthcare provider to lose weight in an effort to reduce arthritis symptoms.[26] Those who did receive advice were almost four times more likely to try to lose weight when compared with those not receiving healthcare provider's advice.

Many patients, like Mrs. Jeffrey, are discouraged about weight reduction, especially when numerous attempts have previously been unsuccessful. A study of middle-aged women participating in a 2-year weight-loss program identified poor

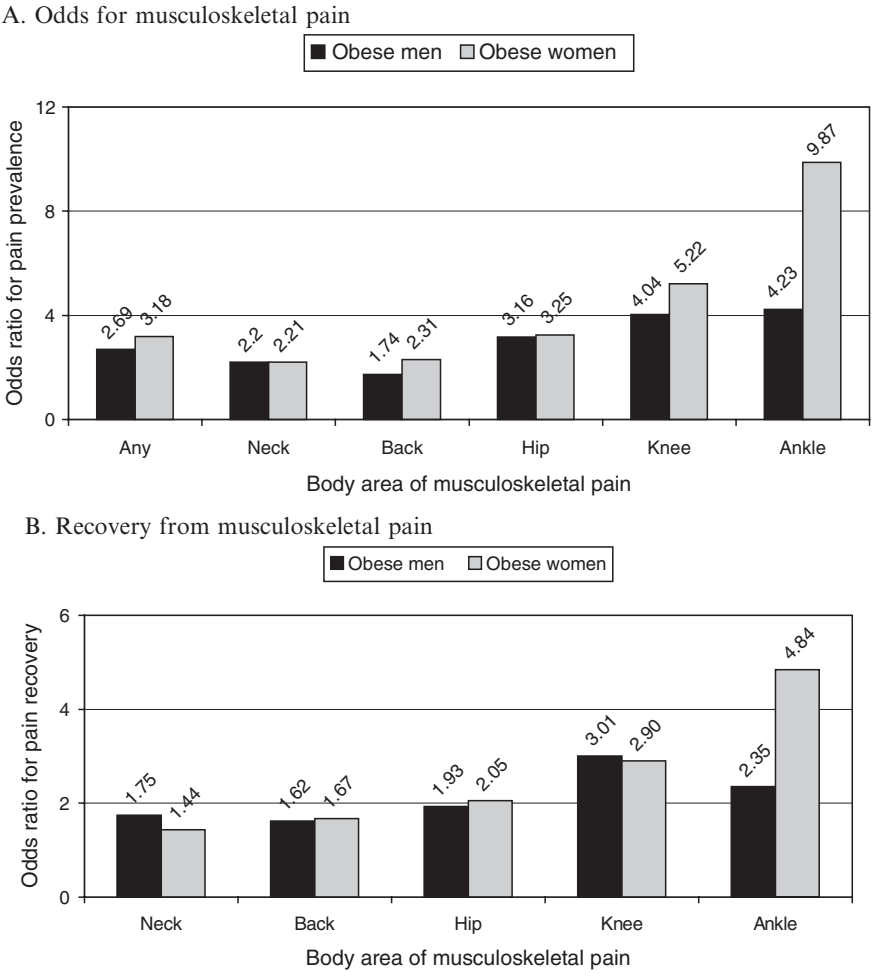


Fig. 18.4 Prevalence of musculoskeletal pain and response to weight loss in obese men and women (Based on Peltonen[20]) (**A**) Odds ratio for musculoskeletal pain in obese men and women (adjusted for age, smoking, work status, and physical activity level). Prevalence of musculoskeletal pain in every body region was significantly higher in obese men and women compared with controls ($P < 0.001$). (**B**) Recovery from musculoskeletal pain after 2 years in obese individuals following surgical intervention. Odds ratios calculated by comparing 2-year recovery from musculoskeletal pain after surgical intervention (with significant weight loss of 27.6–29.5 kg) and non-surgical weight intervention (with minimal weight loss of 0.3–0.4 kg).

self-motivation, numerous previous dieting attempts, dieting resulting in a weight loss of less than 4.5 kg during the previous 2 years, the number of years at current weight, and perceived barriers to exercise as independent risk factors for successful weight reduction.[27] These factors suggest that more aggressive and strictly monitored weight reduction will be necessary to achieve the desired weight reduction.

Box 18.3 Exercise initiation recommendations for overweight and obese adults

- Exercise program should be individualized and monitored by patient's healthcare provider.
  - Exercise recommendations need to be adjusted for patients with significant comorbid disease, such as cardiovascular or respiratory diseases.
- Aerobic exercise
  - Recommended low-impact exercises
    - Brisk walking
    - Bicycling
    - Swimming or pool exercise
  - Frequency: at least every other day
  - Duration: 30–45 minutes per exercise session
  - Intensity: 50% of heart rate reserve (*see* Appendix B)
- Whole body stretching and flexibility exercises
  - Plus exercises targeted to specific pain area, as assigned by a physical therapist

(Based on McInnis[24])

Using daily exercise logs may improve the patient's understanding of exercise instructions and compliance (*see* Appendix B). By reviewing these logs, the healthcare provider can help the patient identify inadequate exercise (e.g., infrequent exercise sessions, failure to progress exercises, failure to elevate heart rate) or excessive exercise (e.g., too rapid progression of exercise, "crash-and-burn" patterns, excessive heart rate, or post-stretching exercise scores that suggest overstretching). Copies of these logs can also provide valuable chart documentation.

Sleep

Chronic pain patients frequently report sleep disturbances. The occurrence and severity of insomnia (defined as unsatisfactory sleep that impacts daily functioning) were evaluated in 70 patients with chronic back pain and 70 healthy controls, using the Insomnia Severity Index, which has been validated against both objective and subjective measures of insomnia. Moderate-severe insomnia affected 53% of pain patients vs. 3% of controls ($P < 0.001$) (Fig. 18.5).[28] Those patients with more severe insomnia were also more likely to report greater pain severity, anxiety, and depression. Others have similarly linked poor sleep in chronic pain patients to depression and pain-related disability.[29]

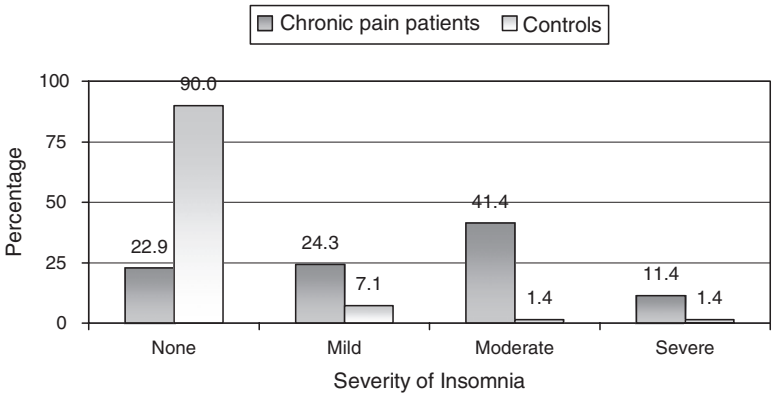


Fig. 18.5 Insomnia in chronic pain patients versus controls (Based on Tang[28]).

Similarly, individuals with insomnia are more likely to report chronic pain. In a recent study, chronic pain was endorsed by 49% of individuals with insomnia vs. 17% without sleep disturbance.[30] These data support an important relationship between poor sleep and chronic pain.

A physiological link between pain and sleep disturbance was supported by an experimental study showing pain hypersensitivity in response to sleep deprivation. Experimental pain threshold was decreased by 41% in rats following sleep deprivation.[31] Rats were then allowed for 24 hours to recover from sleep deprivation; however, hypersensitivity persisted. Furthermore, although morphine produced analgesic effects in non-sleep-deprived rats, pain-relieving benefits were lost when typical morphine doses were administered to sleep-deprived rats and those allowed for 24 hours to recover from deprivation. A similar study evaluating sleep disturbance and pain response in healthy women showed loss of pain inhibition and increase in spontaneous pain following partial sleep deprivation with forced wakenings each hour, suggesting an important role for sleep continuity and pain perception.[32]

Sleep Disturbance and Headache

A cross-sectional survey of five general practices in the UK ($N = 2{,}662$) compared reports of sleep disturbance in adults with and without headaches during the previous 3 months.[33] After adjusting for age and gender, sleep was strongly associated with headache, with headache sufferers more likely to report mild (odds ratio 2.4), moderate (odds ratio 3.6), or severe sleep disturbances (odds ratio 7.5). Furthermore, sleep disturbance was more likely in patients with more frequent or more severe headaches.

Sleep disturbance has been most closely identified in patients with migraine. In a large patient survey ($N = 1{,}283$), about one of every three migraine sufferers reported frequent trouble with falling asleep (31%) and staying asleep (39%).[34] In addition, 38% of migraineurs reported sleeping ≤6 hours nightly compared with

11% for an analogous general population sample. Mean number of headaches per month was greater in migraineurs routinely sleeping ≤6 hours nightly (17.6 headaches) or >8 hours nightly (17.5 headaches) compared with normal sleep (15.1 headaches). Severe headache days per month were similarly higher for patients with insufficient (7.3 severe headache days) and excessive sleep (6.6 severe headache days) compared with migraineurs reporting normal sleep (5.9 severe headache days). These differences reached statistical significance for the insufficient sleep group ($P < 0.01$). Differences were not statistically significant for the excessive sleep group, likely due to a relatively small number of patients in this sleep category ($N = 73$). Gori et al. similarly compared sleep reports in 100 migraineurs and 30 controls.[35] Using a standardized sleep quality measure, poor sleep was reported by 64% of migraineurs vs. 33% of controls. The most notable difference was significantly longer sleep latency in migraineurs compared with controls (25 vs. 10 minutes, $P < 0.01$). Although sleep quality scores were correlated with psychological distress, they did not predict migraine frequency or disability in this sample.

Abnormal sleep patterns are well-established triggers of individual headache episodes. Change in sleep was endorsed as usually triggering a headache for 26% of almost 300 consecutive headache patients.[36] In a second, larger sample of migraine patients, sleep disturbance was similarly reported to be a frequent migraine trigger in 27%, with 14% additionally identifying sleeping late as a frequent headache trigger.[34]

Treatment of Insomnia

Patients reporting sleep disturbance should be assessed for the occurrence of additional medical conditions that may influence sleep patterns, such as thyroid, renal, and cardiovascular disease. Medications should also be reviewed to minimize the occurrence of drug-related sleep disturbance. Treatment of insomnia should primarily focus on sleep hygiene education (Box 18.4). Patients with comorbid anxiety or depression will need specific treatment of mood disorders, which also impact sleep.

Box 18.4 Sleep hygiene techniques

- Perform stretching exercises and relaxation techniques for 15–20 minutes before bed
- Incorporate stress management techniques into your daily routine
- Establish regular bed times during the week
- Don't watch television in bed. Patients may read for 15 minutes, but then lights should be turned out in preparation for sleep.
- Get up early and at the same time each day
- Eat breakfast
- Limit caffeine, alcohol, and nicotine

Medication therapy may include sedating antidepressants for patients with additional neuropathic, fibromyalgia, or migraine pain, or those with comorbid mood disorder. Melatonin [Rozerem] may also be helpful. In an small open-label study ($N = 32$), taking 3 mg of melatonin 30 minutes before bedtime for 3 months reduced the number of migraines by 61%.[37] Migraine severity decreased by 51%. A few people taking melatonin reported side effects of excessive sleepiness ($N = 1$), hair loss ($N = 1$), and increased sexual libido ($N = 3$).

Smoking

Nicotine negatively enhances pain sensitivity. A study of experimental pain showed that chronic nicotine exposure in rodents sensitized nerves and increased the development of painful hypersensitivity after nerve injury.[38] These data support that smoking is a risk factor for the development and perpetuation of chronic pain. The studies described later show that smoking has long-lasting impact on pain and healthcare utilization. Furthermore, smokers tend to utilize more analgesics than non-smokers and experience less pain reduction from analgesic treatment. Therefore, pain management needs will tend to be greater and less responsive in smokers and, while nicotine discontinuation may result in long-term benefits, short-term pain changes are not anticipated from nicotine cessation. Although data directly assessing the impact of smoking cessation on chronic pain are lacking, the following studies do suggest efforts to reduce nicotine exposure that may positively impact pain complaints.

Prevalence of Pain Based on Smoking

Individuals currently or previously smoking at least 20 cigarettes per day have higher odds for experiencing more pain locations and moderate-severe pain compared with individuals who never smoked (Table 18.1).[39]

Headache is also influenced by smoking. In comparison to never smokers, the relative hazard for incident migraine in smokers is 1.35 (1.08–1.68).[40] A longitudinal survey of almost 5,000 women experiencing a pregnancy over a 3.5-year period reported severe headache significantly more often in smokers compared with non-smokers (22% vs. 17%, $P < 0.001$).[41]

Impact of Smoking on Chronic Pain Treatment

Current and former smokers were shown to have an increased risk of analgesic use compared with non-smokers in a national sample of 7,124 adults.[42] In comparison

Table 18.1 Odd ratios (95% confidence interval) of more pain locations and moderate-severe pain in smokers vs. non-smokers (based on John[42])

	More pain locations	Moderate-severe pain
Current smokers		
20 or more per day		
Males	1.5 (1.19–1.82)*	1.5 (1.22–1.88)*
Females	1.4 (1.12–1.83)*	1.6(1.22–2.04)*
<20 per day		
Males	1.2 (0.97–1.42)	1.2 (0.97–1.45)
Females	1.0 (0.83–1.20)	1.1 (0.89–1.31)
Former smokers		
20 or more per day		
Males	1.7 (1.37–2.20)*	1.7 (1.31–2.11)*
Females	1.7 (1.24–2.43)*	1.6 (1.09–2.39)*
<20 per day		
Males	1.4 (1.12–1.80)*	1.3 (1.06–1.67)*
Females	1.4 (1.06–1.78)*	1.2 (0.94–1.46)

Numbers of 20 or more per day and <20 per day refer to the average number of cigarette consumed. Former smokers quit within the previous 12 months.

to adults who had never smoked, the odds ratio of weekly or daily analgesic use was 3.1 among current smokers and 2.0 among former smokers. These data support a recent study that evaluated response to hydrocodone [Vicodin] in 100 healthy patients with nonspecific chronic low back pain.[43] Smokers required higher doses of hydrocodone and reported higher pain scores post-treatment than non-smokers (Fig. 18.6). Despite the greater use of opioid and hydrocodone, blood levels were actually lower in smokers than non-smokers. Furthermore, evaluation of medical charges among patients with back pain showed significantly higher overall medical costs for smokers compared with former smokers and those never smoking.[44]

Abuse

Primary care patients should routinely be questioned about a history of abuse. A national survey conducted in the United States identified a history of childhood abuse in 10.6% of individuals from 15 to 54-years old.[45] Women were more likely to report both physical (5.1% vs. 3.3%) and sexual abuse (11.4% vs. 2.0%) than men ($P < 0.01$). Studies consistently show a strong association between prior abuse exposure and current chronic pain complaints (Fig. 18.7). A survey of 162 consecutive chronic pain patients identified any abuse in 61%.[46] Patients with a history of abuse were significantly more likely to report an Axis I diagnosis ($P = 0.017$). Males with combined abuse were significantly more likely to have bipolar disorder ($P = 0.022$), while females with abuse were significantly more likely to have major depression ($P = 0.016$) or panic disorder ($P = 0.024$) (Fig. 18.8). All of these

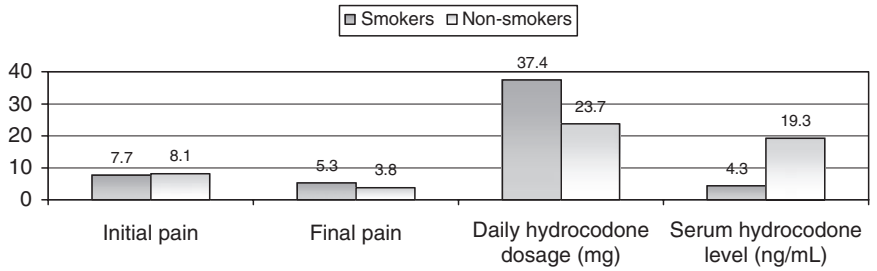


Fig. 18.6 Relationship between smoking and pain and analgesia. Smokers used at least 1 pack of cigarettes per day. All patients were treated with monotherapy with hydrocodone, with a maximum daily dosage of 40 mg for 4 weeks. Pain is rated on a 0 (no pain) to 10 (excruciating pain) severity scale. Significant between-groups differences occurred for final pain, hydrocodone dosage, and hydrocodone levels ($P < 0.05$). (Based on Ackerman[43]).

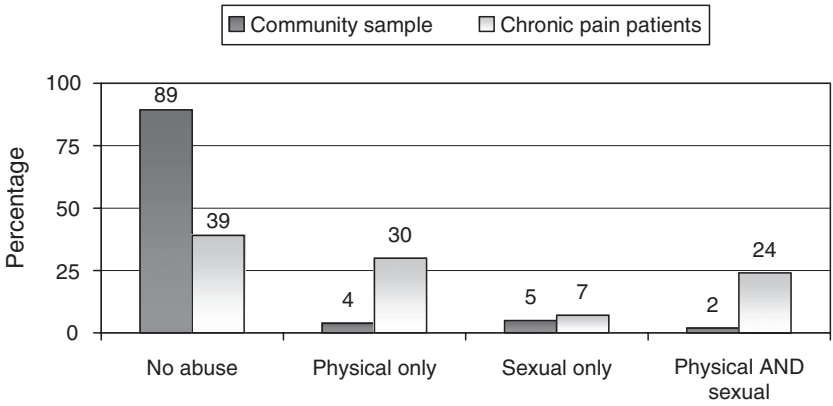


Fig. 18.7 Comparison of abuse history between community survey (childhood abuse) and chronic pain patients (lifetime abuse) (Based on Sachs-Ericsson[45], Bailey[46]).

patients participated in an intensive pain rehabilitation program, with history of abuse not affecting either short- or long-term outcome.

In a community survey of young adults (age 22 years) in the United States, a history of sexual abuse was linked to increased risk for frequent pain (odds ratio = 2.65) and pain impairment (odds ratio = 3.99).[47] Physical abuse, however, was not significantly linked to increased pain risk. Conversely, a Canadian survey of women revealed a significant association between physical abuse and chronic pain (odds ratio = 1.66) but not sexual abuse and chronic pain.[48]

These studies support a link between abuse and chronic pain. Furthermore, chronic pain patients with an abuse history are more likely to have an additional Axis I diagnosis. Consequently, screening for abuse may be particularly important among chronic pain patients to identify patients who require additional intervention.

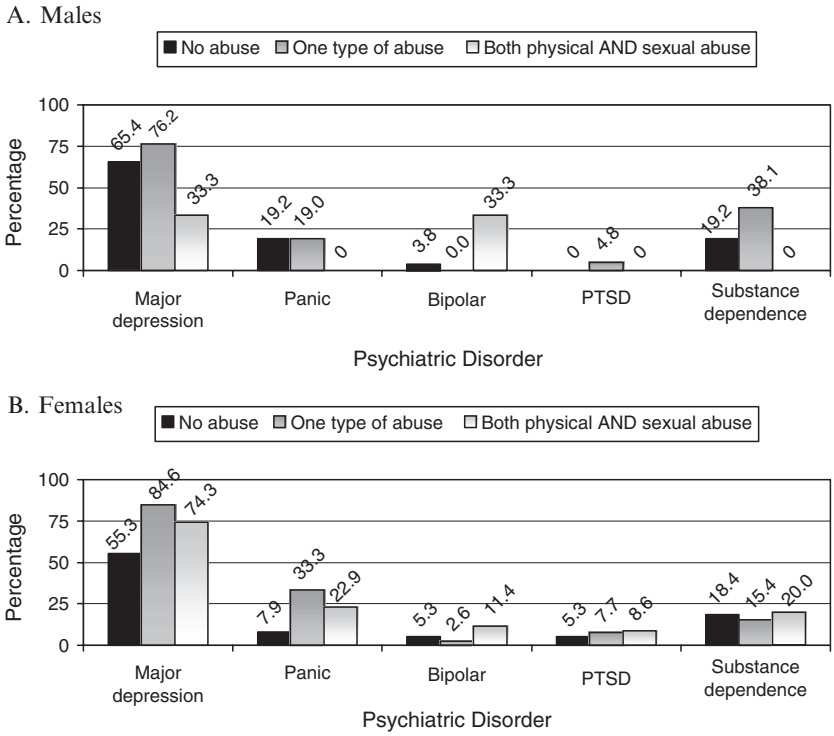


Fig. 18.8 Association of abuse and psychological distress (Based on Bailey[46]). (**A**) Males; (**B**) Females. *PTSD* = post-traumatic stress disorder.

Psychological Distress

Depression and anxiety are the most common mental health conditions seen in primary care. Screening 1,007 consecutive adult primary care patients identified major depression in 18.9%, with generalized anxiety disorder in 14.8% and panic disorder in 8.3%.[49] A separate survey of consecutive patients from 15 primary care practices similarly reported any anxiety disorder in 19.5%, with generalized anxiety disorder in 7.6%, panic disorder in 6.8%, social anxiety in 6.2%, and posttraumatic stress disorder in 8.6%.[50]

Psychological symptoms commonly accompany chronic pain. Nearly half of all patients with a pain disorder have associated psychological or psychiatric comorbidity.[51] The National Comorbidity Survey identified mood and anxiety disorders in a community sample of 5,877 individuals, aged 15 to 54 years old.[52] Chronic pain was endorsed by 6.5%. Both mood and anxiety disorders occurred more commonly in those with chronic pain ($P < 0.05$) (Fig. 18.9). Data from the World Health Organization were likewise analyzed to determine relationships between psychological symptoms and chronic pain.[53] The presence of psychological distress at baseline predicted the development and chronicity of pain complaints

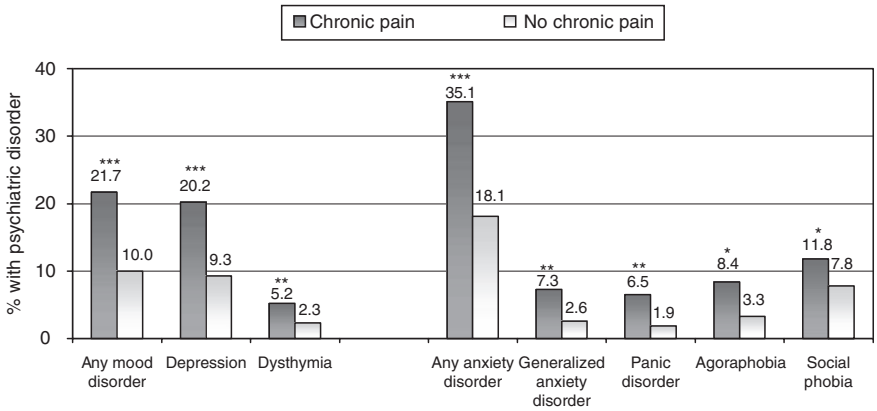


Fig. 18.9 Prevalence of mood and anxiety disorders in a community sample with and without chronic pain. All mood and anxiety disorders occurred more commonly in individuals with chronic pain: $^{*}P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.0001$. (Based on McWilliams[52]).

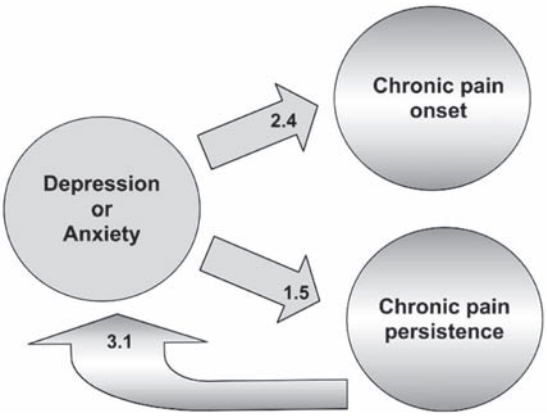


Fig. 18.10 Relationship between psychological distress and chronic pain, with odds ratios in directional arrows. Baseline depression or anxiety predicts both the development and persistence of pain. Persistent pain predicts the development of new-onset depression and anxiety. (Based on Gureje[53]).

(Fig. 18.10). In addition, the persistence of pain complaints also predicted the onset of new symptoms of depression and anxiety.

Premorbid Psychological Factors

Early life events and premorbid psychological factors can increase the risk for developing chronic pain after exposure to pain-producing situations, such as a work injury

or automobile accident. Childhood exposure to traumatic or stressful events increases the risk for chronic pain in adulthood.[54] In addition, premorbid adult depression and anxiety also predict increased likelihood of pain chronicity. Workers in occupations that pose a high risk for back pain were followed after an acute back injury for the development of persistent complaints after 3 months.[9] Both anxiety and depression predicted an increased risk for back pain chronicity (OR: 2.08 for anxiety/insomnia; 2.47 for severe depression). Identifying premorbid psychological factors may help predict those patients at higher risk for developing more recalcitrant pain complaints, and suggest the need for more aggressive initial intervention.

Stress is another important factor for pain persistence. A longitudinal study of adults in the Canadian National Population Health Survey identified stress as an important predictor for the development of back pain in both men and women (odds ratio [OR]: 1.2).[55] Similarly, a prospective study of newly employed workers linked several workplace psychological factors with increased risk for developing chronic pain.[56] Odds ratios for developing pain were 1.7 for exposure to stressful work, 1.6 for hectic work, and 1.7 for dissatisfaction with support from colleagues. Therefore, work stress should be considered when evaluating impact of pain on work disability.

Current Psychological Factors

Current psychological factors are important variables in patients with chronic pain. Identification of psychological distress and primary and secondary gains are important to fully understand the patient with chronic pain. For most medical patients, including patients with chronic pain, exposure to psychological symptoms or stress will aggravate primary medical symptoms. Identifying and treating those factors that typically aggravate chronic pain – such as stress, depressed mood, and anxiety – are important aspects of patient care. When psychological distress is prominent, initial therapy may need to focus on psychological issues before pain management will be effective.

Stress

Mental stress is one of the most common triggers of chronic medical symptoms. Exposure to stress increases cardiac symptoms in patients with heart disease, bowel symptoms in patients with gastrointestinal disorders, seizures in patients with epilepsy, and pain in chronic pain sufferers. Stress is identified as a usual trigger for pain flares by 31% of patients with chronic pain.[57] Pain flares triggered by stress exposure are no less "real" than the heart attack occurring during a stressful situation.

Stress aggravates chronic pain through a variety of physiological changes in the nervous system, specifically through changes in several neurotransmitters important for pain transmission. For example, stress leads to hyperalgesia and changes in the activity of a variety of catecholamines that are important for pain transmission,

including dopamine and norepinephrine.[58,59] These changes themselves will serve to aggravate pain perception.

Depression and Anxiety

A survey of 716 patients with chronic pain attending a specialty clinic identified depression in 59%, with anxiety in 56%.[57] Prevalence of depression is about twice as high in patients with pain who attend specialty clinics compared with primary care patients (Fig. 18.11).[60] Depression prevalence is also higher in patients with greater pain severity (Fig. 18.12).[61] As expected, the presence of psychological distress aggravates pain severity and impedes response to pain treatment (Box 18.5).

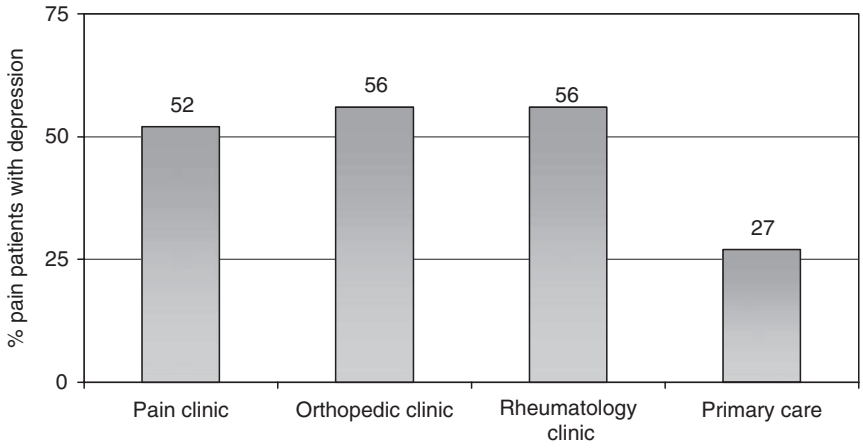


Fig. 18.11 Prevalence of depression in chronic pain patients (Based on Bair[60]).

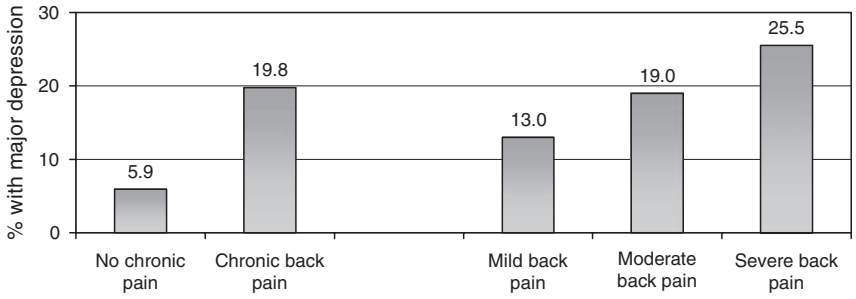


Fig. 18.12 Prevalence of major depression in individuals with chronic back pain. Data from the Canadian Community Health Survey–Cycle 1 (n = 118,533). Prevalence of chronic back pain was 9%. Prevalence of major depression increased with the presence of chronic back pain, as well as pain severity. (Based on Currie[61]).

Box 18.5 Depression predicts

- Onset of new pain kg/m^2
- Persistent pain after acute injury kg/m^2
- Poor response to pain treatment kg/m^2
- Long-term, pain-related disability kg/m^2

(Base on Blyth[60])

Pain prevalence is also high in patients with the primary complaint of depression. A literature review identified pain in an average of 65% of individuals with depression.[60] Interestingly, more than 50% of depressed individuals described only somatic symptoms, with no emotional complaints. Nearly 66% of these complaints were pain-related. These data further support the need to screen for depression in patients reporting chronic pain.

Primary and Secondary Gain

Primary gain is a sense of internal control or relief from anxiety that is associated with the occurrence of physical symptoms. Secondary gains are external rewards, such as financial compensation, release from unpleasant responsibilities, or increased personal attention. Patients with chronic pain rarely experience primary gain from their symptoms, usually experiencing increased conflict and anxiety from their pain complaints.

Secondary gain issues should be evaluated in every patient with chronic pain. The presence of secondary gain does not, by itself, suggest pain symptom magnification. However, it is important to acknowledge that patients with active litigation typically report greater pain severity and disability than similar patients without litigation.[62,63] Failure to identify possible conflicts with secondary gain results in a reduced understanding of the patient's needs. Open discussions about secondary gain – such as preinjury work conflicts or concerns about returning to work – facilitate the development of treatment designed to effectively address patient concerns and maximize successful reduction in pain and disability.

Assessment for Psychological Distress

Reliable, validated screening tools to help identify depression and anxiety are provided in Appendix C. Additional resources are available on the Internet. For example, the online, 10-item Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ) quickly screens for depression (http://bipolar.stanford.edu/pdf/questionnaire.doc; accessed March 2008). Patients may also complete

an online anxiety screen through the New York University Medical Center site (http://bipolar.stanford.edu/pdf/questionnaire.doc; accessed March 2008).

Psychological Treatment

Management of patients with chronic pain needs to include reduction in psychological distress as an important treatment goal. Even in patients without significant psychological distress, a reduction in pain severity and disability are typically achieved using psychological pain management skills. Psychological forms of pain therapy are best utilized with other types of pain therapy, such as medications, physical therapy, and occupational therapy. Studies show a superior response when treatment includes both medication and psychological therapy.[64,65]

Treating Comorbid Psychological Symptoms

Patients with comorbid psychological disorders and chronic pain often insist that the psychological symptoms will resolve spontaneously once pain symptoms are controlled. Because psychological symptoms increase the risk for developing new and persistent pain while functioning as triggers for pain aggravation, specific treatment of psychological symptoms cannot be ignored. Patients with comorbid depression, anxiety, and so on, will need to have those symptoms addressed before or in conjunction with pain therapy. Patients with severe psychological symptoms are not able to effectively participate in rehabilitative therapy to reduce pain and will need to begin psychological therapy for the emotional disorder first. Patients who are severely depressed will have difficulty motivating themselves to comply with exercise therapy, whereas very anxious patients often tend to overuse pain medications in an effort to reduce feelings of inner agitation and distress.

Psychological Treatment of Chronic Pain

Healthcare providers can unwittingly reinforce chronic pain complaints by excessively focusing attention on pain severity, activity restriction, and medication prescriptions. Lack of attention to positive health behaviors and increased focus on negative behaviors can reinforce pain complaints and disability. Behavioral treatment of chronic pain provides a positive response to pain complaints, removing reinforcement (healthcare provider attention) from negative responses to pain by focusing treatment on achieving productive well behaviors. For example, focusing attention during appointments on exercise and activity logs rather than pain scores encourages the patient to likewise place higher importance on rehabilitative therapies.

Box 18.6 Effective psychological pain management treatments

- Cognitive-behavioral therapy
- Relaxation (may include biofeedback)
- Development of coping skills
- Stress management
- Pain education

Table 18.2 Replacing cognitive and behavioral distortions with more appropriate thoughts and responses

Maladaptive thoughts and responses	Adaptive thoughts and responses
Oh no. I have another migraine. Now I will never get my work done!	My migraines usually last about 6 hours. I know I can reduce the severity by taking my medicine and doing relaxation techniques. I will need to take a break to treat my migraine for about 30 minutes, but then I will be able to complete my work.
My low back pain flared when I was driving to my mother's house. I guess I'll never be able to visit her again.	I see that I cannot just jump in the car and drive for 3 hours. Next time, I would better do some stretching exercises before I start driving and schedule brief rest stops along the way.
My pain became intolerable when I returned to work after my injury. After one 8-hour day, I had to spend 2 weeks in bed. I do not plan to ever return to work.	I need to assess the different physical tasks of my job and see if the tasks might be modified to improve my ability to perform work activities. I may also need to try gradual re-entry.
I live on the sofa. I just cannot do any housework anymore. All that carrying, lifting, and reaching is just too much. If the family wants meals, clean laundry, or vacuumed floors, they would better do it themselves!	I should have a family meeting so we can decide how to divide household chores. I need to see how I can break down tasks into components that I can do. For example, I cannot carry the laundry baskets, but I can sort and fold the wash.
I have no time to exercise or do relaxation techniques.	I can do my neck stretches while standing in the shower, or pelvic tilts while sitting in the office. I can do floor exercises while watching the 6 o'clock news. Relaxation techniques might be a good way to help me wind down before bed.
My pain is so bad, and I refuse to even talk on the phone.	Talking on the phone aggravates my neck pain because I tend to hold the phone by squeezing it between my ear and shoulder. If I use a headset, I should be able to use the phone comfortably.
There is no point in even getting out of bed. My pain is just debilitating.	I am going to have pain if I stay in bed or get out of bed. I might as well get up, get dressed, and start getting back into my regular routine. Staying in bed certainly is not helping my pain.

Box 18.7 Identifying and resuming normal activities

Activity assessment:

1. Select desired target activity

   _____

   _____

2. List barriers to achieving target activity

   _____

   _____

3. Identify intermediate activity that can currently be accomplished

   _____

   _____

4. Develop short-term strategy for accomplishing intermediate activity

   _____

   _____

5. Develop long-term strategy for accomplishing desired target

   _____

   _____

Psychological treatments of chronic pain – including education, relaxation with biofeedback, cognitive-behavioral therapy (CBT), and stress management – are uniformly effective for a wide variety of chronically painful conditions (Box 18.6).[66,67] CBT helps patients recognize distorted thinking about pain complaints and behavioral responses to pain. Strategies are then developed to replace counterproductive thoughts and behaviors with more adaptive views and responses to pain (Table 18.2). This type of problem-solving strategy helps remove patients from the role of being sick and disabled and return them to being a contributing member of their social and work environment. Using pain management skills enhances the patient's perception of self-ability to control pain (or self-efficacy). Self-efficacy effectively reduces pain severity through activation of both opioid and non-opioid pain modulation pathways.[68] CBT techniques can be used to help patients resume normal activity levels by first identifying a reasonable activity they wish they could complete and developing a strategy plan for accomplishing it (Boxes 18.7 and 18.8).

Summary

Modifiable lifestyle factors significantly influence chronic pain. Obesity, nicotine use, sleep disturbance, and psychological distress have all been linked to increased pain occurrence and severity. Furthermore, both nicotine use and sleep deprivation have been linked to reduced response to analgesic effects from pain medications.

Box 18.8 Example of completed activity assessment

1. Select desired target activity
   - Shopping at an outlet mall with my daughter
2. List barriers to achieving target activity
   - Unable to ride in the car for the 2 hours to get to the stores
   - Unable to stay in one position, either standing or sitting, without changing position for more than 20 minutes
   - Unable to walk more than 45 minutes without needing to sit and rest
   - Unable to carry heavy packages
   - Afraid daughter will become angry and disappointed if we leave before she's done shopping
3. Identify intermediate activity that can currently be accomplished
   - Shopping at one store in the local mall
4. Develop short-term strategy for accomplishing intermediate activity
   - Discuss strategy with daughter, including need to take breaks during shopping.
   - Use a lumbar support for the car ride.
   - Arrange to do some brief stretches that can be done while standing after arriving at the mall. Follow this with 15 minutes of walking in the mall before you start shopping.
   - Select only one store to visit and agree beforehand that you will not go to any other stores that day, even if there is a great sale.
   - Take a watch and agree to shop for only 1 hour before stopping.
   - Plan to get lunch after shopping to celebrate being together.
   - After arriving home, use relaxation techniques and do your stretching exercises, even if you feel tired.
5. Develop long-term strategy for accomplishing desired target
   - Successfully complete several brief trips to the local mall.
   - Gradually increase shopping time, remembering to take breaks to sit, stretch, and use pain management skills.

(continued)

Box 18.8 (continued)

- Identify rest stops on route to the outlet malls. Use rest stops to walk and do stretching exercises.
- Identify 2–4 stores you will visit at the outlet mall.
- Take breaks in between visiting each store.
- Allow daughter to carry bundles to the car between stores to minimize carrying.
- Do not be discouraged if your first attempt is not completely successful.

Lifestyle modifications may positively impact pain complaints. Increased weight is linked to the occurrence of and impact from chronic pain. Weight reduction significantly reduces pain in patients with chronic musculoskeletal pain. Insomnia affects half of chronic pain patients and is linked to increased pain-related disability and depression. About half of chronic pain patients treated at specialty clinics and 25% treated through primary care have depression. Anxiety similarly affects about half of chronic pain patients treated at specialty clinics. Psychological distress predicts the development and persistence of chronic pain.

Test Your Knowledge

1. Prevalence of which areas of chronic pain is/are increased in obese adults:

   a. Shoulder
   b. Back
   c. Knees
   d. All of the above

2. Which of the following statements is true:

   a. Pain reduction after weight reduction occurs only after patients achieve a normal BMI
   b. BMI is not associated with increased pain prevalence until patients reach a BMI $\geq 35\,kg/m^2$.
   c. Success of weight reduction is limited by long history of obesity, previous attempts at weight reduction, poor motivation to lose weight, and verbalized barriers to participating in exercise therapy.
   d. Obese women with comorbid depression should not be asked about weight, which may aggravate sense of low self-esteem.

3. Successful weight reduction in obese patients is maximized by utilizing:

   a. Graded exercise programs that begin with modest exercise
   b. Allowing patients to select dietary therapy alone if they prefer to avoid exercise
   c. Initiation of treatment with aggressive exercises, such as stair climbing or running programs
   d. Infrequent monitors of patients progress to minimize patients being discouraged from slow progress

4. Choose the correct statement(s) about the relationship between sleep and pain:

   a. About half of chronic pain patients report moderate-severe insomnia.
   b. Sleeping less than 6 hours per night will usually not influence migraine activity.
   c. Sleep deprivation is linked to pain hypersensitivity and reduced pain threshold in experimental studies.
   d. Benzodiazepines should be used as initial treatment for insomnia.
   e. A and C
   f. All of the above

5. Smoking influences chronic pain by increasing:

   a. Pain hypersensitivity
   b. Incident migraine
   c. The need for analgesics
   d. All of the above
   e. None of the above

6. About how many primary care patients with chronic pain have depression:

   a. 1 in 2
   b. 1 in 3
   c. 1 in 4
   d. 1 in 5
   e. 1 in 10

Answers: 1d, 2c, 3a, 4e, 5d, 6c

References

1. Rosemann T, Laux G, Kuehlein T. Osteoarthritis and functional disability: results of a cross sectional study among primary care patients in Germany. BMC Musculoskeletal Disord 2007;8:79
2. Ogden CL, Carroll MD, Curtin LR, et al. Prevalence of overweight and obesity in the United States, 1999–2004. JAMA 2006;295:1549–1555
3. Centers for Disease Control. State-specific prevalence of obesity among adults – United States, 2005. MMWR 2006;55:985–988
4. Field AE, Coakley EH, Must A, et al. Impact of overweight on the risk of developing common chronic diseases during a 10-year period. Arch Int Med 2001;161:1581–1586

5. Miranda H, Viikari-Juntura E, Martikanien R, Takala EP, Riihimaki H. A prospective study of work related factors and physical exercise as predictors of shoulder pain. Occup Environ Med 2001;58:528–534
6. Jinks C, Jordan K, Croft P. Measuring the population impact of knee pain and disability with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Pain 2002;100:55–64
7. Webb R, Brammah T, Lunt M, Urwin M, Allison T, Symmons D. Prevalence and predictors of intense, chronic, and disabling neck and back pain in the UK general population. Spine 2003;28:1195–1202
8. Lake JK, Power C, Cole TJ. Back pain and obesity in the 1958 British birth cohort: cause or effect? J Clin Epidemiol 2000;53:245–250
9. Fransen M, Woodward M, Norton R, et al. Risk factors associated with the transition from acute to chronic occupational back pain. Spine 2002;27:92–98
10. Marcus DA. Obesity and the impact of chronic pain. Clin J Pain 2004;20:186–191
11. Rosemann T, Grol R, Hermann K, Wensing M, Szecsenyi J. Association between obesity, quality of life, physical activity and health service utilization in primary care patients with osteoarthritis. Int J Behav Nutr Phys Activity 2008;5:4
12. Sharma L, Lou C, Cahue S, Dunlop DD. The mechanism of the effect of obesity in knee osteoarthritis: the mediating role of malalignment. Arthritis Rheum 2000;43:568–575
13. Bastard JP, Jardel C, Bruckett E, et al. Elevated levels of interleukin 6 are reduced in serum and subcutaneous adipose tissue of obese women after weight loss. J Clin Endocrinol Metab 2000;85:3338–3342
14. Winkler G, Salamon F, Harmos G, et al. Elevated serum tumor necrosis factor-alpha concentrations and bioactivity in Type 2 diabetes and patients with android type obesity. Diabetes Res Clin Pract 1998;42:169–174
15. Sullivan M, Karlsson J, Sjostrom L, et al. Swedish obese subjects (SOS)-an intervention study of obesity. Baseline evaluation of health and psychosocial functioning in the first 1743 subjects examined. Int J Obes Relat Metab Disord 1993;17:503–512
16. Goldstein LT, Goldsmith SJ, Anger K, Leon AC. Psychiatric symptoms in clients presenting for commercial weight reduction treatment. Int J Eat Disord 1996;20:191–197
17. Becker ES, Margraf J, Turke V, et al. Obesity and mental illness in a representative sample of young women. Int J Obes Relat Metab Disord 2001;25 suppl 1:S5–S9
18. Jackson AS, Stanforth PR, Gagnon J, et al. The effect of sex, age, and race on estimating percentage body fat from body mass index: The Heritage Family Study. Int J Obes Relat Metab Disord 2002;26:789–796
19. Zhou BF. Predictive values of body mass index and waist circumference for risk factors of certain related diseases in Chinese adults – study on optimal cut-off points of body mass index and waist circumference in Chinese adults. Biomed Environ Sci 2002;15:83–96
20. Peltonen M, Lindroos AK, Torgerson JS. Musculoskeletal pain in the obese: a comparison with a general population and long-term changes after conventional and surgical obesity treatment. Pain 2003;104:549–557
21. Evers Larsson U. Influence of weight loss on pain, perceived disability and observed functional limitations in obese women. Int J Obes Relat Metab Disord 2003;11
22. Huang M, Chen C, Chen T, Weng M, Wang W, Wang Y. The effects of weight reduction on the rehabilitation of patients with knee osteoarthritis and obesity. Arthritis Care Res 2000;13:398–405
23. Melissas J, Volakakis E, Hadjipavlou A. Low-back pain in morbidly obese patients and the effect of weight loss following surgery. Obes Surg 2003;13:389–393
24. McInnis KJ. Exercise and obesity. Coron Artery Dis 2000;11:111–116
25. Hulens M, Vansant G, Lysens R, et al. Exercise capacity in lean versus obese women. Scand J Med Sci Sports 2001;11:305–309
26. Fontaine KR, Haaz S, Bartlett SJ. Are overweight and obese adults with arthritis being advised to lose weight? J CLin Rheumatol 2007;13:12–15

27. Teixeira PJ, Going SB, Houtkooper LB, et al. Weight loss readiness in middle-aged women: psychological predictors of success for behavioral weight reduction. J Behav Med 2002;25:499–523
28. Tang NY, Wright KJ, Salkovskis PM. Prevalence and correlates of clinical insomnia co-occurring with chronic back pain. J Sleep Res 2007;16:85–95
29. Naughton F, Ashworth P, Skevington SM. Does sleep quality predict pain-related disability in chronic pain patients? The mediating roles of depression and pain severity. Pain 2007;127:243–252
30. Taylor DJ, Mallory LJ, Lichstein KL, et al. Comorbidity of chronic insomnia with medical problems. Sleep 2007;30:213–218
31. Nascimento DC, Andersen ML, Hipólide DC, Nobrega JN, Tufik S. Pain hypersensitivity induced by paradoxical sleep deprivation is not due to altered binding to brain μ-opioid receptors. Behav Brain Res 2007;178:216–220
32. Smith MT, Edwards RR, McCann UD, Haythronthwaite JA. The effects of sleep deprivation on pain inhibition and spontaneous pain in women. Sleep 2007;30:494–505
33. Boardman HF, Thomas E, Millson DS, Croft PR. Psychological, sleep, lifestyle, and comorbid associations with headache. Headache 2005;45:657–669
34. Kelman L, Rains JC. Headache and sleep: examination of sleep patterns and complaints in a large clinical sample of migraineurs. Headache 2005;45:904–910
35. Gori S, Morelli N, Maestri M, et al. Sleep quality, chronotypes and preferential timing of attacks in migraine without aura. J Headache Pain 2005;6:258–260
36. Marcus DA. Chronic headache: the importance of trigger identification. Headache & Pain 2003;14:139–144
37. Peres MP, Zukerman E, da Cunha Tanuri F, Moreira FR, Cipolla-Neto J. Melatonin, 3 mg, is effective for migraine prevention. Neurology 2004;63:757
38. Josiah DT, Vincler MA. Impact of chronic nicotine on the development and maintenance of hypersensitivity in the rat. Psychopharmacology (Berl) 2006:188:152–161
39. John U, Hanke M, Meyer C, et al. Tobacco smoking in relation to pain in a national general population survey. Pre Med 2006;43:477–481
40. Hozawa A, Houston T, Steffes MW, et al. The association of cigarette smoking with self-reported disease before middle age: the Coronary Artery Risk Development in Young Adults (CARDIA) study. Pre Med 2006;42:193–199
41. Christian P, West KP, Katz J, et al. Cigarette smoking during pregnancy in rural Nepal. Risk factors and effects of beta-carotene and vitamin A supplementation. Eur J Clin Nutr 2004;58:204–211
42. John U, Alte D, Hanke M, et al. Tobacco smoking in relation to analgesic drug use in a national adult population sample. Drug Alcohol Depend 2006;85:49–55
43. Ackerman WE, Ahmad M. Effect of cigarette smoking on serum hydrocodone levels in chronic pain patients. J Ark Med Soc 2007;104:19–21
44. Musich S, Faruzzi SD, Lu C, et al. Pattern of medical charges after quitting smoking among those with and without arthritis, allergies, or back pain. Am J Health Promot 2003;18:133–142
45. Sachs-Ericsson N, Kendall-Tackett K, Hernandez A. Childhood abuse, chronic pain, and depression in the National Comorbidity Survey. Child Abuse Neglect 2007;31:531–547
46. Bailey BE, Freedenfeld RN, Kiser RS, Gatchel RJ. Lifetime physical and sexual abuse in chronic pain patients: psychosocial correlates and treatment outcomes. Disabil Rehabil 2003;25:331–342
47. Brown J, Berenson K, Cohen P. Documented and self-reported child abuse and adult pain in a community sample. Clin J Pain 2005;21:374–377
48. Walsh CA, Jamieson E, MacMillan H, Boyle M. Child abuse and chronic pain in a community survey of women. J Interpersonal Violence 2007;22:1536–1554
49. Olfson M, Shea S, Feder A, et al. Prevalence of anxiety, depression, and substance use disorders in an urban general medicine practice. Arch Fam Med 2000;9:876–883
50. Kroenke K, Spitzer RL, Williams JW, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidty, and detection. Ann Intern Med 2007;146:317–325

51. Aigner M, Bach M. Clinical utility of DSM-IV pain disorder. Compr Psychiatry 1999;40: 353–357
52. McWilliams LA, Cox BJ, Enns MW. Mood and anxiety disorders associated with chronic pain: an examination in a nationally representative sample. Pain 2003;106:127–133
53. Gureje O, Simon GE, von Korff M. A corss-national study of the course of persistent pain in primary care. Pain 2001;92:195–200
54. Goldberg RT, Pachas WN, Keith D. Relationship between traumatic events in childhood and chronic pain. Disabil Rehabil 1999;21:23–30
55. Kopec JA, Sayre EC, Esdaile JM. Predictors of back pain in a general population cohort. Spine 2003;29:70–78
56. Nahit ES, Hunt IM, Lunt M, Dunn G, Silman AJ, Macfarlane GJ. Effects of psychosocial and individual psychological factors on the onset of musculoskeletal pain: common and site-specific effects. Ann Rheum Dis 2003;62:755–760
57. Marcus DA. Gender differences in chronic pain in a treatment-seeking population. J Gend Specif Med 2003;6:19–24
58. Pacak K, Palkovits M, Yadid G, Kvetnansky R, Kopin IJ, Goldstein DS. Heterogeneous neurochemical responses to different stressors: a test of Selye's doctrine of nonspecificity. Am J Physiol 1998;275:R1247–R1255
59. Wood PB. Stress and dopamine: implications for the pathophysiology of chronic widespread pain. Med Hypotheses 2004;62:420–424
60. Bair MJ, Robinson RL, Katon W, Kroenke K. Depression and pain comorbidity. A literature review. Arch Intern Med 2003;163:2433–2445
61. Currie SR, Wang J. Chronic back pain and major depression in the general Canadian population. Pain 2004;107:54–60
62. Suter PB. Employment and litigation: improved by work, assisted by verdict. Pain 2002;100:249–257
63. Blyth FM, March LM, Nicholas MK, Cousins MJ. Chronic pain, work performance and litigation. Pain 2003;103:41–47
64. Holroyd KA, France JC, Cordingley GE. Enhancing the effectiveness of relaxation-thermal biofeedback training with propranolol hydrochloride. J Consult Clin Psychol 1995;63:327–330
65. Evers AW, Kraaimaat FW, van Riel PL, de Jong AJ. Tailored cognitive-behavioral therapy in early rheumatoid arthritis for patients at risk: a randomized controlled trial. Pain 2002;100:141–153
66. Nielson WR, Weir R. Biopsychosocial approaches to the treatment of chronic pain. Clin J Pain 2001;17(suppl):S114–S127
67. Astin JA. Mind-body therapies for the management of pain. Clin J Pain 2004;20:27–32
68. Bandura A, O'Leary A, Taylor CG, Gauthier J, Gossard D. Perceived self-efficacy and pain control: opioid and nonopioid mechanisms. J Pers Soc Psychol 1987;53:563–571

Chapter 19
Analgesics and Opioids

Key Chapter Points:

- Analgesia may be enhanced with non-opioid and opioid analgesics, as well as coanalgesic agents.
- Non-opioid analgesics and short-acting opioids in chronic pain should be limited to infrequent, intermittent use for severe pain flares.
- Long-term risk for gastric and renal toxicity with analgesics is minimized with opioid analgesics.
- Medication abuse behavior occurs in 25–30% of patients with chronic pain treated with opioids.

Key Words Analgesia, Opioid, Prostaglandin

Case History

Mr. Walter is a 55-year-old man with chronic low back pain. He underwent three back surgeries and numerous other treatments – including a fusion procedure, epidural steroid injections, facet blocks, and numerous medication trials – without benefit. He is a chef and restaurant owner, but his pain has prevented him from cooking in the restaurant or spending more than about 2 hours a day at work. He had been treated with nonsteroidal analgesics, but developed anemia from gastric ulcers. A trial of tramadol was unsuccessful and he currently doses several times daily with acetaminophen, with minimal relief. Mr. Walter's examination revealed pain with postural changes and restricted motion in his lumbar spine. He had no leg weakness, reflex changes, or numbness. His doctor diagnosed mechanical back pain and, after ensuring no history of drug or alcohol abuse and discontinuing acetaminophen, treated him with short-acting hydrocodone for disabling pain, with a prescription for 30 pills. Mr. Walter called the clinic after 1 week, reporting good results from the hydrocodone, with mild constipation controlled by adding prune juice to breakfast and no cognitive effects. He requested a medication refill. The partner of Mr. Walter's treating physician authorized four refills. Mr. Walter returned to the clinic in 1 month and

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

reported great satisfaction with his medication. He reported he could now grade his pain with a score of 6, on a scale of 0–10, instead of 9, and that he was able to spend 6 hours a day at the restaurant. He had even restarted cooking for some meals. In addition, he had resumed his stretching and flexion exercise program, now that his pain was better controlled. Although encouraged by this good report, Mr. Walter's doctor was surprised to see that in 1 month, Mr. Walter had used 150 tablets. The doctor angrily asked why Mr. Walter was using the medication so frequently, reminding Mr. Walter that he was instructed to use hydrocodone only for severe pain. Mr. Walter replied that before starting hydrocodone his pain was always severe, and hydrocodone effectively relieved his pain, but only for approximately 4 hours. Therefore, Mr. Walter was taking hydrocodone four times daily. The doctor discontinued hydrocodone and requested consultation at a drug abuse facility.

Introduction

Patients with recalcitrant, disabling musculoskeletal pain, like Mr. Walter, may be candidates for analgesic therapy, with little benefit expected from coanalgesics. While short-acting opioids effectively reduced Mr. Walter's pain and resulted in decreased disability, they failed to provide the long-lasting relief he needed for his constant, severe pain when used with more appropriate infrequent dosing. Mr. Walter discovered, as patients often do, that frequent dosing with a short-acting product would achieve longer lasting pain-relieving results. Failure of Mr. Walter to communicate the constant nature of his pain to the doctor and the doctor's failure to provide clear medication limits resulted in a dissatisfactory follow-up visit for both parties. Mr. Walter's frequent use of short-acting opioids appears to represent a legitimate attempt to achieve long-acting therapy results, rather than a typical pattern of abuse. Indeed, opioid therapy resulted in good achievement of treatment goals – both pain reduction and significant improvement in functional ability, with a marked increase in work hours. Consultation with a drug abuse counselor resulted in a recommendation to switch to sustained-release opioids. Better clarifying Mr. Walter's analgesic needs and utilizing risk management strategies provided in Chap. 3 might have avoided the conflicts experienced by this patient.

Analgesic pain medications include a wide assortment of therapies (Table 19.1). Analgesic medications reduce peripheral or central sensitization or enhance activity of central descending inhibitory pathways. Determining appropriate therapy for individual patients requires a thorough understanding of the patient's pain diagnosis and symptoms. While non-opioid and opioid analgesics were designed to reduce pain severity, coanalgesic medications were developed to treat alternative medical conditions but also offer analgesic properties. Coanalgesics are most commonly used to treat neuropathic pain and chronic headache and include medications originally designed to reduce mood disturbance and epilepsy.

While each analgesic medication category offers potential benefits, no individual drug is likely to help the majority of patients with chronic pain. A large, systematic

Table 19.1 Analgesic categories

Drug class	Options
Non-opioid analgesics	Acetaminophen
	NSAIDs
Opioid analgesics	Immediate-release opioids
	Sustained-release opioids
Coanalgesics	Antidepressants
	Neurostabilizing antiepileptics
	Muscle relaxants
	Topical agents (lidocaine, capsaicin)

NSAIDs nonsteroidal anti-inflammatory drugs

Table 19.2 NNT for effective analgesia (based on McQuay et al.[1])

Medication	NNT
Oral analgesics	
Acetaminophen	2.9
Ibuprofen	2.0
Tramadol	8.2
Propoxyphene	7.5
Topical NSAIDs	3.0
Antidepressants	3.0
Antiepileptics	2.5
Topical capsaicin	3.9

NSAIDs nonsteroidal anti-inflammatory drugs

review of outpatient chronic pain management analyzed data from the existing literature to identify the number of patients needed to be treated to achieve an effective response for an assortment of medication therapies (Table 19.2).[1] Number-needed-to-treat (NNT) was defined as the number of patients needed to be treated to result in a single patient with moderate to severe pain achieving >50% pain relief compared with placebo. NNT values between 2 and 4 were considered to indicate effective treatment. None of these individual therapies was effective for most patients. These data show that a variety of therapies may be effective for chronic pain, but the individual patient will probably need to try several therapies before finding one that works well for him or her.

Selecting Pain Relief Medication

Some types of chronic pain, such as neuropathic pain and headache, can be effectively treated with coanalgesic therapy, such as tricyclic antidepressants and neurostabilizing antiepileptic drugs. These therapies, however, are much less effective for other common painful conditions, such as musculoskeletal pain. For severe pain complaints, analgesic medications are often needed, either as short-term therapy for intermittent management of pain flares or long-term therapy for persistent, constant,

disabling pain. Choice between non-opioid and opioid analgesics requires a comparison of efficacy, safety, and tolerability.

Short-acting analgesics may be used to treat intermittent, severe pain flares, while long-acting or sustained analgesics and adjuvant coanalgesic therapies are effective for reducing persistent disabling pain. Opioids provide stronger analgesic potency for non-inflammatory pain than non-opioid analgesics without risk of prostaglandin-related side effects. About 30% of primary care patients prescribed opioids for chronic pain, however, demonstrate medication misuse or abuse, including reporting lost/stolen prescriptions, obtaining opioids from secondary sources, and repeatedly requesting early refills.[2]

Non-opioid Analgesics

Intermittent, mild to moderate severity pain can often be effectively managed with non-opioid analgesics:

- Acetaminophen
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Tramadol

A prospective study randomly assigning emergency department patients with acute traumatic pain to intravenous treatment with an acetaminophen analogue, diclofenac, or tramadol showed similar analgesic response with each analgesic therapy.[3] NSAIDs effectively reduce inflammation in addition to providing analgesia.

Prostaglandin effects from non-opioid analgesics contribute to significant organ toxicity, particularly with long-term use. Concern about long-term effects of chronic analgesic use is especially important in patients with chronic pain, due to expectations of long duration of pain complaints and requirements for analgesic therapy. An estimated 2% of adults in both Europe and the USA consume daily non-narcotic analgesics.[4,5] Annual costs associated with toxicity from non-opioid analgesics in the USA approach $1.9 billion.[6] Nearly 75% of this cost is related to NSAIDs, which result in an annual toxicity cost of $1.35 billion.

Chronic analgesic use results in significant gastrointestinal (GI) toxicity, with ulcers occurring in 15–30% of NSAID users. Gastroprotective agents are two to four times more likely to be used in patients with arthritis when they are treated with NSAIDs.[7] Cyclooxygenase-2 (COX-2) selective inhibitors result in lower risk of GI side effects than non-selective NSAIDs. For example, overall incidence of GI adverse events was 19% for placebo, 26% with celecoxib, and 31% with naproxen in a comparative trial in patients with rheumatoid arthritis.[8] Increased risk of cardiovascular events with COX-2 selective agents, however, limits their clinical usefulness.[9,10]

Nephrotoxicity also is associated with chronic analgesic use. Renal impairment occurs in 24% and renal papillary necrosis in 12% of patients with arthritis using chronic NSAIDs.[11] Renal effects of non-opioid analgesics can include fluid retention, edema, hypertension, and congestive heart failure. Nephrotoxic risks increase with

analgesic overuse, with renal impairment in 65% and renal papillary necrosis in 27% of chronic analgesic overusers.[12] Renal toxicity risks are not reduced with COX-2 inhibitors.[13]

Analysis of female participants in the Nurse's Health Survey identified even infrequent analgesic use as an independent risk factor for developing hypertension.[14] The survey followed 51,630 women with no history of hypertension or renal disease for 8 years. After adjustment for age, body mass index, sodium and alcohol intake, physical activity, family history of hypertension, diabetes, and smoking, risk for developing new-onset hypertension was increased similarly for women using aspirin, acetaminophen, or NSAIDs (Fig. 19.1). A more recent survey similarly evaluated risk of incident hypertension in 16,031 male health professionals.[15] Incident hypertension was significantly linked to the number of analgesic pills consumed weekly. Compared with patients taking no analgesics, those taking 15 or more pills weekly had a relative risk of developing hypertension of 1.48 ($P < 0.001$). Among individual analgesics, hypertension risk was significantly increased in men exposed to each individual category at least 4–5 days per week (multivariate adjusted relative risk = 1.59 with acetaminophen, 1.15 with NSAIDs, and 1.29 with aspirin). Hypertension risk is perhaps greater in elderly patients with established hypertension because NSAIDs reduce diuretic efficacy. For example, adding NSAIDs to diuretics doubled the risk for hospitalization from congestive heart failure in a large survey of more than 10,000 patients.[16]

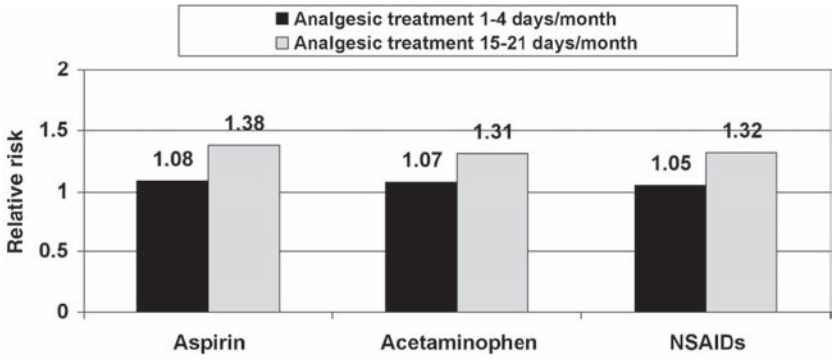


Fig. 19.1 Risk of new-onset hypertension in women treated with analgesics. *NSAIDS* nonsteroidal anti-inflammatory drugs (based on Dedier[14]).

Opioid Analgesics

Opioid treatment of chronic, non-malignant pain remains controversial. Opioids offer stronger analgesic potency than non-opioid analgesics, without prostaglandin-related adverse events. Although expert opinion suggests that, in many

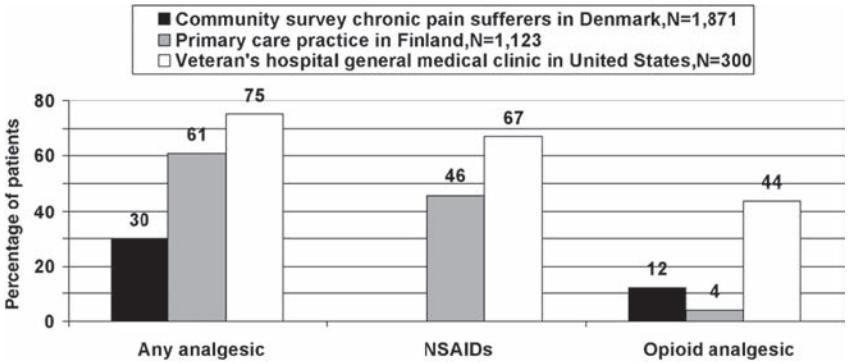


Fig. 19.2 Opioid prescribing habits. *NSAIDs* nonsteroidal anti-inflammatory drugs (based on Mantyselka et al.[20]; Clark[21]; Eriksen et al.[22]).

circumstances, improved efficacy and reduced organ toxicity with opioids compared with non-opioid analgesics outweighs the risks for misuse and abuse,[17–19] many clinicians continue to be uncomfortable with an expanded role for opioids from malignant to non-malignant chronic pain. This has resulted in marked differences in the prevalence of opioid prescriptions for chronic pain among medical practices (Fig. 19.2).[20–22]

Superior long-term tolerability is perhaps the most significant benefit of opioid analgesics, as opioids typically offer only modest additional efficacy benefit in comparison to non-opioid analgesics. In a randomized, comparative study, 36 patients were treated with NSAIDs (maximum daily dose: 1,000-mg naproxen), short-acting opioid (maximum daily dose: 20-mg oxycodone), or combined short- plus long-acting opioid (maximum daily dose: 200-mg morphine).[23] The average dosage consumed in the short- plus long-acting opioid group was 41 mg of morphine per day. Pain control and tolerability were superior with opioids, although functional improvement (as measured by activity levels) was similar among all therapies (Fig. 19.3). Short-acting opioids are often combined with non-opioid analgesics (e.g., hydrocodone plus acetaminophen [Vicodin, Lorcet] and oxycodone plus aspirin [Percodan] or acetaminophen [Percocet]). Selecting opioid-only preparations or combination drugs with a lower dosage of non-opioid analgesic (e.g., Norco) can minimize additional undesirable prostaglandin-related adverse effects.

Pain relief efficacy can be maintained long term when low doses of opioids are used. Pain was effectively reduced for 6 months in 58 patients with arthritis who were treated with sustained-release oxycodone (average daily dose: 40 mg) in a placebo-controlled study, without development of tolerance.[24] Pain and disability were similarly reduced in a long-term study of 33 patients with low back pain followed for a mean of 32 months.[25] Five patients discontinued opioids after a short trial because of side effects. In the remaining 28 patients using long-term treatment, pain was reduced by 31% and disability by 42%. In addition, addictive behaviors or drug diversion occurred for none of these patients.

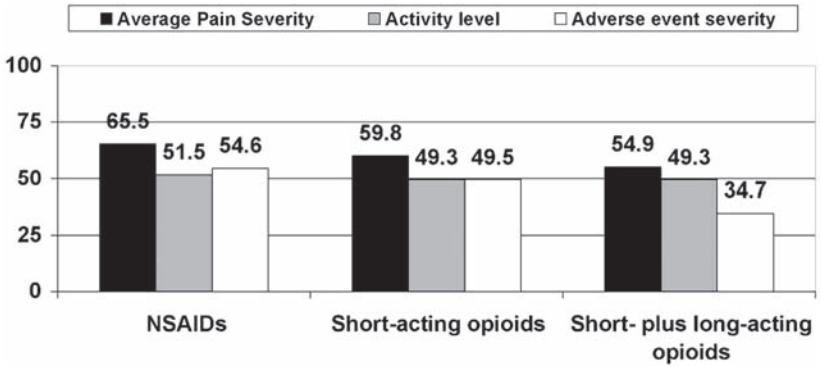


Fig. 19.3 Comparison of opioid and non-opioid analgesics for chronic back pain. Average pain and activity level scale: 100 = optimal; adverse event severity: 100 = extreme side effect. Differences among drugs were significant for pain ($P < 0.001$) and adverse events ($P < 0.0001$). *NSAIDs* nonsteroidal anti-inflammatory drugs (based on Jamison et al.[23]).

Box 19.1 Reasons to consider opioids for non-malignant pain

- Analgesic overuse
- Inadequate response from other therapy
- Significant disability
- Severe pain that limits ability to participate in rehabilitation

Incorporating Opioids into the Overall Management Plan

Opioids may be considered to be a component of multidiscplinary pain management for patients with disabling pain who have failed other therapy (see Box 19.1). Opioids should be incorporated into a comprehensive treatment plan, which may include physical therapy, occupational therapy, and psychological pain management skills. Additionally, pharmacological therapy does not need to be limited to either opioid or non-opioid therapies. Combining non-opioid medication with opioids can improve pain control for some patients. Eckhardt et al. evaluated experimental pain in healthy controls treated with placebo, gabapentin, morphine, and the combination of these medications.[26] Gabapentin alone was no more effective than placebo in improving pain tolerance. The addition of morphine to placebo increased pain tolerance by 41%, whereas the addition of both morphine and gabapentin increased pain tolerance by 76%.

Constipation can become a treatment-limiting side effect with opioids, especially in patients concomitantly treated with other constipating medications, such as tricyclic antidepressants. Constipation can be reduced by adding an exercise program, fiber-rich foods, and stool softeners, as needed. Selection of opioid may also influence constipation. In a large study of more than 1,800 patients with opioid-treated pain, constipation was more likely to occur with oxycodone (6.1%) or morphine (5.1%) in comparison with transdermal fentanyl (3.7%).[27] Clinical experience supports reduction in constipation when patients are switched to fentanyl [Duragesic].

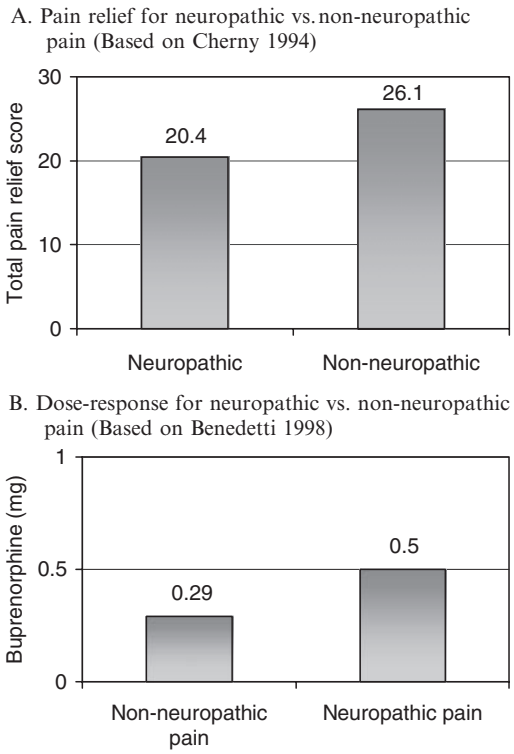


Fig. 19.4 Opioid efficacy for neuropathic pain. (**A**) Pain relief for neuropathic vs. non-neuropathic pain (based on Cherny et al.[28]). (**B**) Dose-response for neuropathic vs. non-neuropathic pain (based on Benedetti et al.[29]).

A new, matrix fentanyl membrane patch designed with a reduced drug load [Matrifen] is available outside of the US, with clinical trials underway in the US as of the publication of this book.[37]

While opioids are most effective in reducing non-neuropathic pain, they may also be used for disabling neuropathic pain, although pain reduction may be less and dose requirements may be higher. Total pain relief with opioids was evaluated in four single-dose studies with 168 patients.[28] Pain relief occurred with both groups, with a significantly greater response among patients with non-neuropathic pain ($P = 0.02$) (Fig. 19.4a). In a second study, the dosage of opioid buprenorphine necessary to reduce pain by at least 50% was compared in 21 patients treated initially for non-neuropathic post-operative thoracic surgery pain and again 1 month later for postthoracotomy neuropathic pain (Fig. 19.4b).[29] While pain reduction was successfully achieved for both acute non-neuropathic pain and subsequent neuropathic pain, the opioid dosage necessary to achieve comparable pain relief was significantly elevated for the neuropathic pain ($P < 0.001$).

Opioid Abuse and Misuse

A major barrier to use of opioids in patients with chronic pain is the significant concern about medication misuse and abuse. A recent comparison of patients prescribed

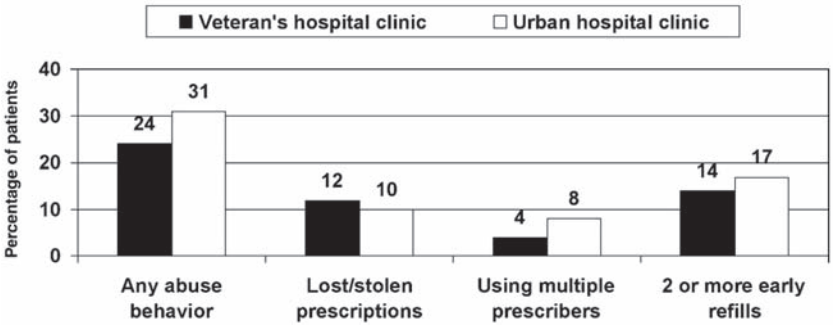


Fig. 19.5 Documented possible medication abuse behaviors in primary care outpatients prescribed with opioids. Data obtained from 6-month chart review (based on Reid et al.[2,30]).

opioids for non-malignant pain identified abusive behaviors in 24–31% (Fig. 19.5).[30] Median time from initiation of opioids to first abusive behavior was 24 months.

Predicting which patients will develop abusive behaviors can be difficult. Pretreatment characteristics were evaluated in patients who used opioids chronically at a Veterans Administration Hospital pain clinic, almost 30% of whom developed features of abuse.[31] None of the baseline patient characteristics studied could be used to predict which patients would later develop abusive behaviors, including history of previous drug or alcohol abuse, abnormal scores on abuse screening tools, high pain severity, high perceived need for opioids, or depression. Identification of abusive behaviors in 25–30% of patients treated with opioids, along with lack of accurate predictors for abuse, suggests the need for pharmacological vigilance in all patients with chronic pain who are treated with opioids.

As described in detail in Chap. 3, risks for inappropriate opioid use are minimized by adhering to specific requirements for patient selection, treatment targets, and follow-up requirements. As with any medical therapy, opioids can only be prescribed to patients actively engaged in treatment, for whom a specific diagnosis that will be treated by the therapy has been established. Opioids must never be prescribed for non-patients, including patients referred but not yet evaluated. Therapy efficacy must be evaluated at regular intervals, with treatment-plan modifications when efficacy targets, tolerability, or compliance is not achieved. Realistic treatment goals should be established (Table 19.3), with therapy continuation contingent upon goal attainment (Table 19.4).

Determining Appropriate Dosing

Opioid therapy needs to be matched with pain characteristics. Patients with constant, disabling pain are best managed with low doses of a long-acting opioid. Intermittent pain flares may be treated with short courses (2–4 days) of short-acting opioids.

Table 19.3 Sample treatment goals for opioid therapy

Endpoint goal	Appropriate goal	Inappropriate goal
Pain relief	Pain reduction to moderate severity	Complete relief of all pain – to become free of all pain
	Reduction in number, severity, or duration of pain flares	Elimination of any pain flares
	Development of techniques to treat pain flares	
Functional improvement	Increase tolerance for sitting, standing, or walking by specific amount: sit or stand 1 hour; walk ½ mile	Feel comfortable while maintaining significant disability
	Increase household chores: laundry 2 days per week, dinner preparation 3 nights per week, grocery shopping once weekly	Resume aggressive sports in which patient participated in youth
	Resume yard work	Return to regular work with no need to modify routine or work simplification
	Return to school or reduce school absences from pain to no more than once monthly	
	Return to work, e.g., return to work part time or at modified duties with a strategy to increase toward baseline work level	
	Participate in retraining or education to improve work readiness	
	Increase social/leisure activities: resume walking program, biking, swimming, or other sport; attend movies, concerts, or children's performances	
Other	Develop pacing skills and work simplification to assist in increasing activity level without intolerable increase in pain flares	Improve anxiety, mood, marital strife, relationship issues
		Improve sleep disturbance

Frequent pain flares that occur daily or several times daily should be managed with self-administered physical therapy modalities (such as heat, ice, oscillatory movements, or trigger-point therapy) and psychological pain management techniques (such as relaxation).

If opioids are utilized for chronic pain treatment, patients should be treated with low doses. Lack of familiarity with sustained-release opioid dosages may result in use of excessive quantities. Both patients and healthcare providers benefit from understanding the equivalency of a long-acting medication with short-acting

Table 19.4 Sample endpoint achievement with opioids: identification of effective therapy

Endpoint goal	Response suggests effective therapy: realistic goals achieved	Response suggests ineffective therapy: realistic goals not achieved
Pain relief	"My pain is now more tolerable, with moderate pain severity."	"My pain was about 50% better with the medication, so I doubled the dose to try to totally get rid of my pain."
Functional improvement	"I have been able to do my walking program every other day now and my stretching exercises each morning." "I have gone back to work part-time." "I have started doing more household chores: laundry, cooking, mowing the yard." "I get out of bed every morning and fix breakfast for the kids instead of laying in bed all day."	"My pain is really well controlled. Now when I lay on the sofa watching television all day, I'm really comfortable."
Other		"I take my pain pills at night and it knocks me out for a good night's sleep." "When I really want to overdo activities, I just double up on my pain medication to control the pain before it starts." "If I know it's going to be a stressful day, I take a couple of extra pain pills to keep things under better control." "I don't seem to worry so much, now that I'm taking the pain pills. I'm a lot calmer."

medications that have been used previously. Table 19.5 provides a comparison between comparable doses of short- and long-acting opioid analgesics. Although opioids do not have a ceiling dose to set the maximum dose that may be prescribed, general practitioners should probably seek consultation with a pain specialist before escalating opioid doses to high levels (e.g., doses exceeding 50-μg fentanyl or 50-mg morphine twice daily or 40-mg oxycodone three times daily).

Maintenance of low opioid dosage limits the development of tolerance and opportunities for medication abuse in the clinic. This practice is also supported by basic science research. Numerous experiments in rodents have convincingly shown that chronic exposure to high doses of opioids alters neurotransmitter activity in pain-provoking pathways, resulting in a paradoxical hyperalgesia or increased sensitivity to pain.[32] Therefore, lack of long-term efficacy with high doses of opioids may occur from the combination of lowering of the pain threshold and medication tolerance.

Table 19.5 Opioid dose equivalents

Short-acting opioid dosage	Long-acting opioid dosage
4–8 (5 mg) hydrocodone or oxycodone	10-mg oxycodone twice daily 15-mg morphine twice daily or 30 mg once daily
10 (5 mg) hydrocodone or oxycodone	25-mcg fentanyl patch every 48–72 hours 5-mg methadone twice daily
16 (5 mg) hydrocodone or oxycodone	40-mg oxycodone twice daily
20 (5 mg) hydrocodone or oxycodone	50-mcg fentanyl patch every 48–72 hours 10-mg methadone twice daily 50-mg morphine twice daily or 100 mg once daily

Coanalgesics

Coanalgesic or adjuvant therapy enhances pain-relieving benefits in patients utilizing a variety of pain reduction therapies, including analgesics. Both topical and systemic agents are available:

- Topical agents
  - Capsaicin (Zostrix)
  - Lidocaine patch (Lidoderm)
- Systemic agents
  - Antidepressants (e.g., Elavil, Norpramin, Cymbalta)
  - Neurostabilizing antiepileptics (e.g., Neurotin, Lyrica)
  - Tizanidine (Zanaflex)

In general, coanalgesics most effectively reduce pain caused by neuropathy, chronic headache, and fibromyalgia. Comorbid mood and sleep disturbance may also be reduced using antidepressants and some antiepileptics. Sleep disturbance may also be lessened with tizanidine.

As with non-opioid and opioid analgesics, no single coanalgesic therapy is effective for most patients. NNT was determined for 58 outpatients with chronic peripheral focal neuropathic pain syndromes randomized to treatment with 5% lidocaine or placebo patches.[33] The NNT to obtain one patient with a 50% reduction in pain was calculated at 4.4 for lidocaine patches in this study. The authors compared this number to literature reports of NNT for patients with postherapeutic neuralgia (Fig. 19.6).

Antidepressants

Analgesic properties of antidepressants are independent of their mood-relieving qualities, with analgesia occurring in patients without comorbid depression. Among

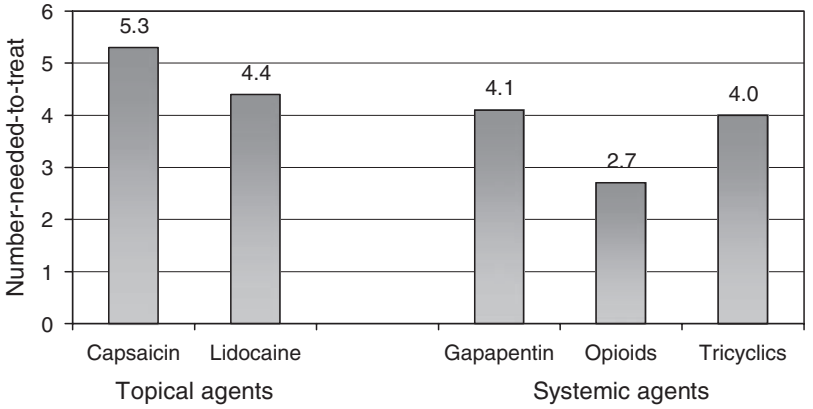


Fig. 19.6 Efficacy of coanalgesics (based on Meier et al.[33]).

different classes of antidepressants, tricyclics have the most potent analgesic effects. In two double-blind studies, 57 patients with painful diabetic neuropathy were randomized to treatment with amitriptyline, desipramine, fluoxetine, or placebo.[34] Mean daily doses were 105 mg amitriptyline, 111 mg despiramine, and 40 mg fluoxetine. Pain relief was superior to placebo for both tricyclic antidepressants ($P < 0.05$) but not fluoxetine (Fig. 19.7). There were no significant differences in efficacy between the two tricyclics.

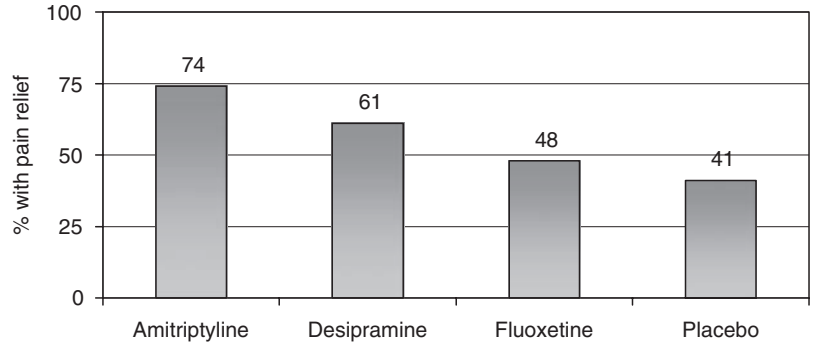


Fig. 19.7 Effects of antidepressants on diabetic neuropathy pain (based on Max et al.[34]). The graph shows the percentage of patients receiving each treatment who experienced moderate or better pain relief.

Among the newer antidepressants, serotonin and norepinephrine reuptake inhibitors, such as venlafaxine and nefazodone, and noradrenergic and specific serotonergic antidepressants, such as mirtazapine, offer the most promise for providing analgesia. Both of these classes of antidepressants affect α_2-adrengeric receptors and κ_1,κ_3, δ-opioid receptors, which may contribute to their analgesic properties.[35]

Neurostabilizing Antiepileptics

Antiepileptic drugs with neurostablizing properties reduce neuronal excitability by blocking sodium and calcium channels and acting as gamma-aminobutyric acid mimics. Antiepileptics, such as gabapentin, pregabalin, carbamazepine, baclofen, valproate, topiramate, and others, provide modest analgesic benefit and reduction of neuropathic pain and chronic headaches. Pain relief with antiepileptics is similar to that achieved with tricyclic antidepressants. For example, 25 patients with diabetic neuropathy were randomized to treatment with gabapentin (mean dosage = 1,565 mg daily) or amitriptyline (mean dosage = 59 mg daily) for 6 weeks.[36] There were no significant differences in pain reduction between gabapentin and amitriptyline throughout the 6 weeks of treatment. At least moderate pain relief was experienced by 52% with gabapentin and 67% with amitriptyline.

Muscle Relaxants

Most muscle relaxants or antispasmodic medications offer minimal long-term benefit for chronic pain. Tizanidine has been shown to effectively reduce pain and sleep disturbance in patients with chronic headache and neuropathic pain. Tizanidine acts as an alpha 2-adrenergic receptor agonist, similar to the analgesic mechanism for clonidine.

Topical Agents

Effective topical agents for neuropathic pain include 5% lidocaine patches and capcaisin cream. In addition to reduction in neuropathic pain, these treatments also provide minimal systemic adverse effects.

Summary

Analgesia may be enhanced by prescribing analgesics and coanalgesics. Coanalgesics are most beneficial in patients with neuropathic pain, chronic headache, and fibromyalgia. Some coanalgesics may also be used to reduce mood and sleep disturbances. Risks of gastric and renal toxicity with long-term use of non-opioid analgesics are minimized with opioid analgesics. Opioid therapy may also be considered when patients have failed to achieve benefit from other pain therapies, are unable to tolerate non-opioid analgesics, or have severe, disabling pain. Although prostaglandin-related adverse events do not occur with opioids, medication abuse behavior occurs in 25–30% of patients with chronic non-malignant pain treated with opioids. Both patients and clinicians must be cognizant of this risk and reduce the likelihood of abuse by establishing specific treatment targets, requiring strict

medication schedule compliance, making continued treatment contingent on goal attainment, and arranging regular follow-up assessments.

Test Your Knowledge

1. Which of the following medications has/have analgesic properties:

   a. NSAIDs
   b. Opioids
   c. Antidepressants
   d. Neurostabilizing antiepileptics
   e. A and B
   f. All of the above

2. Which of the following analgesics or coanalgesics have a NNT suggesting effective treatment:

   a. Acetaminophen
   b. Ibuprofen
   c. Tricyclic antidepressants
   d. Propoxyphene
   e. A, B, and C
   f. All of the above

3. Short-acting, immediate-release opioids should be considered in patients with:

   a. Frequent pain flares, occurring three times weekly
   b. Infrequent pain flares, occurring once per week or less
   c. Constant, disabling pain
   d. Constant, mild pain

4. Choose the correct statement:

   a. Abusive behaviors occur in approximately 4–9% of chronic pain patients treated with opioids.
   b. Medication abuse is unlikely to occur in patients with no personal or family history of abuse, depression, or anxiety.
   c. Opioids may be continued in patients who repeatedly report missing medications as long as they provide valid police reports of theft or other documentation.
   d. All of the above
   e. None of the above

5. Opioids may be prescribed for:

   a. Active patients
   b. Patients who have been referred for consultation but not yet evaluated when they will run out of their medications before the consultation appointment
   c. Close relatives

d. Employees with no abuse history
e. A and B
f. All of the above

6. Opioid dosage should be adjusted to achieve:

a. Complete pain relief
b. Complete relief of disability
c. Improvement in sleep
d. All of the above
e. None of the above

Answers: 1f, 2e, 3b, 4e, 5a, 6e

References

1. McQuay HJ, Moore RA, Eccleston C, Morley S, de C Williams AC. Systematic review of outpatient services for chronic pain control. Health Technol Assess 1997;1:1–150
2. Reid MC, Engles-Horton LL, Weber MB, et al. Use of opioid medications for chronic noncancer pain syndromes in primary care. J Gen Intern Med 2002;17:173–179
3. Hoogewijs J, Diltoer MW, Hubloue I, et al. A prospective, open, single blind, randomized study comparing four analgesics in the treatment of peripheral injury in the emergency department. Eur J Emerg Med 2000;7:119–123
4. Kromann-Andersen H, Pedersen A. Reported adverse reactions to and consumption of nonsteroidal anti-inflammatory drugs in Denmark over a 17-year period. Dan Med Bull 1988;35:187–192
5. Matzke GR. Nonrenal toxicities of acetaminophen, aspirin, and nonsteroidal anti-inflammatory agents. Am J Kidney Dis 1996;28(1 Suppl 1):S63–S70
6. McGoldrick MD, Bailie GR. Nonnarcotic analgesics: prevalence and estimated economic impact of toxicities. Ann Pharmacother 1997;31:221–227
7. Lapane KL, Spooner JJ, Pettitt D. The effect of nonsteroidal anti-inflammatory drugs on the use of gastroprotective medication in people with arthritis. Am J Manage Care 2001;7:402–408
8. Simon LS, Weaver AL, Graham DY, et al. Anti-inflammatory and upper gastrointestinal effects of celecoxib in rheumatoid arthritis. A randomized controlled trial. JAMA 1999;282:1921–1928
9. Funk CD, Fitzgerald GA. COX-2 inhibitors and cardiovascular risk. J Cardiovasc Pharmacol 2007;50:470–479
10. Wong M, Chowienczyk P, Kirkham B. Cardiovascular issues of COX-2 inhibitors and NSAIDs. Aust Fam Physician 2005;34:945–948
11. Segasothy M, Chin GL, Sia KK, et al. Chronic nephrotoxicity of anti-inflammatory drugs used in the treatment of arthritis. Br J Rheumatol 1995;34:162–165
12. Segasothy M, Samad SA, Zulfigar A, Bennett WM. Chronic renal disease and papillary necrosis associated with the long-term use of nonsteroidal anti-inflammatory drugs as the sole or predominant analgesic. Am J Kidney Dis 1994;24:17–24
13. LeLorier J, Bombardier C, Burgess E, et al. Practical considerations for the use of nonsteroidal anti-inflammatory drugs and cyclo-oxygenase-2 inhibitors in hypertension and kidney disease. Can J Cardiol 2002;18:1301–1308
14. Deider J, Stampfer MJ, Hankison SE, Willett WC, Speizer FE, Curhan GC. Nonnarcotic analgesic use and risk of hypertension in US women. Hypertension 2002;40:604–608
15. Forman JP, Rimm EB, Curhan GC. Frequency of analgesic use and risk of hypertension among men. Arch Intern Med 2007;167:394–399
16. Heerdink ER, Leufkens HG, Herings RM, et al. NSAIDs associated with increased risk of congestive heart failure in elderly patients taking diuretics. Arch Int Med 1998;158:1108–1112

17. Friedman DP. Perspectives on the medical use of drugs of abuse. J Pain Symptom Manage 1990;5 (suppl):S2–S5
18. Shannon CN, Baranowski AP. Use of opioids in non-cancer pain. Br J Hosp Med 1997;5: 459–463
19. Savage SR. Opioid use in the management of chronic pain. Med Clin North Am 1999;83: 761–786
20. Mantyselka P, Ahonen R, Kumpusalo E, Takala J. Variability in prescribing for musculoskeletal pain in Finnish primary health care. Pharm World Sci 2001;23:232–236
21. Clark JD. Chronic pain prevalence and analgesic prescribing in a general medical population. J Pain Symptom Manage 2002;23:131–137
22. Eriksen J, Jensen MK, Sjøgren P, Ekholm O, Rasmussen NK. Epidemiology of chronic non-malignant pain in Denmark. Pain 2003;106:221–228
23. Jamison RN, Raymond SA, Slawsby EA, Nedeljkovic SS, Katz NP. Opioid therapy for chronic noncancer back pain: a randomized prospective study. Spine 1998;23:2591–2600
24. Roth SH, Fleischman RM, Burch FX, et al. Around-the-clock, controlled-release oxycodone therapy for osteoarthritis-related pain. Placebo-controlled trial and long-term evaluation. Arch Intern Med 2000;160:853–860
25. Schofferman J. Long-term opioid analgesic therapy for refractory lumbar spine pain. Clin J Pain 1999;15:136–140
26. Eckhardt K, Ammon S, Hofmann U, et al. Gabapentin enhances the analgesic effect of morphine in healthy volunteers. Anesth Analg 2000;91:185–191
27. Staats PS, Markowitz J, Schein J. Incidence of constipation associated with long-acting opioid therapy: a comparative study. South Med J 2004;97:129–134
28. Cherny NI, Thaler HT, Friedlander-Klar H, et al. Opioid responsiveness of cancer pain syndromes caused by neuropathic or nociceptive mechanisms: a combined analysis of controlled, single-dose studies. Neurology 1994;44:857–861
29. Benedetti F, Vighetti S, Amanzio M, et al. Dose-response relationship of opioids in nociceptive and neuropathic postoperative pain. Pain 1998;74:205–211
30. Reid MC, Engles-Horton LL, Weber MB, Kerns RD, Rogers EL, O'Connor PG. Use of opioid medications for chronic noncancer pain syndromes in primary care. J Gen Intern Med 2002;17:173–179
31. Chabal C, Erjavec MK, Jacobson L, et al. Prescription opiate abuse in chronic pain patients: clinical criteria, incidence, and predictors. Clin J Pain 1997;13:150–155
32. Ossipov MH, Lai J, Vanderah TW, Porreca F. Induction of pain facilitation by sustained opioid exposure: relationship to opioid antinociceptive tolerance. Life Sci 2003;73:783–800
33. Meier T, Wasner G, Faust M, et al. Efficacy of lidocaine patch 5% in the treatment of focal peripheral neuropathic pain syndromes: a randomized, double-blind, placebo-controlled study. Pain 2003;106:151–158
34. Max MB, Lynch SA, Muir J, et al. Effects of desipramine, amitriptyline, and fluoxetine on pain in diabetic neuropathy. N Engl J Med 1992;326:1250–1256
35. Coluzzi F, Mattia C. Mechanism-based treatment in chronic neuropathic pain: the role of antidepressants. Curr Pharm Des 2005;11:2945–2960
36. Morello CM, Leckband SG, Stoner CP, Moorhouse DF, Sahagian GA. Randomized double-blind study comparing the efficacy of gabapentin with amitriptyline on diabetic peripheral neuropathy pain. Arch Intern Med 1999;159:1931–1937
37. Hair PI, Keating GM, Mckeage K. Transdermal matrix fentanyl membrane patch (Matrifen) in severe cancer-related chronic pain. Drugs 2008;68:2001–2009

Chapter 20
Managing Pain at End of Life

Key Chapter Points:

- End-of-life care can be broadly defined as services needed during the terminal stages of an incurable illness with a likely prognosis of ≤1 year.
- Pain occurs in most patients during the course of a terminal illness and in about half of the patients during their final days.
- Palliative care during the end of life is designed to enhance comfort and quality of life by addressing physical symptoms, emotional distress, family issues, and spiritual needs.
- More than half of hospice services are provided for non-cancer, terminal illnesses.
- Most patients receive hospice services in the home or residential settings.

Key Words End of life, Hospice, Palliative, Terminal

Case History

Mrs. Sepulveda is a 52-year-old wife and mother of two teenage daughters. She has widely metastatic breast cancer and has recently applied for hospice services. At her doctor's appointment, she approaches several areas of concern: "I spoke with the hospice nurse and was relieved to hear they'll provide home services. I am concerned about worsening pain as my disease progresses. And I've been keeping my husband up at night with problems sleeping. I was hoping you might prescribe something stronger for my pain and maybe something for sleep. I also feel so guilty about leaving the girls and know they're grieving, although they always try to keep up a cheerful face and tell me I'll be cured." After glancing at his watch, her doctor replies, "Yes. We'll take care of everything when we need to. Don't worry about your family. They'll be fine. See you in two weeks."

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

Introduction

Caring for patients during the terminal stages of illness requires a holistic approach to address more than simply medical needs and physical symptoms. Like Mrs. Sepulveda, patients often turn to their healthcare providers for end-of-life counseling. Negative emotions expressed by patients can be met with an empathic ear, encouraging the patient to continue communication, or with lack of empathy, discouraging further discussion, as in the case of Mrs. Sepulveda. Providing an empathetic environment reduces patient's depression and improves patient's quality of life and patient's investment in participating in cancer treatment.[1] A recent study evaluated communication about emotionally charged issues between oncologists and patients with advanced cancer.[2] In this study, one in three conversations contained at least one opportunity for the oncologist to acknowledge a patient's expression of negative emotion; however, an empathetic response occurred only 27% of the time. Over 40% of oncologists never used an empathetic statement. A typical example of a non-empathetic response that discouraged further communication was premature reassurance: "Give us time. We are getting there." Similar to the response Mrs. Sepulveda received, the doctor may that believe these comments are supportive and optimistic; however, failure to specifically ask more about endorsed pain, sleep disturbance, and emotional distress within the family effectively dissuades any additional conversation.

Clinicians are often uncomfortable confronting end-of-life issues, possibly fearing inadequacy in addressing the patient's varied needs beyond simple medical advice, viewing death as a sign of their own failure in patient care, and feeling discomfort about their own spiritual understanding of death. This chapter will describe the important and diverse roles to be fulfilled or coordinated by the clinical team in end-of-life treatment, focusing on pain management.

Defining End-of-Life Care

End of life is often defined as the final stages of a terminal illness when the prognosis is considered to be ≤6 months. A more robust and clinically useful understanding of end-of-life care includes management of patients with chronic, life-limiting disease who might be reasonably expected to die within the next year. This broader definition provides important service opportunities for patients and their families during the final stages of illnesses that may extend beyond 6 months.

End-of-life pain is managed using principles of palliative care, defined as the total care of patients for whom curative treatment is not possible.[3] Healthcare providers need to address end-of-life concerns for both the patient and their family members. Frequently endorsed end-of-life needs for both patients and family were catalogued in a recent study interviewing terminal patients and their significant others (Table 20.1).[4] End-of-life care focuses on maintaining quality of life

Table 20.1 Common concerns for terminal patients and their families

Areas of patient's concern	Specific issues
Deteriorating health status	Increasing patient's disability
	Decreasing patient's quality of life
	Increased reliance on others for basic care
Decreased independence	Frustration by patients and families
	Patient anger at feeling *mothered* or overprotected
Social isolation	Restricted mobility reduces social participation for patient
	Caregiver duties reduce social participation for family members
Family burden	Patients feel guilty about relying on family members for care
	Family members are generally willing to care for the patient
Limited resources	Patients receive most support from family, friends, and specialist nurses. Patients often feel additional support and services are needed but unavailable
Poor access to community services	Limited ability to travel to doctor visits or receive follow-up appointments
	Financial limitations
	Need for assistive equipment
Acceptance	Patients and family members desire honest assessments of prognosis
	Patients and family are usually aware of terminal status, even when not openly discussed by the clinical team
Depression	Depressive symptoms further restrict patient's activity and quality of life
	Patient depression adds to guilt and burden imposed on family members
Concerns about the future	Fears about future deterioration
	Fears about uncontrolled symptoms
	Desire to die at home
	Worries about family after patient dies

Based on Fitzsimons et al.[4]

as long as possible, ensuring safe and comfortable dying, self-determined life closure, and effective grieving of those left behind. Patients and their significant others need clear information about prognosis to allow for opportunities for growth and life closure during the dying process. Healthcare providers also need to ensure that each patient will have an actively engaged, readily accessible treatment team throughout the terminal process and into the post-death period for the remaining family. In addition, nine of ten cancer patients prefer to die at home in order to continue a *normal* routine as long as possible and maintain close contact with loved ones.[5,6] The likelihood of dying at home increases when a patient lives with a caregiver, has stated a preference to die at home, and has a family physician

who makes home visits.[7] Healthcare providers need to identify preferred end-of-life locations for their patients and help facilitate achieving death in their preferred environment. Needs are best met by including outpatient and visiting nursing support, social services, spiritual counseling, and psychological therapy with the treatment team.

Unfortunately, doctors are often poorly trained to address the diverse needs for patients facing the end of life. A recent survey of medical students in their final year of training in both the UK and USA identified deficiencies in both groups of students, with substantially greater training deficits among US-trained medical students.[8] The average number of patients dying for whom students participated in management was similar for both groups of students ($N = 6$). Formal course work or a clinical rotation in end-of-life care was completed by 85% of UK students and only 25% of students in the USA ($P < 0.0001$). Most UK students reported their dying patients had been managed in a way that they would want the death of themselves or a family member to be handled (79%), while this same sentiment was endorsed by only 3% of US students ($P<0.0001$). A total of 38% of UK students felt that they were very well prepared to manage pain at the end of life, compared with only 19% of US students ($P < 0.0001$). All doctors managing patients with chronic illness need to achieve an adequate level of knowledge and comfort for managing end-of-life issues to ensure that patient needs are addressed and adequately met during their final stages of illness.

Pain at End of Life

Pain is a common and distressing end-of-life symptom. The importance of identifying and treating end-of-life pain was highlighted by a recent study asking patients participating in palliative or hospice care about end-of-life symptoms.[9] Pain occurred in 82% of patients. Although lack of energy occurred more often than pain (92%), pain was most often listed as the single most distressing symptom (Fig. 20.1).

Caregivers for 674 patients dying in one of 230 long-term care facilities in four states in the United States (Florida, New Jersey, North Carolina, and Maryland) were interviewed about symptoms occurring during the last month of each patient's life. Pain occurred in 59% of patients with about one in three patients experiencing untreated or ineffectively treated moderate to severe intensity pain during their final weeks and days of life (Fig. 20.2).[10] A retrospective review of 185 dying patients from five long-term care facilities in Canada reported pain in 44% of patients during their last 48 hours of life.[11] An earlier prospective study of 200 consecutive hospice patients similarly reported pain in 51% of patients during the last 48 hours before death, with about half of these patients developing new pains and the remainder experiencing exacerbations of previously controlled pain.[12] Opioids were used by 91% of patients prior to the last 48 hours of life, with the dosage increased during the last 48 hours in 44%, unchanged in 43%, and decreased in 13%.

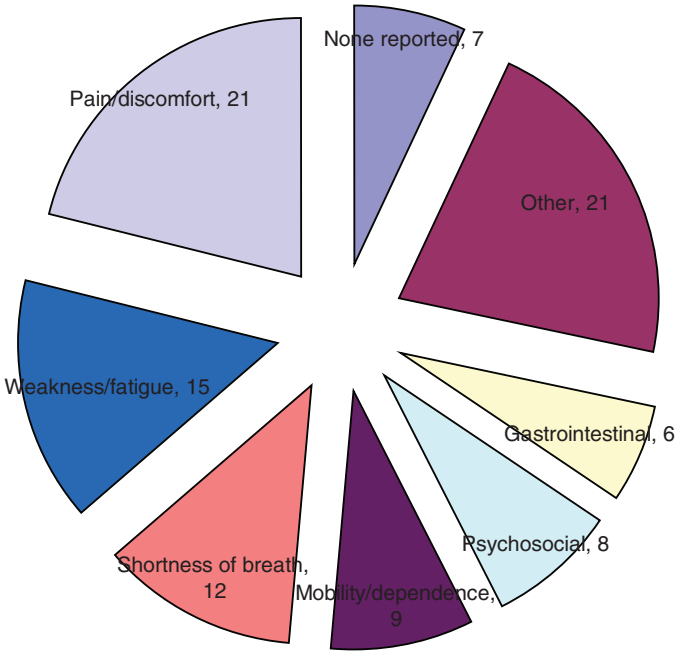


Fig. 20.1 Single most distressing end-of-life symptom. Patients were asked to record that symptom which was most distressing or bothersome. Among all individual symptoms, pain or discomfort was most commonly endorsed as most distressing. Percentages of patients endorsing each symptom are shown in the pie chart. (Based on Kutner et al.)[9]

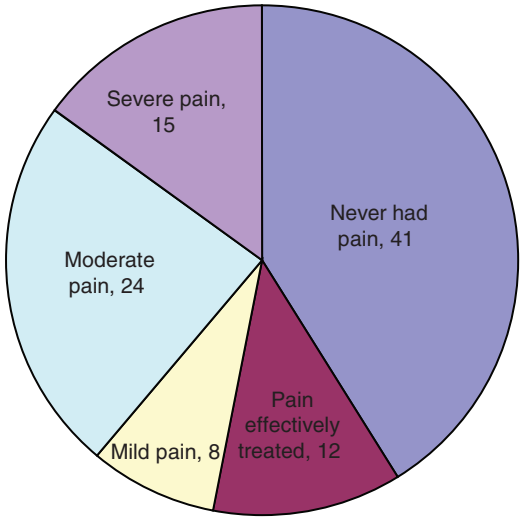


Fig. 20.2 Pain during the last month of life (based on Hanson et al.[10]). Nearly 60% of patients experienced pain during their final month of life, with only 20% of those with pain reporting effective pain control. Pain was moderate to severe in 62% of those with pain.

Assessment

End-of-life needs are often varied and may be overlooked during typical patient appointments focusing on medical issues. The primary care treatment team provides a critical role in assessing patient needs:

- Providing a familiar staff to coordinate specialist care
- Maintaining regular contact and communication
- Ensuring that the patient understands the diagnosis and treatment options
- Providing access to community services for both patient and family
- Providing an opportunity for the patient and family to share concerns, fears, frustrations, guilt, and anger in a familiar, nonjudgmental forum
- Assessing for emotional distress

When facing incurable disease, patients and their families are generally seeking validation of symptoms, support through difficult times, and therapies to reduce distress. Doctors need to recognize that reports of distress do not need to be met with suggestions for correction or cure. The empathetic doctor provides a valuable resource of information, support, and emotional strength for the terminal patient. Identifying specific concerns for patients and families may be facilitated by utilizing a needs checklist (Box 20.1). Reviewing this checklist can help identify additional team members whose services are needed by the patient and foster open communication about unmet needs.

Common distressing end-of-life symptoms may be evaluated and monitored using the Edmonton System Assessment Scale, which has been validated in patients with cancer (Box 20.2).[13–15] Alternative versions of this assessment tool are available online at the Center to Advance Palliative Care (http://www.capc.org/) and http://www.palliative.org/.

Box 20.1 Palliative-care-needs checklist

Please tick all check boxes that describe needs you would like to have addressed by your treatment team:

- ❑ More information about your diagnosis
- ❑ More information about your treatment
- ❑ Information on alternative treatments
- ❑ Counseling for depression or anxiety
- ❑ Family counseling to help with anger, guilt, or depression
- ❑ Help with daily activities and independence
- ❑ Help with financial problems
- ❑ Information on obtaining support services (transportation, adaptive equipment, visiting nurse, meals on wheels, help with housework, hospice, etc.)
- ❑ Arranging home medical visits
- ❑ Spiritual counseling
- ❑ Establishing advance directives (e.g., living will, healthcare surrogate, power of attorney)

Box 20.2 Edmonton System Assessment Scale (modified from Bruera et al.[13])

Patient: _____

Date: _____ **Time:** _____

Completed by (circle): patient patient + caregiver caregiver alone

Please circle the number that best describes each symptom:

1. Pain

0 1 2 3 4 5 6 7 8 9 10

No pain Worst possible pain

2. Tiredness

0 1 2 3 4 5 6 7 8 9 10

Not tired Worst possible tiredness

3. Nausea

0 1 2 3 4 5 6 7 8 9 10

Not nauseated Worst possible nausea

4. Depression

0 1 2 3 4 5 6 7 8 9 10

Not depressed Worst possible depression

5. Anxiety

0 1 2 3 4 5 6 7 8 9 10

Not anxious Worst possible anxiety

6. Drowsiness

0 1 2 3 4 5 6 7 8 9 10

Not drowsy Worst possible drowsiness

7. Appetite

0 1 2 3 4 5 6 7 8 9 10

Best appetite Worst possible appetite

8. Well being

0 1 2 3 4 5 6 7 8 9 10

9. Shortness of breath

0 1 2 3 4 5 6 7 8 9 10

No shortness of breath Worst possible shortness of breath

10. Other problem: _____

0 1 2 3 4 5 6 7 8 9 10

No longer present Worst possible severity

Treatment

End-of-life treatment includes a holistic, palliative care approach. The treatment team will generally need to address physical problems, including pain, as well as emotional, spiritual, and family needs (Fig. 20.3). Family concerns may include direct patient care, as well as personal distress. Treatment should include reducing caregiver stress by including at home medical services, respite care, adaptive equipment, and assistance with daily household chores. Team members must be readily available to provide services to help both the patient and their family and friends cope with death as a natural and final stage of the patient's life.

The treatment team represents a valuable information resource to provide the patient and family with an understanding of disease course expectations in addition to prescribing treatments to reduce symptoms. For example, when patients describe symptoms, they need to hear what this symptom means (is it expected; does it represent disease progression), if it will worsen, and if it can be controlled:

> "Most patients with your disease experience this symptom. Getting this symptom does/does not mean that your disease is worsening. You should expect the symptom should only get a little bit worse/become more severe over the next few months. We'll use this treatment now, and will add additional therapy when the symptom worsens to keep the severity down to moderate."

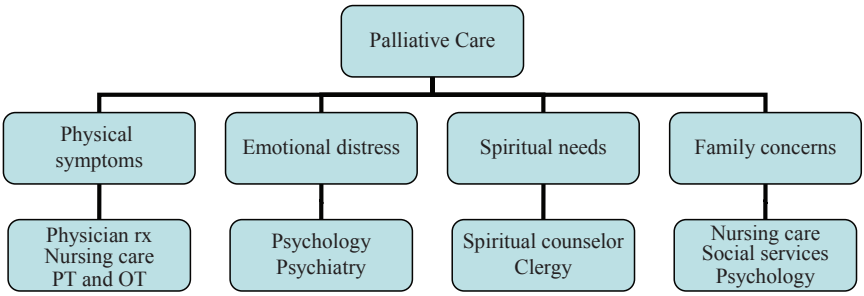


Fig. 20.3 Palliative care service providers. *OT* occupational therapy, *PT* physical therapy, *rx* treatment.

Pain Control

When patients or family members report pain, the treatment team needs to provide information about the following:

- Whether pain is an expected occurrence in this terminal illness
- If the pain is caused by the disease, disease progression (e.g., tumor enlargement or metastasis), disease treatment (radiation effect), or another condition (e.g., additional myofascial pain)
- Expected pain prognosis during the end of life
- Reassurance that the pain will be treated to prevent it from becoming severe
- Concerns about drug dependence and addiction

Patients should be directly asked about pain symptoms at each visit, since patients may be reluctant to spontaneously describe pain, fearing that the development of pain heralds ominous disease progression and possibly fearing developing a dependence on pain medications.

Opioids are generally necessary to relieve moderate to severe end-of-life pain. Patients and their families should be educated about the important role for opioids in providing adequate analgesia, addressing possible concerns about addiction and side effects. Both medical providers and family members may excessively restrict opioids, concerned that high-dose opioids may hasten death. A prospective hospice study evaluated the relationship between opioid escalation and survival in 13 hospitals across the USA.[16] While higher opioid doses were linked to shorter survival, opioid dose was only one of the several factors in a multivariate analysis linked to reduced time to death, including cancer diagnosis, unresponsiveness, and pain severity. None of these factors individually explained >10% of the variance in time until death. Therefore, while opioid dosing was a factor in patient survival, this association was fairly weak, and the authors concluded that opioids should be administered to terminal patients in doses that achieve effective analgesia.

Palliative sedation may be considered for terminal patients with refractory and distressing end-of-life symptoms. In a survey of 100 consecutive hospice inpatients, sedation was required in 20 patients to treat delirium (45% of patients requiring palliative sedation), nausea and vomiting (25%), seizures (15%), dyspnea (10%), and pain (5%).[17] Unlike euthanasia, palliative sedation is designed to provide comfort measures and symptom relief without intending to hasten death. Sedation is generally achieved with benzodiazepines, although sedating antipsychotics, barbiturates, and general anesthetics may also be used. Nutrition and fluids are restricted during palliative sedation to improve comfort by reducing pulmonary, salivary, and gastrointestinal secretions that might otherwise result in coughing, vomiting, or need for suctioning, reducing urinary output to limit incontinence and the need for catheterization, and possibly reducing tumor-related edema. Dry mouth may be managed with fluid sips and oral hygiene.

Hospice Care

Hospice care is designed to provide a comprehensive team to maximize patient comfort during the end of life and provide necessary support to family members. Hospice service providers often include doctors, nurses, psychologists, home health aides, social workers, and clergy to address physical, emotional, and spiritual needs. Hospice services are most commonly performed in home or residential settings.

Table 20.2 Hospice care options

Level of care	Where care is provided	Services provided
Home hospice when continuous nursing care is not necessary	Patient's home	Palliative medications Nurse and home aide visits Social worker Dietician Chaplain Adaptive equipment
Continuous nursing care	Patient's home	Palliative medications 24-hours nursing care Home aide visits Social worker Dietician Chaplain Adaptive equipment
Inpatient care	Hospice or hospital facility	Inpatient treatment when deterioration requires frequent therapeutic adjustments
Respite care when family caregivers require a reprieve due to exhaustion	Hospice or hospital facility	5-day transfer to medical facility

In the USA, 74% of patients receive hospice services outside of a hospital or hospice facility.[18] While hospice is often associated with cancer care, 56% of hospice services rendered in the USA in 2007 were for a non-cancer illness.[16] Information about available hospice services can be accessed at the website of the National Hospice and Palliative Care Organization (http://www.nhpco.org) and their patient/family-oriented Caring Connections site (http://www.caringinfo.org/).

Supportive care during the final stages of terminal illness may be provided at the patient's home, in the hospital, or in other healthcare facilities (Table 20.2). A local hospice provider can be identified through the National Hospice and Palliative Care Organization website (http://www.nhpco.org). Hospice staff can assist families in determining when different levels of care are needed. Advance directive planning to establish end-of-life wishes and power of attorney can be assisted by using documents available on the Caring Connections website (http://www.caringinfo.org/).

Summary

The most clinically useful understanding of end-of-life care uses a broad definition including services needed during the terminal stages of an incurable illness with a likely prognosis of ≤1 year. Pain occurs in most patients during the course of a terminal illness and in about half of the patients during their final days. Patients facing the end of life should be offered multidisciplinary palliative care services to enhance comfort and quality of life by addressing physical symptoms, emotional distress, family issues, and spiritual needs. Residential patients often benefit by accessing hospice services, which should not be restricted to only patients with terminal cancer.

Test Your Knowledge

1. End-of-life care includes management of the following:

   a. Physical symptoms
   b. Emotional distress
   c. Spiritual needs
   d. A and B
   e. All of the above

2. Which of the following is/are common concerns for terminal patients:

   a. Social isolation
   b. Family burden
   c. Mood disturbance
   d. Memory loss and hallucinations

e. A and C
f. A, B, and C
g. All of the above

3. In the USA, what percentage of students have completed end-of-life training by completion of medical school:

a. 5%
b. 25%
c. 33%
d. 65%
e. 85%

4. About how many patients experience pain during an end-of-life illness:

a. 15%
b. 25%
c. 55%
d. 80%
e. 100%

5. Choose the correct statement about end-of-life pain management:

a. End-of-life pain can usually be managed with simple analgesics and adjunctive therapy.
b. Palliative sedation is a type of euthanasia.
c. Addiction occurs in over half of terminal patients treated with opioids.
d. None of the above.
e. All of the above.

6. What percentage of hospice services is provided in a hospice center or hospital:

a. 25%
b. 35%
c. 50%
d. 75%

Answers: 1e, 2f, 3b, 4d, 5d, 6a

References

1. Neumann M, Wirtz M, Bollschweiler E, et al. Determinants and patient-reported long-term outcomes of physician empathy in oncology: a structural equation modeling approach. Patient Educ Couns 2007;69:63–75
2. Pollak KI, Arnold RM, Jeffreys AS, et al. Oncologist communication about emotion during visits with patients with advanced cancer. J Clin Oncol 2007;25:5748–5752
3. Cancer Pain Relief and Palliative Care. Technical Report Series 804. Geneva, World Health Organization, 1990

4. Fitzsimons D, Mullan D, Conway B, et al. The challenge of patients' unmet palliative care needs in the final stages of chronic illness. Palliat Med 2007;21:313–322
5. Tang ST. When death is imminent: where terminally ill patients with cancer prefer to die and why. Cancer Nurs 2003;26:245–251
6. Beccaro M, Costantini M, Giorgi Rossi P, et al. Actual and preferred place of death of cancer patients. Results from the Italian survey of the dying of cancer (ISDOC). J Epidemiol Community Health 2006;60:412–416.
7. Brazil K, Bedard M, Willison K. Factors associated with home death for individuals who receive home support services: a retrospective cohort study. BMC Palliat Care 2002;1:2
8. Hammel JF, Sullivan AM, Block SD, Twycross R. End-of-life and palliative care education for final-year medical students: a comparison of Britain and the United States. J Palliat Med 2007;10:1356–1366
9. Kutner JS, Bryant LL, Beaty BL, Fairclough DL. Time course and characteristics of symptom distress and quality of life at end of life. J Pain Symptom Manage 2007;34:227–236
10. Hanson LC, Eckert JK, Dobbs D, et al. Symptom experience of dying long-term care residents. J Am Geriatr Soc 2008;56:91–98
11. Hall P, Schroder C, Weaver L. The last 48 hours of life in long-term care a focused chart audit. J Am Geriatr Soc 2002;50:501–506
12. Lichter I, Hunt E. The last 48 hours of life. J Palliat Care 1990;6:7–15
13. Bruera E, Kuehn N, Miller MJ, Selmser P, Macmillan K. The Edmonton Symptom Assessment System (ESAS): a simple method of the assessment of palliative care patients. J Palliat Care 1991;7:6–9
14. Chang VT, Hwang SS, Feuerman M. Validation of the Edmonton Symptom Assessment Scale. Cancer 2000;88:2164–2171
15. Moro C, Brunelli C, Miccinesi G, et al. Edmonton symptom assessment scale: Italian validation in two palliative care settings. Support Care Cancer 2006;14:30–37
16. Portenoy RK, Sibirceva U, Smout R, et al. Opioid use and survival at the end-of-life: a survey of a hospice population. J Pain Symptom Manage 2006;32:532–540
17. Cameron D, Bridge D, Blitz-Lindeque J. Use of sedation to relieve refractory symptoms in dying patients. S Afr Med J 2004;94:445–449.
18. National Hospice and Palliative Care Organization. 2007 in Review. Available at http://www.nhpco.org (accessed January 2008)

Chapter 21
Appendices: Patient Educational Materials

Key Chapter Points:

- Patients with chronic pain are very interested in education about pain.
- Receiving basic information significantly improves physical and emotional symptoms in patients with chronic pain.
- Effective education delivery systems include brief instruction by a healthcare provider, written handouts, and multimedia aides.

Key Words Diet, Drug, Exercise, Fibromyalgia, Neuropathic pain, Relaxation

Case Histories

Ms. Stoll, a 47-year-old nurse's aide with chronic low back pain, complains: *I just don't know what to do. My doctor told me not to do activities that aggravate my pain, but he also told me to return to work, even though my pain started with a work injury. He also gave me a booklet of exercises. Whenever I do the exercises, my pain gets worse and he yelled at me when I told him I don't do them.*

M. Gray, a 23-year-old mother of a toddler, gets migraine headaches and grumbles: *Everybody seems to give me headache advice. My mother-in-law insists that most headaches are caused by foods and that I should avoid drinking coffee and eating chocolate and peanuts. My cousin says her headaches are relieved when she drinks coffee and to try that. One friend tells me she takes over-the-counter pain killers every day for her headache, while another claims her doctor told her that pain pills actually cause headaches. I'm too busy running around after my son to try everything. Wish I knew what was really likely to be helpful.*

An inability of medical professionals to provide clear diagnoses, explanations, and treatment courses for patients with chronic pain may result in the worsening of sickness behavior and dependence on the healthcare system.[1] Patients understand this relationship and, like Ms. Stoll and Ms. Gray, they are usually eager to receive useful education from their healthcare providers. For example, an analysis of a

D. Marcus, *Chronic Pain: A Primary Care Guide to Practical Management*,

survey asking pain specialists and patients with chronic headache about important aspects of care revealed that education was the top priority for patients,[2] but was considered important by only a minority of doctors. Additionally, 86% of the patients rated the receipt of answers to their questions as important compared with only 15% of doctors. Similarly, educating patients about headaches and teaching patients how to treat attacks were rated important by 72% of patients and 15% of doctors. Thus, although patients understand the importance of education, clinicians have only recently become aware of the valuable therapeutic effect education has on the outcome of patient care.

The education of patients with chronic pain effectively reduces fear of pain and pain-related disability. A single education session with a physical therapist, during which pain physiology or spine anatomy is explained, resulted in significant improvements in pain catastrophizing, disability perception, and range of motion ($P < 0.01$) (see Fig. 21.1).[3] The ability of patients to demonstrate significant improvements in attitude and physical limitations after this single intervention suggests that brief education administered during the course of a routine primary care office visit would also be beneficial. In one study, the addition of a single, 30-minute educational session about migraine and medication use with an allied healthcare worker plus three follow-up telephone calls resulted in a 47% reduction in headache activity compared with an 18% headache reduction in patients receiving only the doctor visit without supplemental education.[4]

Effective education can be delivered within the clinical environment or through outside resources. For example, a multimedia educational program consisting of pain education and relaxation delivered through written materials, television, and radio programs to 164 individuals with headache over 10 weeks decreased headache days by 50% and analgesic use by 30%.[5] In addition, work absence decreased by 45% and doctor visits decreased by 61%. Headache education administered via the Internet similarly improved headache, with a 31% reduction in headache activity.[6]

Appendices A–H provide a variety of educational tools that can be utilized in clinical practice. Providing written materials for patients to take home strongly reinforces the educational messages doctors provide during an office visit. Studies support that

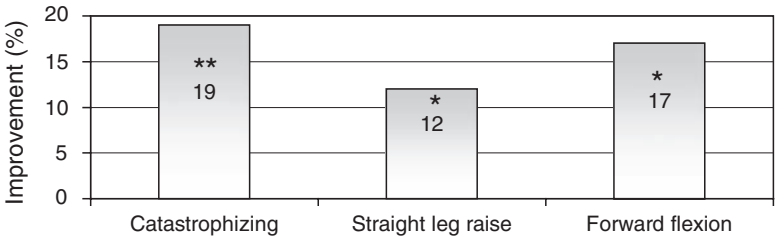


Fig. 21.1 Benefits of brief education about pain physiology for patients with chronic low back pain. Seventy-five patients with chronic low back pain (average pain duration: 3.9 years) were tested before and after a single informational session about pain physiology. Time between assessments was 3.5 hours. Improvements were significant (*$P < 0.01$; **$P < 0.001$) (based on Moseley[3]).

providing written educational materials to patients with chronic back pain significantly reduces both pain and disability ($P < 0.05$), with benefits maintained up to 18 months.[7,8] Supplementing oral education with take-home materials can also reduce the face-to-face time required to deliver education in the busy office.

References

1. Glenton C. Chronic back pain sufferers – striving for the sick role. Soc Sci Med 2003;57:2243–2252
2. Lipton RB, Stewart WF. Acute migraine therapy: do doctors understand what patients with migraine want from therapy? Headache 1999;39 (suppl 2):S20–S26
3. Moseley GL. Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain. Eur J Pain 2004;8:39–45
4. Holroyd KA, Cordingley GE, Pingel JD, Jerome A, Theofanous AG, Jackson DK, Leard L. Enhancing the effectiveness of abortive therapy: a controlled evaluation of self-management. Headache 1989;29:148–153
5. de Bruijn-Kofman AT, van de Wiel H, Groenman NH, Sorbi MJ, Klip E. Effects of a mass media behavioral treatment for chronic headache: a pilot study. Headache 1997;3:415–420
6. Andersson G, Lundström P, Ström L. A controlled trial of self-help treatment of recurrent headache conducted via the Internet. J Consult Clin Psychol 2000;68:722–727
7. Udermann BE, Spratt KF, Donelson RG, et al. Can a patient educational book change behavior and reduce pain in chronic low back pain patients? Spine J 2004;4:425–435
8. Coudeyre E, Givron P, Vanbiervliet W, et al. The role of an information booklet or oral information about back pain in reducing disability and fear-avoidance beliefs among patients with subacute and chronic low back pain. A randomized controlled trial in a rehabilitation unit. Ann Readapt Med Phys 2006;49:600–608

Appendix A
Rationale Behind Pain Management

Why Do Pain Management Skills Work? The Gate Theory

Pain management skills are designed to block pain messages by sending other signals through the nerves and spinal cord that distract or overload message circuits, thereby blocking access to pain signals. For example, walking requires a great deal of effort from the nervous system, which has to judge muscle contraction, joint angles, and balance systems. Performing activities that *tie up* the transmission of nervous energy – such as relaxation techniques and exercising – helps prevent pain messages from traveling along these same pathways.

Scientists have identified different types of nerves: small nerves that send pain messages and large nerves that send messages about things other than pain, like temperature or gentle touch. If the large nerves are busy, messages being sent by the small pain nerves are blocked. This is the basis for the gate theory.

Gate Theory

Pain starts with the activation or signaling of nerves in the skin. For these signals to reach the brain, they must first pass through a gating mechanism at the spinal cord. When pain nerves are activated, the pain gate opens and allows pain messages to reach the brain, at which time we become aware of the pain. When large nerves are activated by non-painful changes in touch or temperature, the pain gate closes and messages other than pain messages travel to the brain. When the pain gate is closed, we are not aware of pain. There are pain gates in both the spine and brain (see Fig. A.1).

Everyday pain experiences can be used to illustrate gate theory in action. For example, if your hammer slips and hits your finger, a pain message is formed in the nerves in the skin of the finger. This opens the pain gate in the spine and you become aware of a painfully smashed finger. To block that pain, you may pop your finger into your mouth and suck on it. Your tongue creates a touch signal that stimulates the large nerves and closes the pain gate. After a few seconds, however, you

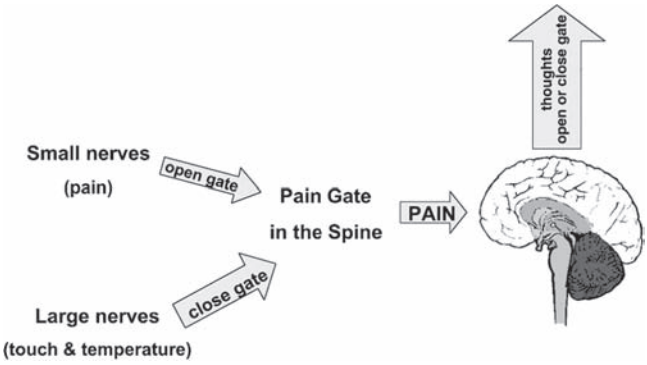


Fig. A.1 Gate theory. Pain signals small nerves to open the pain gate, sending pain messages through the spine to the brain. Pain gates in the spine can be closed by stimulating the large nerves with touch or temperature changes. If pain signals reach the brain, thoughts can open or close pain gates. When pain gates are closed, pain severity is reduced. When pain gates in the spine and brain are allowed to stay open, more severe pain will be felt.

may pull the finger out of your mouth to look at it. However, because looking at the finger does not activate sensory nerves, the pain gate is no longer closed and the pain messages are again free to travel to the brain. The same process applies when bumping your funny bone and finding relief from gently rubbing the elbow.

Another way to activate the large, pain-blocking nerves is by using heat. If you have ever overdone a day of yard work or cleaning and felt sore and achy all over, you know you can find almost instant relief by soaking in a tub of warm water. As soon as you are immersed in the warm water, the pain will seem to disappear. That is because heat activates the temperature-sensitive nerves and closes the pain gates. Once you get out of the tub, you will *stiffen up* and the pain will return because the trauma of the day was not cured by soaking, but rather the pain signals were blocked from traveling to the brain. You will also notice that after soaking for about 15 minutes, the pain will return, even if you stay in the hot tub. This is because your brain gets bored of repeatedly receiving the same message, and will begin to block the heat signal, just like you can ignore a phone ringing. Curiously, the brain does not seem to tire of pain messages.

The Brain Influences Pain Severity

Once pain signals reach the brain, the brain decides how much attention to give to them and responds by opening and closing pain gates in the brain. If the brain is focused on other important tasks, it may ignore the pain. If the brain is not distracted, pain severity will be maximized. For example, people often complete their day's work while they have pain, only to find that the pain becomes intolerable

once they get home at the end of the day. The work activities helped distract the brain from the pain messages. Also, there is a natural tendency to want to go to bed when pain starts, hoping that, by resting quietly, the pain will go away. However, this may actually cause the pain to become magnified. When lying in a dark, quiet room, the brain has nothing else to divert attention away from the pain, so the pain signals will be felt at their maximum severity. Many activities can distract the brain from pain, including walking, biking, exercising, or practicing relaxation techniques.

How we think about pain can also affect how strongly we experiences pain signals. When children get bumps and bruises, parents can often *kiss it and make it better*. This does not mean that the children were faking their pain. They believe that their parents have the power to take their pain away. For children, kissing a boo-boo is believed to be an effective therapy. The same process works in adults. For example, have you ever noticed that pills for the heart are tiny and white or pastel colored, whereas pain pills are big and red or orange? Most people are afraid of heart pills, so these pills are designed to appear gentle and harmless. People do not want a gentle pain pill, but a strong one. Research shows that patients will achieve better pain relief if they take a big red pain pill ("I'm big and strong and can wipe out that pain") rather than taking the exact same medication packed in a tiny white pill ("I'm the gentle, wimpy pill"). This does not mean that people make up their pain. Instead, it shows that adults can also change how much pain travels through the pain gates by thoughts about pain.

Pain management skills work because the brain can moderate pain severity. When we feel hopeless about pain ("There's nothing I can do to help"), the pain gates open and the severity of the pain increases. Having positive thoughts about our ability to cope with the pain ("There are techniques I can use to help control my pain") helps close pain gates and reduces pain severity. Although no one can just *think their pain away*, knowing that you have skills and medications to help control your pain helps close pain gates to reduce pain severity and helps the treatments work even better.

Different physical and mental conditions influence the pain gates.

Open pain gates – Increase pain	Close pain gates – Decrease pain
Fatigue	Feeling energetic, happy, and calm
Boredom	Being relaxed
Depression	Being in good physical shape
Anger, frustration, or stress	Being distracted or occupied with non-pain topics
Being out of shape	Having positive pain expectations – "I can help control my pain"
Dwelling on pain	
Having negative pain expectations – "There's nothing I can do to help my pain"	

Using Gate Theory in Pain Management

A variety of techniques you can practice to help close pain gates are as follows:

- Distract the brain with non-pain messages: take a walk outside and look at the scenery, listen to soothing music, do stretches in the shower.
- Exercise to keep yourself fit.
- Practice relaxation and biofeedback techniques.
- Manage your mood and reaction to stress.
- Use heat or ice in a moist towel.

The brain gets bored of repeatedly hearing the same message. Ever notice how you will stop hearing a fan hum or even a toddler whine after a few minutes? The same is true for strategies that close pain gates. These strategies usually work for about 15–20 minutes. So, instead of just soaking in a hot tub or resting under a heating pad, once the pain lessens, do some stretching exercises or relaxation skills to help keep those pain gates closed. Combining techniques (e.g., doing stretching exercises while practicing relaxation or watching a television program, or walking outdoors rather than on a treadmill) improves effectiveness in closing pain gates.

Using gate theory techniques will not eliminate all of your pain. However, by combining these techniques with medications and other therapies you may significantly improve the effectiveness of those therapies.

So get up from your chair, escape from your boredom, and close those pain gates!

Appendix B
Exercise and Pain Management

Why Do Exercises? How Can Exercise Help Real Pain?

> About 10 years ago, I injured my back while participating in an aerobic exercise class. I was diagnosed with a herniated disc and had to have surgery. After surgery, I was afraid to do the exercises my doctor had prescribed, since exercise caused my pain in the first place. A couple of weeks after surgery, the pain started getting worse and I figured I better try something. Once I started exercising, I was surprised that the exercising actually made the pain better. Now, 10 years later, if I stop my exercise program, the pain comes back. Also, I can tell my back and all of my body are much stronger and I don't feel I get injured as easily as I did before.
>
> —Dr. Marcus

Exercise is a vital part of pain management that provides two essential benefits: pain reduction and protection.

Pain Reduction

Pain causes an involuntary muscle spasm. If you twist your ankle, the muscles around the ankle become stiff, forming a natural cast around the injury that helps stabilize the injured joint while it heals. People with back pain sometimes notice this, saying, "I bent over and the pain was so bad I couldn't stand up." When you have chronic pain, your muscles develop a pattern of muscle spasm that no longer is helpful for protecting a newly injured area. The muscle spasm itself is also painful.

It is easy to see what happens to these structures when we do not exercise. If you have ever spent a couple of days in bed rest, due to illness or your pain, you probably noticed that your whole body felt stiff and achy once you started getting out of bed. Our muscles and joints expect to be used, and if we do not use them, our pain usually becomes worse.

Pain management exercises begin with gentle stretching. This helps relieve the muscle spasm. When you start exercising, you should notice that after a few repetitions, the stretching exercises feel soothing. After the exercise session is over, however,

the muscles will probably go into spasm again. That is why you need to do stretching exercises a couple of times each day. As you perform a consistent routine of stretching, your muscles get used to being stretched and are less likely to go into spasm. This will result in longer lasting pain relief.

If you do stretching exercises too vigorously or overstretch the muscle, the muscles react by increasing muscle spasm. For this reason, you need to work with a therapist while beginning an exercise program, especially if you notice pain aggravation with exercise. The therapist will encourage you to stretch muscles just to the point that you first feel them stretching and not to the point that you have stretched as far as you possibly can.

Pain Protection

Muscles and connecting structures, such as tendons and ligaments, provide important protection for the rest of the body. In order to provide protection, they must be in shape and strong. We keep our muscles, tendons, and ligaments in good shape by exercise.

After we have been injured once, there is a natural tendency to try to avoid future injuries. For example, when I hurt my back while exercising, I was scared to start exercising again. It is natural to think, "I'll just sit quietly in the chair and that way I'll never be hurt again." Unfortunately, the more inactive we become, the more out of shape our protective muscles, ligaments, and tendons become. This puts us at high risk for injury, from even slight trauma. When these tissues are out of shape, minor incidents, such as twisting our ankles, carrying small bags of groceries, or bending, can result in major pain flares. Future injury from these minor events is reduced when the supporting and protective structures of our bodies are strong and flexible.

How Do I Get Started?

Forget the "no pain, no gain" motto. Pain exercise first concentrates on stretching and later works on muscle strengthening. Stretching exercises are very boring, but very important. Try to do them while watching a television program or listening to the radio, so you do not dread doing them and find excuses for not stretching. You will need to do stretches for the whole body and also stretches that target your pain areas.

Body reconditioning exercises – such as walking, swimming, and biking – are also essential. Your doctor can help you decide which exercise is right for you. Begin this program gradually and slowly increase exercise duration and intensity after you have become comfortable at each exercise level. Do not increase the exercise intensity too quickly, otherwise you will cause muscle spasm and increased pain. Do not exercise too little, or you would not achieve exercise benefits.

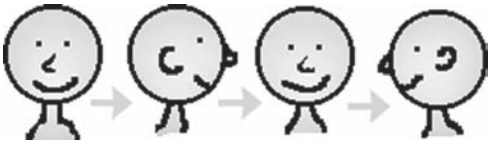
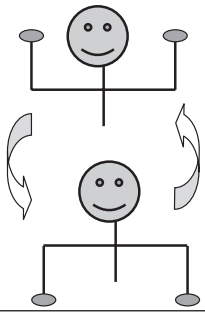
General Principles of Stretching Exercise

- Perform stretches twice daily, in the morning and before bed.
- Begin stretches after taking a warm shower or using a heating pad over your most painful area for 15 minutes.
  – Perform deep-breathing exercises or relaxation techniques while warming the painful area before exercises.
- Perform exercises while listening to music or television to provide distraction.
- Perform each stretch slowly. Stretch until the first sensation of stretching is reached, then hold the stretch for 5 seconds. Relax and repeat three to ten times.
- When pain flares up, do your exercise program, but reduce the intensity and number of repetitions.
- If pain levels are higher after stretching, apply ice wrapped in a towel to the most painful area for 10 minutes.
  – If pain levels are consistently high after stretching, reduce the extent of the stretch and review your exercise program with your physical therapist.

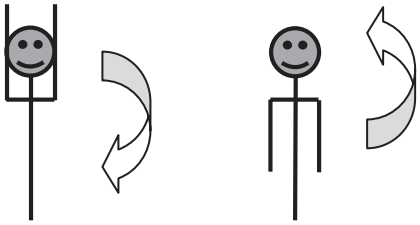
Whole-Body Stretches

Lie down on the floor on your back, with your legs stretched out on the floor. Perform each stretch slowly. Stretch until the first sensation of stretching is reached. Then hold the stretch for 5 seconds. Relax for 10 seconds and repeat three times.

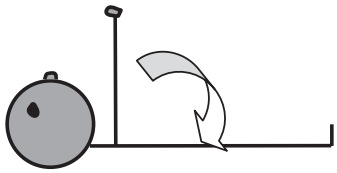
The following exercises should be performed while lying on your back on the floor

Exercise description	Exercise drawing
Neck rotation Rotate your neck slowly to the left, trying to place your left ear flat on the floor. Hold for 5 seconds. Return to center and relax. Then rotate to the right and hold for 5 seconds. Return to center and relax.	
Shoulders and arms Hold each arm outward at the shoulder so that your body makes a giant cross. Keeping your arms on the floor, bend your elbows to make a 90° angle. This is your starting position. Keeping your arms on the floor between the shoulder and elbow, rotate your forearms up and over, so that your fists become level with your waist. Rotate back to the starting position.	

Raise both arms back over your head. (Like a police man has said, "Stick 'em up!") Breathe out and reach out with your arms in a half circle, first upward toward the ceiling, then downward to your sides. Breathe in and reach overhead again. If this is uncomfortable in your back, try bending your knees when you do this exercise.

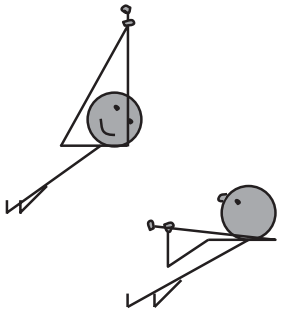


Lift both arms toward the ceiling. Hold. Lower both arms to your sides. If this is uncomfortable in your back, try bending your knees when you do this exercise.

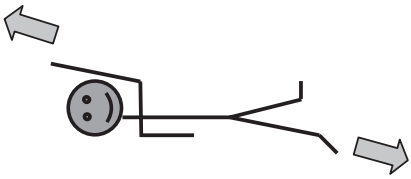


Back

Lift your left arm up to the ceiling. Grab your left wrist with your right hand. Keeping your left arm straight (do not bend the left elbow), pull the left arm across your chest to the right. Turn chin to the left. Hold. Then raise right arm to the ceiling, grabbing right wrist with left hand and pulling the arm across the chest to the left. Turn chin to the right. Hold.



Stretch your right arm over your head. At the same time, point your left toe and stretch your leg. The arm and leg should be reaching in opposite directions. Hold. Repeat with the left arm and right leg.

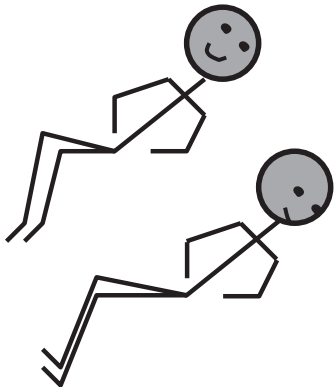


Pelvis

Squeeze and tighten buttock muscles. Hold.

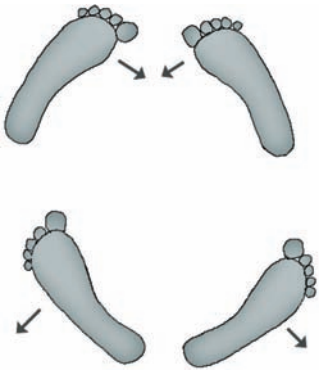
Tighten muscles in the stomach and buttocks, pressing the small of your back flat onto the floor. Hold.

Bend your knees. Keep knees together and your shoulders on the floor. Slowly lower your knees to the floor at the right, causing a rotation of your pelvis. Turn your head to the left, away from your knees. Hold. Return knees and head to the center. Then lower your knees to the left and look to the right. Keep your head and shoulders on the floor to allow your pelvis to rotate.



Legs

Spread feet about 2 feet apart. Turn both feet inward toward the middle. Hold. Turn both feet outward so your arches are turned toward the ceiling. Hold.



Flare Management

Even if you practice your exercises and pain management techniques consistently, you will probably experience times of increased pain or pain flares. If the increased pain has the same characteristics as your typical pain, flare management techniques are often helpful. If you develop a new pain, see your doctor.

Flare management techniques are used when chronic pain increases to help minimize pain. Several techniques may be used together:

- Apply heat or ice (whichever you find more soothing) for 20 minutes to the painful area.
- Begin relaxation techniques: deep breathing, imagery, or biofeedback.
- Perform stretching exercises that stretch your painful area. Be sure to stretch slowly, and only to the point of first feeling a stretching sensation.
- Do oscillatory movements (small, rhythmic, side-to-side movements of the painful area). For example, for neck pain, turn the head through about 25% of its full range of motion. Starting with your head facing forward, first turn your head away from the painful side and back. Repeat at a rate of about one per second, for a total of 30 seconds. Rest for 30 seconds, and then repeat until no further relief is noted. Then switch to turning the head toward the painful side, and proceed as stated earlier. Your therapist can describe oscillatory movements for your painful area.
- Trigger-point compression: you may notice certain spots on your muscles that aggravate your pain when you press them. These are called trigger points. If you identify trigger points, apply pressure to them with your fingers and hold for 12–60 seconds. Release the pressure, and proceed with your usual stretching exercises.

Exercise and Activity Logs

Daily recording logs can serve as motivational tools and self-checks for patients to ensure that they are staying on task with their exercise program and plans for increasing activity level. Patients should be instructed to maintain daily logs and bring completed logs for review to follow-up appointments. A quick perusal of completed logs provides a quick glimpse into patient compliance, areas of difficulty, and treatment efficacy.

Stretching Exercise Program

Stretching exercises should be done twice daily for 15–20 minutes in each exercise session. Stretching should be completed at least 4 days per week. Record the time spent stretching, as well as your pain levels before and after exercise.

Name:_____; First day of log:_____/_____/_____

	Morning stretches			Evening stretches		
	Time (minutes)	Pain before	Pain after	Time (minutes)	Pain before	Pain after
Sunday						
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						

Do stretches in front of the television or with music playing.
Record actual time spent for performing stretches in each session.
Rate and log pain from 0 (no pain) to 10 (most severe pain imaginable).

Estimating Target Heart Rate, Using Heart Rate Reserve Method

- Formula for calculation: Target heart rate = [(maximal heart rate − resting heart rate) × 50%] + resting heart rate
  - Maximal heart rate = 220 − age
  - Target heart rate = [(220 − age − resting heart rate) × 50%] + resting heart rate
- Example: 50-year-old patient with a resting heart rate of 90 beats per minute
  - Target heart rate = [(220 − 50 − 90) × 50%] + 90
  - Target heart rate = 130 beats per minute

Aerobic Exercise Log

Name:_____; First day of log:_____/_____/_____

Walking program: Target goals are shown with dots. Place "X" in the boxes each day after you complete your walking program. Also, count the number of times your heart beats in 60 seconds and record this as your heart rate each day that you exercise. Ideally, walk outside with a partner who walks at the same pace. If walking on a treadmill, listen to a television or music while walking.

Week 1:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 mile							
½ mile							
¼ mile							
⅛ mile							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 2:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 mile							
½ mile							
¼ mile							
⅛ mile							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 3:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 mile							
½ mile							
¼ mile							
⅛ mile							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Biking program: Target goals are shown with dots. Place "X" in the boxes each day after you complete your biking program. Also, count the number of times your heart beats in 60 seconds and record this as your heart rate each day that you exercise.

Week 1:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20 minutes							
15 minutes							
10 minutes							
5 minutes							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 2:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20 minutes							
15 minutes							
10 minutes							
5 minutes							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 3:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20 minutes							
15 minutes							
10 minutes							
5 minutes							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Sample Aerobic Exercise Log

Name:_____; First day of log:_____/_____/_____

Walking program: Target goals are shown with dots. Place "X" in the boxes each day after you complete your walking program. Also, count the number of times your heart beats in 60 seconds and record this as your heart rate each day that you exercise. Ideally, walk outside with a partner who walks at the same pace. If walking on a treadmill, listen to a television or music while walking.

Week 1:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 mile							
½ mile							
¼ mile							•
⅛ mile	•		•		•		
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 2:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 mile							
½ mile					•	•	
¼ mile		•	•				
⅛ mile							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 3:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 mile		•		•	•	•	
½ mile	•						
¼ mile							
⅛ mile							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Biking program: Target goals are shown with dots. Place "X" in the boxes each day after you complete your biking program. Also, count the number of times your heart beats in 60 seconds and record this as your heart rate each day that you exercise.

Week 1:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20 minutes							
15 minutes							
10 minutes							•
5 minutes	•		•		•		
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 2:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20 minutes							
15 minutes					•	•	
10 minutes		•	•				
5 minutes							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Week 3:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20 minutes		•		•	•	•	
15 minutes	•						
10 minutes							
5 minutes							
Heart rate							

Heart rate: record your heart rate at the end of your exercise session

Identifying and Resuming Normal Activities

Activity Assessment

Name:_____; First day of log:_____/_____/_____

1. Select desired target activity.
   _____
   _____
2. List barriers to achieving target activity.
   _____
   _____
3. Identify intermediate activity that can currently be accomplished.
   _____
   _____
4. Develop short-term strategy for accomplishing intermediate activity.
   _____
   _____
5. Develop long-term strategy for accomplishing desired target.
   _____
   _____

Example of Completed Activity Assessment

Activity Assessment

Name:_____; First day of log:_____/_____/_____

1. Select desired target activity.
   - Shopping at an outlet mall with my daughter
2. List barriers to achieving target activity.
   - Unable to ride in the car for 2 hours to get to the stores
   - Unable to stay in one position, either standing or sitting, without changing position for more than 20 minutes
   - Unable to walk more than 45 minutes without needing to sit and rest
   - Unable to carry heavy packages
   - Afraid that daughter will become angry and disappointed if we leave before she has done shopping
3. Identify intermediate activity that can currently be accomplished.
   - Shopping at one store in the local mall
4. Develop short-term strategy for accomplishing intermediate activity.
   - Discuss strategy with daughter, including need to take breaks during shopping.
   - Use a lumbar support for the car ride.
   - Arrange to do some brief stretches that can be done while standing after arriving at the mall. Follow this with 15 minutes of walking in the mall before you start shopping.
   - Select only one store to visit and agree beforehand that you would not go to any other stores that day, even if there is a great sale.
   - Take a watch and agree to shop for only 1 hour before stopping.
   - Plan to get lunch after shopping to celebrate being together.
   - After arriving home, use relaxation techniques and do your stretching exercises, even if you feel tired.
5. Develop long-term strategy for accomplishing desired target.
   - Successfully complete several brief trips to the local mall.
   - Gradually increase shopping time, remembering to take breaks to sit, stretch, and use pain management skills.
   - Identify rest stops on route to the outlet malls. Use rest stops to walk and do stretching exercises.
   - Identify 2 – 4 stores you will visit at the outlet mall.
   - Take breaks in between visiting each store.
   - Allow daughter to carry bundles to the car between stores to minimize carrying.
   - Do not be discouraged if your first attempt is not completely successful.

Appendix C
Psychological Screening and Pain Management Skills

Depression Screening

Hilton and colleagues developed and validated a ten-item screening tool for depression in medically ill patients, called the Depression in Medically Ill screen or DMI-10.[1] An adaptation of this self-report questionnaire is presented below:

Name:_____; Date:_____/_____/_____

Please rate each statement, considering how you have been feeling in the last 2 to 3 days compared with how you normally feel:

	Not true	Slightly true	Moderately true	Very true
	Score = 0	Score = 1	Score = 2	Score = 3
I find myself stewing over things				
I feel more vulnerable than usual				
I am critical of or hard on myself				
I feel guilty				
Nothing seems to cheer me up				
I feel like I have lost my core or essence				
I feel depressed				
I feel less worthwhile				
I feel hopeless or helpless				
I feel distant from other people				

Scoring: Sum scores from each question. A total score ≥9 suggests depression

[1]Parker G, Hilton T, Bains J, Hadzi-Pavlovic D. Cognitive-based measures screening for depression in the medically ill: the DMI-10 and the DMI-18. Acta Psychiatr Scand 2002;105:419–426.

Anxiety Screening

Spitzer et al. developed and validated a seven-item screening tool for anxiety in primary care patients, called the General Anxiety Disorder-7 (GAD-7).[2] An adaptation of this self-report questionnaire is presented below:

Name:_____; Date:_____/_____/_____

Choose one description for each item that best describes how many days have you been bothered by each of the following over the past 2 weeks:

	None	Several	7 or more	Nearly every day
	Score = 0	Score = 1	Score = 2	Score = 3
Feeling nervous, anxious, or on edge				
Unable to stop worrying				
Worrying too much about different things				
Problems relaxing				
Feeling restless or unable to sit still				
Feeling irritable or easily annoyed				
Being afraid that something awful might happen				

Scoring: Sum scores from each question. A total score of 5–9 suggests mild anxiety, while a score ≥10 suggests moderate to severe anxiety

[2]Spitzer RL, Kroenke K, Williams JW, Löwe B. A brief measure for assessing generalized anxiety disorder. The GAD-7. Arch Intern Med 2006;166:1092–1097.

Psychological Pain Management Techniques

Many effective pain management techniques are taught by psychologists. These techniques are designed to help reduce muscle spasm and the number of pain messages sent by the brain. These techniques are effective for most people with chronic pain. Pain improvement after using these techniques does not mean that the pain was *imaginary* or *psychological*. Additionally, these techniques are not designed to treat serious psychological problems, such as depression and anxiety. Relaxation training, biofeedback, and stress management are among the many techniques taught by psychologists. Patients achieve the most benefit from these techniques when they receive some formal training from an experienced therapist.

Relaxation

Relaxation techniques should be learned while sitting in a comfortable chair, with arms and legs uncrossed, feet flat on the floor, and eyes closed. Each practice session should last for about 15 to 20 uninterrupted minutes. Once you have regularly practiced and mastered these techniques, you will be able to use them whenever you feel yourself starting to tense or in anticipation of stress.

- Progressive muscle relaxation involves alternately contracting and relaxing muscles throughout your body. With your eyes closed, tense and then relax individual muscles in different parts of your body, starting at your feet and moving toward your neck and face. Hold the tension for 10 to 15 seconds, then release. Tense and release the muscles in your feet, then in other parts of the body in the following order: legs, abdomen, arms, shoulders, neck, jaw, eyes, and forehead. Focus on the sensations of the muscles when they are no longer tensed. With practice, you will begin to recognize when your muscles are tensed. For example, you may notice tension in your face, neck, and shoulders when sitting in traffic or waiting in a line at the store. Once you feel this tension, work to release it before your pain flares.
- Cue-controlled relaxation uses a combination of deep breathing and repetition of the word *relax*. Begin this exercise with a slow, deep, abdominal breath. Place your hand over your abdomen to feel it moving in and out with each breath. After inhaling, hold the breath for 5 to 10 seconds, then exhale, slowly repeating the word *relax*. Repeat. After you are comfortable with this technique, you should be able to close your eyes and take a deep abdominal breath before confronting stressful situations, e.g., a doctor's visit, a meeting with the boss, or a discussion with your teenager. This will reduce the impact of stress on your pain.

Thermal Biofeedback

- Some people find it difficult to feel relaxed and use biofeedback as part of their relaxation training as an external monitor. To begin, place a handheld thermometer on your finger and measure the temperature. While practicing relaxation skills, check the temperature on your thermometer. When you are relaxed, the finger temperature should increase by about 2 to 3°F (probably to about 96°F).
- An inexpensive finger thermometer and biofeedback audiotape may be obtained from Primary Care Network (1-800-769-7565).

Stress Management

Stress is one of the most common triggers for pain flares, aggravating pain in about 30% of people with chronic pain. Individuals usually notice that stress aggravates their usual health problems: people with heart disease experience chest pain; people with irritable bowel syndrome develop diarrhea, and patients with chronic pain have pain flares. Stress management does not mean avoiding or eliminating all of the stress in your life. Instead, you train your body to react differently when exposed to stress so that your pain is less likely to become flared. For example, many people feel stressed when stuck in traffic, reacting with anger, clenched teeth, and tightening of muscles in the neck and upper back. After learning stress management, you may still get stuck in traffic, but you will be able to respond by repeating soothing thoughts ("I will make my appointment. I am a responsible person.") or listening to music while practicing relaxation techniques (such as slow, deep breathing). In this way, your body will not release pain-provoking chemicals or cause muscle spasm, both of which may aggravate your pain condition. These same strategies can be used before attending a meeting with one's boss or a child's teacher, before beginning a discussion about family issues with spouse or child, or while waiting in a long line at the grocery store.

Most people experience stress symptoms when exposed to new environments and situations. Identify situations that are typically stress provoking for you, that cause you to feel your jaw or hands clench or begin to sweat. For some people, major events – such as taking an examination in school or giving a speech or a business presentation – will result in a stress response. For others, seemingly minor events – such as making a phone call, driving in traffic, meeting a child's teacher, or even meeting an old friend – may be stress provoking. Understanding your body's reaction to frequent situations allows you to plan to use relaxation techniques and stress management immediately before each event to minimize the stress response and the impact stress will have on your chronic pain.

Appendix D
Pain Medications

Dosing Guide for Chronic Pain Medications

Medication	Indication	Adult dosage
Anti-depressants	Depression Neuropathic pain Headache Fibromyalgia Sleep disturbance	Amitriptyline (Elavil®) 25–150 mg at bed Duloxetine (Cymbalta®) 60 mg daily Imipramine (Tofranil®) 25–150 mg at bed Milnacipran (Ixel® – not available in the United States) 100–200 mg daily Paroxetine (Paxil®) 10–20 mg twice daily Sertraline (Zoloft®) 25–50 mg twice daily
Antiepileptics	Neuropathic pain Migraine Fibromyalgia Anxiety Sleep disturbance	Gabapentin (Neurontin®) 100–300 mg 2–3 times daily Pregabalin (Lyrica®) 100 mg 3 times daily Topiramate (Topamax®) 50–100 mg twice daily Valproate (Depakote®; for migraine) 125–250 mg twice daily
Muscle relaxant	Myofascial pain Sleep disturbance	Tizanidine (Zanaflex®) 1–4 mg at bed or twice daily
Non-narcotic analgesics	Pain flares Inflammation	Ibuprofen (Motrin®) 400 mg every 6 hours Tramadol (Ultram®) 50–100 mg every 6 hours
Opioids – short-acting	Disabling pain flared	Hydrocodone (Vicodin®, Norco®) 5–10 mg every 6–8 hours
Opioids – long-acting	Disabling constant pain	Morphine (MS Contin®, Kadian®) 15–30 mg twice daily Methadone 5 mg twice daily

Appendix E
Chronic Headache

Mechanism of Migraine

Exposure to a variety of possible triggers – food, stress, change in sleep pattern, or hormonal medication – causes an imbalance in pain chemicals within the brain that results in stimulation of the trigeminal nerve. The trigeminal nerve supplies pain fibers to the head and face, as well as a variety of additional important functions (see Fig. E.1). Activation of the trigeminal system results in tenderness of the scalp, so that brushing the hair is painful. Trigeminal nerves also signal blood vessels around the head, causing them to expand so that more blood can flow through them. Enlargement of these blood vessels can sometimes be seen at the temples. In addition, migraine sufferers notice a throbbing or pulsing sensation similar to that of the heartbeat. Trigeminal signals also go to parts of the brain to cause sensitivity to light, sound, and smell, as well as trigger cravings for certain foods, such as chocolate. Messages are also sent into the upper part of the cervical spinal cord, where

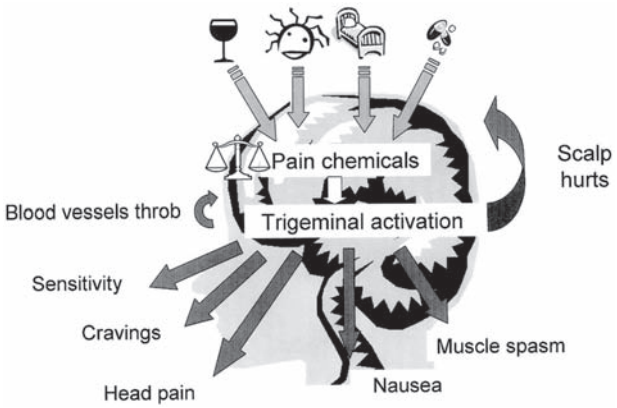


Fig. E.1 Mechanism of migraine. Exposure to triggers (including foods, stress, changes in scheduling, or hormones) causes changes in pain chemical balance that trigger the trigeminal system. Activating the trigeminal system causes a variety of migraine symptoms: pain, nausea, cravings, and sensitivities to light, noises, and smells.

they pass through the vomiting center, resulting in nausea during headache. In the cervical spinal cord, muscles in the back of the neck and shoulders may also become activated, causing muscle spasm and neck pain during migraine. Treatment of migraine is designed to eliminate possible triggers or change the balance of pain chemicals that are affected by these triggers.

Headache as a Balancing Act

People with headaches can imagine that they have a scale in the brain that controls the balance between a headache occurring or not occurring on any given day. The left side of the scale contains brain chemicals that prevent headache activity, including serotonin, γ-aminobutyric acid (GABA), and endorphins. The right side of the scale contains chemicals that trigger headache, such as dopamine and norepinephrine. Exposure to certain foods or stress increases activity in the pain-producing chemicals in the right side of the scale and results in the increased likelihood of a headache occurring. Headache therapies work by increasing the activity of chemicals on the pain-prevention side. Triptans, such as Imitrex®, Maxalt®, Relpax®, and Zomig®, and antidepressant medications, such as Elavil® or Paxil®, increase serotonin activity. Interestingly, nonpharmacological therapies, such as relaxation and biofeedback, have also been shown to increase serotonin activity. Antiepileptic drugs, such as Depakote®, Neurontin®, Lyrica®, and Topamax®, increase GABA activity. Pain pills increase endorphin activity. This increase in headache-protecting chemicals reduces the likelihood of headache (see Fig. E.2).

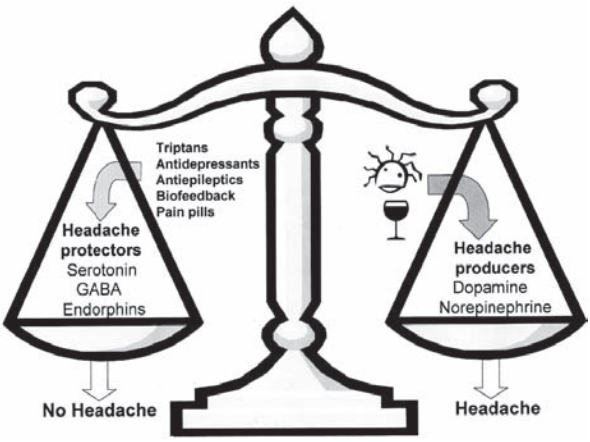


Fig. E.2 Headache is a balancing act. Headache is caused by a change in the balance of brain chemicals. The headache protector chemicals serotonin, GABA, and endorphin protect against head pain. Dopamine and norepinephrine cause pain. Headache activity is reduced when the amount of headache protectors is high. Many headache therapies work by increasing activity or amounts of headache protectors. Headache triggers, such as stress and some foods such as red wine, increase activity or amounts of headache-producing brain chemicals.

Daily Headache Recording Diary

Instructions:

1. Record Sunday's date in the first column.

Day ___/___/___	Severity (0–3)				Medication used (prescription and OTC)	Menstrual days
	Morning	Noon	Evening	Bed		
Sunday						
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						

2. Record headache severity everyday, four times daily (morning, noon, evening, and night) using the following severity scale:

   0 = no headache
   1 = mild headache – able to continue with routine activities
   2 = moderate headache – activities restricted
   3 = severe headache – unable to perform usual activities

3. Record all medications used for headache: prescription and over-the-counter (OTC)
4. Women: record any days with menstrual flow

Headache-Free Diet

Adapted from American Council for Headache Education Tyramine Restricted Diet & Theisler CW: Migraine Headache Disease: Diagnostic and Management Strategies. Austintown: Aspen Publishers; 1990, pp. 111–112.

Only about 30% of people can identify specific food triggers. This diet is designed to identify individual foods that may be triggers for you. Specific foods are avoided to limit exposure to chemicals that can trigger headaches. Any food not listed in the *AVOID* column is allowed. Only a sample of allowed foods is listed.

Category	Avoid	Allowed	Chemical
Meats	Aged/cured meat: bacon, bologna, chicken liver, ham, pepperoni, salami, sausage Nuts: peanuts and peanut butter, pumpkin, sesame, and sunflower seeds Pickled herring, snails	Beef, poultry, fish, eggs	Nitrites Tyramine
Dairy	Buttermilk Ripened *stinky* cheese: bleu, brick, cheddar, emmentaler (Swiss), guyere, parmesan, provolone, brie, stilton, camembert, gouda Sour cream	Cheese: American, Velveeta™, cream cheese, cottage cheese, Ricotta Milk Yogurt (limit ½ cup per day)	Histamine Phenylethylamine Tyramine
Fruit	Banana, fig, kiwi, mango, raisin, papaya, plum, strawberry	Apple, apricot, cherry, cranberry, nectarine, peach, pear, prune, watermelon Citrus (limit ½ cup per day)	Tyramine
Vegetable	Avocado, corn, eggplant, olives, onion, pickles and pickled food, sauerkraut, spinach, snow pea, tomato Beans: broad, fava, garbanzo, lentils, lima, navy, pinto, soy	Artichoke, asparagus, beet, broccoli, carrot, cauliflower, lettuce, pea, potato, squash, string bean, zucchini	Histamine Tyramine
Bread and cereal	Donuts, fresh homemade yeast bread and coffee cake, pizza, sour dough bread	Bagels, hot and cold cereal, crackers without cheese, commercial bread, English muffin, pasta, rice	Tyramine

(continued)

Category	Avoid	Allowed	Chemical
Beverages	Alcohol Caffeinated: chocolate, coffee, tea, Mt. Dew®, cola	Caffeine-free soda: 7-Up®, Sprite®, ginger ale Fruit juice (except citrus)	Histamine Phenylethylamine Tyramine
Desserts	Chocolate Mincemeat	Cakes and cookies without yeast or chocolate Gelatin Ice cream and sherbet	Phenylethylamine
Additives	Accent and seasoned salt, meat tenderizer Monosodium glutamate (often listed as natural flavoring, hydrolyzed protein, carrageenan, or caseinate): this common food enhancer is found in many prepared foods. Avoid canned, frozen, and prepared foods; food in jars; weight loss powders; dry soup/bouillon; potato chips; Chinese food Nutrasweet: diet foods, Equal®		
Medicine and habits	Caffeine: Anacin®, Aqua Ban®, diet pills, Excedrin®, Midol®, No Doz®, Norgesic®, Tussirex®, Vanquish®, Vivarin® Nicotine		

Diet instructions:

1. Follow a regular eating schedule. Do not skip meals or fast.
2. Read food and medicine labels.
3. Strictly follow the diet for 3 weeks. If headache improves, slowly add 1 food back into your diet each week. Food triggers should produce a headache within 12 hours. If your headache does not improve on this diet, foods are not triggers for your headache.

Headache Medication Guide

For migraine and tension-type headaches

Section I: Acute-Care Medications

To be used for infrequent, severe headaches (less than 3 days per week)

Medication	Dosage	Common side effects
Analgesics Aspirin Ibuprofen Naproxen Excedrin® Tylenol®	Aspirin: 650 mg (2 tablets) every 3–4 hours; daily maximum 4 g Ibuprofen: 400 mg (2 Advil® tablets) every 4–6 hours Naproxen: 440 mg (2 Aleve®) every 8 hours Excedrin®: 2 tablets every 6 hours Tylenol®: 650 mg every 4 hours; daily maximum 3.5 g	Stomach upset, dizziness, fluid retention, bleeding, ringing in the ears, hearing loss, kidney or liver damage
Anti-nausea Reglan® Compazine® Thorazine® Tigan®	Reglan®: 10 mg by mouth or IM injection Compazine®: 25 mg rectally	Drowsiness, dystonia, parkinsonism. Rarely tardive dyskinesia or neuroleptic malignant syndrome
Isometheptene Midrin® (*Avoid if taking MAO-I or uncontrolled high blood pressure or glaucoma*)	2 tablets initially, then 1 in 1 hour if needed. No more than 5 pills per day and 10 pills per week	Drowsiness, dizziness, rash
Dihydroergotamine DHE-45®; Migranal® (*Avoid with erythromycin*)	Nasal spray: 1 spray (0.5 mg) in each nostril. May repeat in 15 minutes. Maximum 4 sprays per day, 8 sprays per week	Nausea, chest tightness, leg cramps, vomiting, increased blood pressure
Triptans Imitrex® Maxalt® Zomig® Relpax® Axert® Amerge® Frova®	Available as injections, nasal sprays, and oral pills Imitrex pills: 50–100 mg; may repeat once in 2 hours	Tingling, anxiety, nausea, sedation, weakness, chest/neck tightness *(Avoid if heart disease or uncontrolled high blood pressure)*

Remember:

1. Read the labels of your medicine to identify what you're taking.
2. Take acute-care medicines at the beginning of a bad headache attack, when symptoms are still mild. If you have warning signs before a headache starts, use acute therapy when the warning signs occur.
3. Limit acute-care medications to no more than 3 days per week to avoid medication overuse headache.

Section II: Preventive Medications

For prevention of frequent headache (more than 3 days per week)

Medication	Dosage	Common side effects
Anti-depressant Tricyclic Elavil® Tofranil® SSRI Paxil® (*Avoid tricyclic if glaucoma*)	Elavil® or Tofranil®: 25–100 mg 2 hours before bed Paxil®: 5–20 mg twice daily	Sedation, dry mouth, dizziness, weight change, sexual dysfunction, blurred vision, urine retention
Anti-hypertensive Inderal® Calan®	Inderal® 80–160 mg daily. Long-acting form may be used once daily Calan®: 240–480 mg daily. Long-acting form may be used once daily	Depression, sedation, constipation, dizziness
Antiepilepsy Depakote® Neurontin® Topamax®	Depakote®: 125–250 mg twice daily Neurontin®: 100–400 mg 2–3 times daily Topamax®: 50–100 mg twice daily	Weight change, hair thinning, tremor, bleeding, nausea, dizziness, rash, sleepiness, numbness, nausea
Anti-histamine Periactin® (*Avoid if glaucoma or using MAO-I*)	Periactin®: 4 mg 2–3 times daily	Drowsiness, weight gain, dry mouth, constipation

Remember:

1. Do not expect headache reduction for at least 2 to 3 weeks after starting preventive medications.
2. Take preventive medications every day. Acute-care medications can also be used for infrequent, severe headaches.
3. Once headaches are controlled, take preventive medications for 4 to 6 months before trying to taper dose. If headaches return with taper, return to previously effective dose. Retry taper in 6 months.
4. Anti-inflammatory medications, such as naproxen 250–500 mg twice daily, may be used during the menstrual week for menstrual headache or taken for several weeks while tapering off of pain killers in patients with medication overuse headache.

Section III: Herbs and Supplements

Medication	Dosage	Common side effects
Vitamins and minerals	Riboflavin 400 mg daily Coenzyme Q10 150 mg daily Magnesium 600 mg daily	Diarrhea, nausea, insomnia, dizziness, headache
Herbs	Feverfew 100 mg 0.2% parthenolide daily Butterbur 50–100 mg twice daily Peppermint oil 10 g in alcohol applied topically as needed	Feverfew can reduce clotting; avoid using with aspirin or anti-inflammatory drugs Butterbur frequently causes burping
Hormone	Melatonin 3 mg at bedtime	Sleepiness, hair loss, increased libido

Remember:

1. Nutritional supplements may also be beneficial, although their benefit is generally less than with either traditional medication or non-medication therapies.[1]
2. Most therapies must be used 3 months before determining benefit.

[1]Marcus DA. 10 Simple Solutions to Migraine. New Harbinger Press, Oakland, CA, 2006

Acute Migraine Therapy Target Goals

What Is Acute Migraine Therapy?

Acute migraine therapy is used to treat an individual headache episode. Acute migraine medications, which include analgesics and triptans, should effectively relieve the symptoms of migraine and disability that occurs with the migraine.

Acute migraine medications should be limited to a maximum of 3 days per week on a regular basis. Regular use of any acute-care medication for more than 3 days per week over several weeks to months can result in a worsening pattern of headache, called medication overuse headache.

If you have frequent headaches and need to use your acute-care medication more often than 3 days per week, talk to your doctor about considering the addition of a migraine preventive therapy.

How Do I Use Acute Migraine Therapy?

In general, acute-care medications are most effective when they are used before a migraine episode becomes severe or you have to reduce your activities because of your headache. Some medications, such as the triptans, are still effective when used to treat migraines that are already severe. Migraine relief, however, will be faster and more complete if any acute treatment, including triptans, is taken earlier during a migraine episode.

You have been prescribed the following specific acute migraine therapy:
Drug name and dose:_____

Route of administration:

- ❑ Oral tablet (take with water)
- ❑ Orally dissolving tablet (take without water)
- ❑ Nasal spray
- ❑ Injection

When a migraine begins, take _____.

You may repeat the dose in _____ hours.

Can I Wait for Severe Symptoms Before Using My Acute Treatment?

Many people like to *wait to be sure that the headache is a migraine* before using their acute medication. During a migraine, people often develop sensitivity to stimulation so that normally small sensations seem to become magnified. In early migraine, nerve sensitization causes the perception of a throbbing in the head. During this phase, bending forward or coughing can produce unbearable head pain. The second stage of nerve sensitization causes sensitivity to touch signals – you may notice that you skin is sensitive to touch, that your hair seems to hurt, or it hurts to wear glasses, earrings, a headband, or a cap. Medications are much less effective when administered during this second stage. Therefore, you should take your medications early in your migraine, before your hair hurts and skin sensitivity has developed. If you wait too long, you may find that your medication is not effective.

What Should I Expect?

Realistic target goals for acute-care medication include the following:

- Rapid relief of all migraine symptoms
  - Relief should be obtained within 2 hours.
  - Some treatments achieve faster relief.
  - If relief is taking longer than 30 to 60 minutes, consider asking your doctor to adjust your treatment.
- Complete relief of all migraine symptoms
  - Within 2 hours, all symptoms of migraine should be gone.
  - Consider asking for a medication adjustment if you have persistent pain.
- After you initially treat your headache, the headache should not come back within 24 hours.
- You should not have any side effects that make you reluctant to use your medication.

Acute Migraine Therapy Satisfaction Assessment

Try your new acute migraine therapy for three migraine episodes to accurately assess its efficacy. Keep track of how effectively your treatment goals were met by completing the chart below. Write down how long it took to achieve headache relief. Circle yes or no responses for the remaining questions.

	Headache No. 1 Date: / /	Headache No. 2 Date: / /	Headache No. 3 Date: / /
How quickly did you achieve relief of your migraine symptoms? (record minutes or hours)			
Was relief *fast enough* for you?	Yes No	Yes No	Yes No
Did your migraine symptoms go away *completely*?	Yes No	Yes No	Yes No
Is the *formulation* you are using (tablet, dissolving tablet, nasal spray, or injection) convenient and effective for you?	Yes No	Yes No	Yes No
Are you having any *troublesome side effects* that make you hesitant to use your medication?	Yes No	Yes No	Yes No

List any troublesome side effects or other comments:

_____
_____
_____
_____

After treating three headaches, are you satisfied with this treatment?
Yes No
If no, why? _____

Headache Medication Guide

For cluster headaches

Section I: Acute-Care Medications

Medication	Dosage	Common side effects
Oxygen	100% oxygen at 7–8 L per minute for 10 minutes by face mask. May repeat up to 4 times daily.	Generally well tolerated
Dihydroergotamine DHE-45®; Migranal® (*Avoid with erythromycin*)	Nasal spray: 1 spray (0.5 mg) in each nostril. May repeat in 15 minutes. Maximum 4 sprays per day, 8 sprays per week.	Nausea, chest tightness, leg cramps, vomiting, increased blood pressure
Triptans Imitrex®	Imitrex injection: 6 mg subcutaneously	Tingling, anxiety, nausea, sedation, weakness, chest/neck tightness *(Avoid if heart disease or uncontrolled high blood pressure)*
Lidocaine	4% intranasal lidocaine: 1 mL in nostril on painful side. Lie with head extended for 1 minute. May repeat once.	Generally well tolerated
Steroid Dexamethasone	Dexamethasone: 8 mg single dose	High blood pressure, increased blood sugar, confusion, tremor, stomach ulcers. More serious side effects include cataracts, bone thinning and necrosis

Section II: Preventive Medications

Occasionally used for prevention of cluster headaches are anti-nausea medications, anti-anxiety medications, anti-depressants, propranolol, and anti-inflammatory medications. For doses and side effects, refer to migraine/tension-type medication sheets.

Medication	Dose	Side effects
Anti-hypertensive Calan®	Calan®: 240–480 mg daily. Long-acting form may be used once daily	Constipation, diarrhea, dizziness, fluid retention
Antiepilepsy Depakote® Neurontin® Topamax®	Depakote®: 125–250 mg twice daily Neurontin®: 100–400 mg 2–3 times daily	Weight gain, hair thinning, tremor, bleeding, nausea, dizziness, rash
Methysergide Not available in the United States	4–8 mg daily; drug holiday every 6 months; check periodic CXR, IVP, abdominal CT	Leg cramps, leg swelling, numbness in fingers/toes, chest pain, nausea. Rarely retroperitoneal fibrosis
Lithium Lithobid®	600–1,200 mg daily to achieve blood level of 0.6–1.2; may combine with calcium channel blocker	Tremor, confusion, decreased thyroid function, increased urination, blurred vision, nausea, fatigue, weight gain, swelling. May treat tremor with Inderal®
Indomethacin Indocin® *(Used to rule out chronic paroxysmal headache, a rare, cluster-like headache in women)*	Indocin®: 25–50 mg 2–4 times daily	Gastric irritation, dizziness, fatigue, ringing in ears
Triptan Imitrex® Maxalt® Zomig® Relpax® Axert® Amerge® Frova®	Imitrex® pills: 25–50 mg at bed (used short-term for severe cluster period)	Tingling, anxiety, nausea, sedation, weakness, chest/neck tightness (avoid if heart disease or uncontrolled high blood pressure)
Anti-histamine Periactin® (*Avoid if glaucoma or using MAO-1)*	Periactin®: 4 mg 2–3 times daily	Drowsiness, weight gain, dry mouth, constipation

CT computed tomography, *CXR* chest x-ray, *IVP* intravenous pyelogram

Discontinue alcohol intake and smoking during cluster: both aggravate cluster headaches and nicotine decreases medication effectiveness.

Medication Overuse or Rebound Headache

If you have frequent headaches, your doctor may talk to you about medication overuse or drug rebound headaches. People who get headaches often notice that they develop more frequent and more severe headaches when they are regularly using acute-care headache or pain medications (e.g., aspirin, ibuprofen, Tylenol®, Excedrin®, narcotics, or triptans) more than 3 days a week. Medication overuse headaches are generally a dull, everyday headache pain that seems to wax and wane throughout the day. Although taking headache or pain medication will make the headache temporarily better, frequent use of medication may actually be making the headache worse.

How Can a Pain Reliever Cause Pain?

Medication overuse headaches are similar to caffeine withdrawal symptoms. Coffee drinkers typically awaken with a morning headache and irritability, which are relieved after drinking a cup of coffee. After several hours, when the coffee is out of their system, the caffeine-withdrawal headache and irritability return. Coffee drinkers will *medicate* these symptoms with *doses* of coffee throughout the day. Because they do not wake up during the night for coffee, their symptoms are usually at their worst when they wake up in the morning, announcing, "Nobody better talk to me until I've had my cup of coffee." Coffee drinkers easily recognize these symptoms as caused by caffeine. They know that stopping caffeine for a few days will not improve their symptoms, and may even make them temporarily worse. Once they have avoided coffee for several weeks, though, they will no long have these cycling headaches and irritability.

This same pattern occurs in the medication overuser, who wakes early with a bad headache and takes a headache pill. When the headache returns in 3 or 4 hours, they take more pills, and may repeat this several times throughout the day.

How Are Medication Overuse Headaches Treated?

Medication overuse headaches must be treated by medication withdrawal. Under medical supervision, analgesics and triptans can be discontinued. Narcotics and barbiturate combinations (e.g., Fiorinol® or Fioricet®) are tapered. Sometimes people use medications during this withdrawal period that do not cause rebound headache, such as naproxen or Ultram®.

Improvement after medication withdrawal is usually not seen for several weeks to months after stopping the overused medication (see Fig. E.3).[2] Because

[2] Rapoport AM, Weeks RE, Sheftell FD, Baskin SM, Verdi J. The "analgesic washout period": a critical variable in the evaluation of treatment efficacy. Neurology 1986;36 (suppl 1):100–1

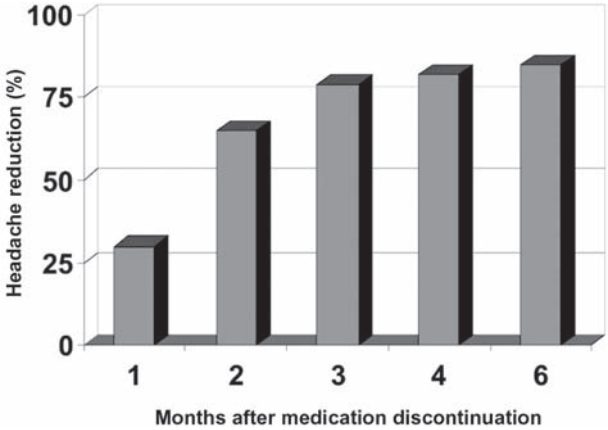


Fig. E.3 Percentage of patients experiencing headache improvement after discontinuing overused medications. Improvement occurs in the majority of patients who discontinue medications, although early improvement 1 month after discontinuing occurs in only about 30% of patients.

medication overuse headache only occurs in people with an underlying headache disorder, such as migraine or tension-type headaches, all headaches will not be cured by discontinuing daily medications.

Standard headache preventive medications (such as anti-hypertensives, antidepressants, and antiepileptics) tend not to work when people are also using daily pain killers. So you may want to talk to your doctor about a second trial of a medicine that was found to be ineffective while you were also using daily or near daily pain killers.

How Can I Avoid Medication Overuse Headaches?

To avoid developing medication overuse headaches, do not regularly take acute-care or pain medications more than 3 days per week. You need to have at least 4 days per week with no acute-care medication. This means you cannot use aspirin 2 days, triptan 3 days, and a narcotic 2 days each week. Maintaining a headache diary can help identify if you are overusing a single medication or a combination of several medications. If you regularly have headaches more than 3 days per week, talk to your doctor about preventive headache treatments.

Appendix F
Neuropathic Pain

Screening Tool for Neuropathic Pain

This simple, six-item questionnaire called the ID Pain questionnaire was developed and validated as an effective screening tool for neuropathic pain.[1]

Answer the following questions about your pain over the past week:

	Yes Scores	No Scores
Did the pain feel:		
Like pins and needles	1	0
Hot or burning	1	0
Numb	1	0
Like electric shocks	1	0
Is the pain worse with touching by clothes or bed linens?	1	0
Is the pain limited to your joints?	−1	0
Total "yes" score		

Add scores from all "yes" answers to get the total "yes" score. Scores ≥3 suggest likely neuropathic pain.

[1] Portenoy R. Development and testing of a neuropathic pain screening questionnaire. ID pain. Curr Med Res Opin 2006;22:1555–1565

Diabetic Neuropathy

Diabetes is the most common medical condition causing painful nerve damage, called neuropathy. You will typically notice a burning and numbness in your feet. Touching your feet may become unpleasant. One in every three patients with diabetes will develop neuropathy.

A number of factors increase your risk of developing diabetic neuropathy:[2]

- Older age
- Long duration of diabetes
- Poor glucose control
- Elevated cholesterol and triglycerides
- Smoking
- Obesity
- Low physical activity

This graph shows the odds of developing a microvascular complication with diabetes, such as neuropathy or retinopathy (nerve damage in the eye) (Fig. F.1).[3] An odds ratio number higher than 1 shows that this factor will increase your risk of developing neuropathy or retinopathy. An odds ratio of 2 means your risk is doubled. For example, the graph shows that your risk of developing these complications is doubled if you smoke, are inactive, and have poorly controlled blood sugars. Your risk is also elevated if your triglyceride level is elevated.

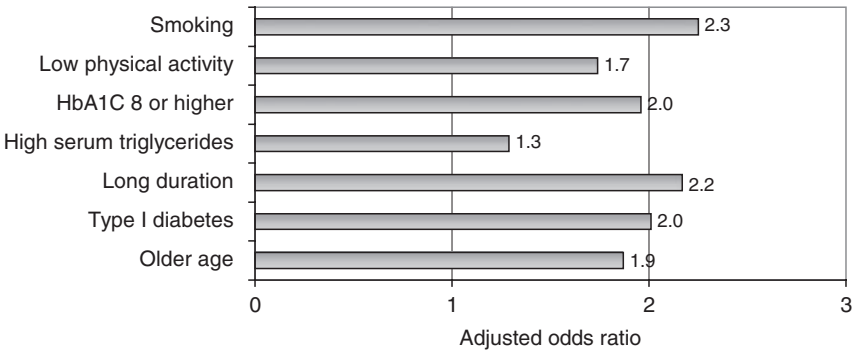


Fig. F.1 Risk factors for microvascular complications with diabetes (based on McClean et al.[3]).

[2] Al-Mahroos F, Al-Roomi K. Diabetic neuropathy, foot ulceration, peripheral vascular disease and potential risk factors among patients with diabetes in Bahrain: a nationwide primary care diabetes clinic-based study. Ann Saudi Med 2007;27:25–31

[3] McClean MT, Andrews WJ, McElnay JC. Characteristics associated with neuropathy and/or retinopathy in a hospital outpatient diabetic clinic population. Pharm World Sci 2005;27:154–158

While you cannot do anything to reduce your risk from age or how long you have been a diabetic, you can reduce other risk factors by doing the following:

- Discontinue tobacco
- Start or increase an aerobic exercise program
- Reducing your weight
- Keep your blood sugars under better control
- Reducing your blood lipid levels

Controlling these factors will help reduce your risk of developing neuropathy. Also, controlling blood sugars and other health factors can reduce the pain you experience after you have already developed diabetic neuropathy.

Appendix G
Fibromyalgia

Recording Sheet for Fibromyalgia Tender Point Examination

Patient:_____ **Date:** ____/____/_____
Examiner:_____

Instructions to Examiner

Press each of the 18 spots with your thumb, exerting 4-kg pressure (nail bed blanches). Ask patient to rate the severity of pain for each spot, using a scale from 0 (*pressure or no pain*) to 10 (*excruciating pain*). Record rating in the circle provided for each spot (Fig. G.1)

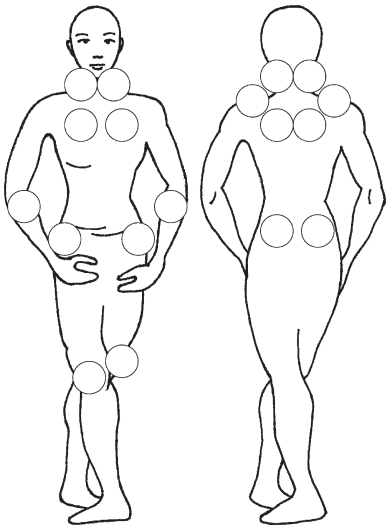


Fig. G.1 Tender-point recording sheet with spots for tender-point count and score.

Interpreting the Tender Point Examination

The tender point count is the number of tender points rated 2 or higher. A diagnosis of fibromyalgia requires 11 positive points out of a possible 18 tested.

The tender point *score* is the sum total of all 18 ratings, ranging from a possible total score of 0–180.

Patient progress can be monitored by following changes in tender point count and score.

Record today's tender point *count* _____ and *score* _____.

Fibromyalgia Impact Questionnaire (FIQ)

Adapted from Burckhardt CS, Clark SR, Bennett RM. The Fibromyalgia Impact Questionnaire: development and validation. J Rheumatol 1991;18:728–734

Question 1: Complete each Line in the following box. Rate how frequently you were able to perform each of the following tasks during the past week. If you would not normally perform one of these tasks, mark N/A for not applicable.

	Always 0	Mostly 1	Occasionally 2	Never 3	N/A
Do shopping					
Do laundry with washer and dryer					
Prepare meals					
Wash dishes/cooking utensils by hand					
Vacuum a rug					
Make beds					
Walk several blocks					
Visit friends or relatives					
Do yard work					
Drive a car					
Climb stairs					

Question 2: In the past week, how many days did you feel good? (Circle a number from 0 to 7 days.)

0 1 2 3 4 5 6 7

Question 3: How many days in the past week did you miss work (including housework) because of your fibromyalgia? (Circle a number from 0 to 7 days.)

0 1 2 3 4 5 6 7

Question 4: For each question below, circle the number on each scale that best describes how you felt overall during the past week.

A. When working (including housework), how much did pain or other fibromyalgia symptoms interfere?

0 1 2 3 4 5 6 7 8 9 10

No problem with work — Great difficulty with work

B. How bad has your pain been?

0 1 2 3 4 5 6 7 8 9 10

No pain — Very severe pain

C. How tired have you been?

0 1 2 3 4 5 6 7 8 9 10

No tiredness — Very tired

D. How have you felt when you got up in the morning?

0 1 2 3 4 5 6 7 8 9 10

Awoke well rested — Awoke very tired

E. How bad has your stiffness been?

0 1 2 3 4 5 6 7 8 9 10

No stiffness — Very stiff

F. How nervous or anxious have you felt?

0 1 2 3 4 5 6 7 8 9 10

Not anxious — Very anxious

G. How depressed or blue have your felt?

0 1 2 3 4 5 6 7 8 9 10

Not depressed — Very depressed

Scoring the FIQ: Possible Score Ranges from 0 (No Impact) to 100 (Severe Impact)

1. Question 1: Add the numbers for each check item in Question 1 and divide by the number of scored items. Number of scored items will be 11 unless some are not applicable. Multiply this average score by 0.33.
2. Question 2: Score items in Question 2 in reverse order: 7 = 0, 6 = 1, 5 = 2, etc. Multiply the score for the selected item by 1.43.
3. Question 3: Multiply selected number by 1.43.
4. Question 4: Add all circled numbers together.
5. Add numbers obtained for scoring questions 1–4 for the total FIQ score. Scores >70 represent severe impact.

Appendix H
Pain Drawing

Patient:_____ **Date:**_____/_____/_____

Instructions to patient: Use Fig. H.1 to help describe ALL of your pain complaints. Please shade ALL painful areas, using the following key:

///// for pain
::::: for numbness
*** for burning or hypersensitivity to touch

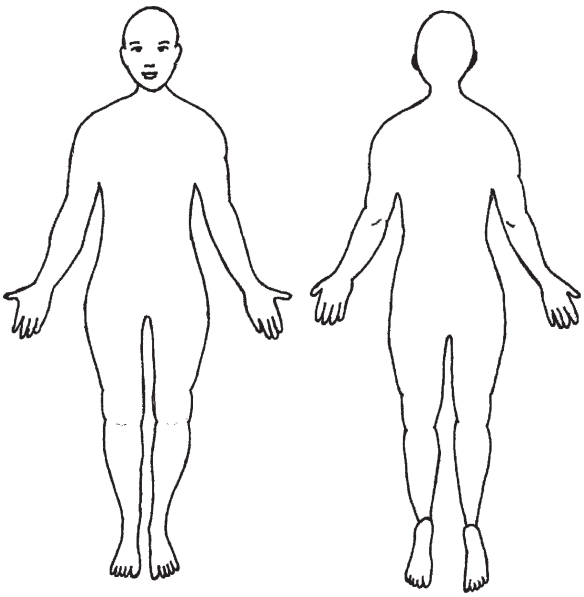


Fig. H1 Pain drawing.

Index