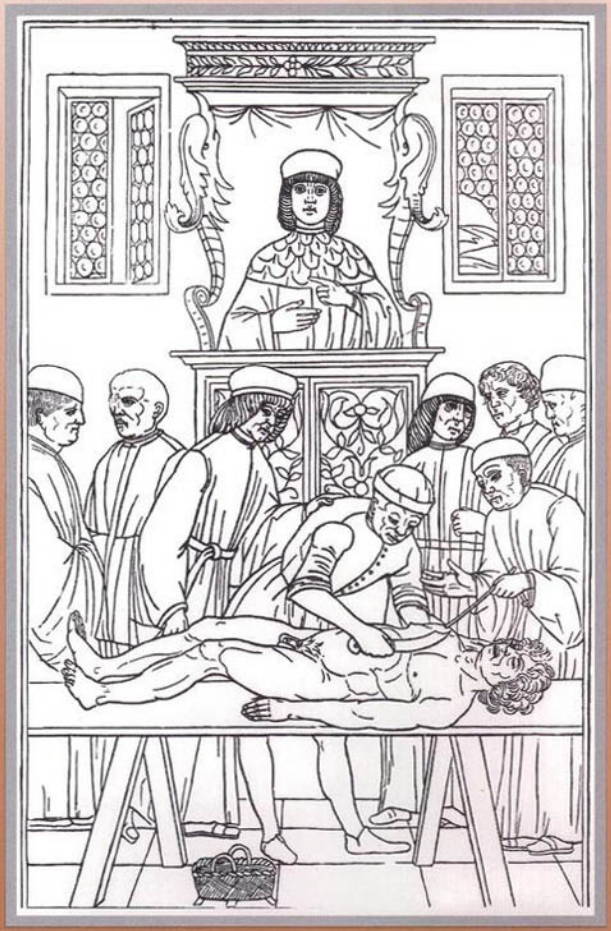
MEDICOLEGAL DEATH INVESTIGATION SYSTEM: WORKSHOP SUMMARY



INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

MEDICOLEGAL DEATH INVESTIGATION SYSTEM

Workshop Summary

Committee for the Workshop on the Medicolegal Death Investigation System

Board on Health Promotion and Disease Prevention

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The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The serpent adopted as a logotype by the Institute of Medicine is a relief carving from ancient Greece, now held by the Staatliche Museen in Berlin.

"Knowing is not enough; we must apply.
Willing is not enough; we must do."
—Goethe

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This report has been reviewed in draft form by persons chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards of objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

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Although the reviewers listed above have provided many constructive comments and suggestions, they did not see the final draft of the report before its release. The review of this report was overseen by **LAWRENCE GOSTIN, J.D.**, Professor of Law, Georgetown University, Professor of Public Health, Johns Hopkins University, Center for Law and the Public's Health, CDC Collaborating Center Promoting Health Through Law, Washington, DC, who was appointed by the Institute of Medicine. Mr. Gostin was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the author committee and the institution.

PREFACE

On first glance, official identification of human remains and certification of the cause of death appear to be mundane endeavors that serve mainly private needs of families, insurers, and litigants. In truth, however, valid and reliable data on the circumstances and causes of deaths serve a variety of important public needs, including fair and accurate adjudication in criminal and civil cases, maintenance of accurate vital statistics, effective public health surveillance and response, advances in health and safety research, and improvement in quality of heath care. The combined task of collecting and interpreting information about circumstances and causes of death has traditionally been called medicolegal death investigation, terminology that reflects the interface of medical science with law and public policy. This "forensic" function has been performed for centuries in all societies, although not always by medical professionals.

Concerns about the adequacy of medicolegal death investigation in the United States have been raised for many decades. The concerns have been voiced by all the constituencies that have a stake in the accuracy of data related to circumstances of death and in the official determinations based on them. For the criminal justice system, concerns about the adequacy of data about deaths merge with general concerns about all aspects of forensic science. Those concerns led the National Institute of Justice to ask the Institute of Medicine to conduct a workshop on the medicolegal death investigation system in the United States. IOM appointed a committee to plan the workshop with the advice and assistance of NIJ, staff of the Centers for Disease Control and Prevention, and other interested constituencies. The workshop was held on March 24-25, 2003, and this report summarizes the ideas and observations expressed at the workshop.

Presentations and opinions expressed at the workshop demonstrated clearly that the current practices of medicolegal death investigation in

this country are in substantial need of improvement. The workshop discussions also showed that accurate data on the circumstances and causes of death (and the identification of human remains) are, in the language of economists, a valuable public good and that much of their value accrues to the benefit of the nation as a whole. To rectify the many deficiencies of the system, it will be necessary to solve many problems, including fundamental issues of financing. The workshop was a starting point for further study and, I hope, for eventual reform.

Richard J. Bonnie

Chair

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INTRODUCTION

The US Department of Justice's National Institute of Justice (NIJ) asked the Institute of Medicine (IOM) of The National Academies to conduct a workshop that would examine the interface of the medicolegal death investigation system and the criminal justice system. NIJ was particularly interested in a workshop in which speakers would highlight not only the status and needs of the medicolegal death investigation system as currently administered by medical examiners and coroners but also its potential to meet emerging issues facing contemporary society in America. Additionally, the workshop was to highlight priority areas for a potential IOM study on this topic.

To achieve those goals, IOM constituted the Committee for the Workshop on the Medicolegal Death Investigation System, which developed a workshop that focused on the role of the medical examiner and coroner death investigation system and its promise for improving both the criminal justice system and the public health and health care systems, and their ability to respond to terrorist threats and events. Six panels were formed to highlight different aspects of the medicolegal death investigation system, including ways to improve it and expand it beyond its traditional response and meet growing demands and challenges.

The workshop was held on March 24-25, 2003. There were six panels that considered the following topics: status, infrastructure and training; professionalism, standards, and quality; a comparison of the medical examiner and coroner systems; medicolegal death

investigation and the criminal justice system; medicolegal death investigation and public health and the health care system; and homeland security and emergency preparedness (See Appendixes A and B).

This report summarizes the Workshop presentations and discussions that followed them. The report identifies the viewpoints of the presenters and discussants; details of their affiliations appear in Appendix B.

The committee was not constituted to draw conclusions or offer recommendations. It was assembled only to oversee the workshop, and it is responsible for the accuracy of this document.

2

OPENING REMARKS

Richard Bonnie

Death investigations are conducted under the authority of state law and local ordinances by either a coroner or a medical examiner, at a minimum, when homicides, suicides, unintentional injuries, deaths caused by drugs or toxic agents, and other deaths not clearly explained by natural causes are involved. Additionally suspicious and unattended deaths and deaths of public health importance might also fall under medicolegal jurisdiction. Official death investigations are reportedly opened in about 20% of annual deaths in the United States. The scope of the investigations, although somewhat variable, generally includes investigation of the scene of the death, collection of evidence, external examination of the body, an autopsy, tests of body tissues or fluids, and the completion of a death certificate that certifies the cause of death.

The purpose of this workshop is to review the system for conducting medicolegal death investigations by taking stock of the present, highlighting problems and issues of concern, and identifying priorities for discussion and possibly for a future IOM study.

There is little risk of dissent in pointing out that there is no such "system" of death investigations, in the same sense that there is no health care system in this country. Instead, the processes and structure of death investigations vary widely according to the

characteristics and practices of distinct jurisdictions. The source of variation is not only state law but also local authority. Responsibility for death investigations rests at the county level for over 2,000 counties.

Remarkably, for well over a century, there has been continuous concern about the lack of standardization in death investigations and about high rates of errors, whether real or perceived. Concern began to be expressed by progressive reformers over the last decades of the 19th century. Even the National Academy of Sciences weighed in—75 years ago. In 1928, the National Research Council's Committee on Medical Legal Problems issued its report, *The Coroner and the Medical Examiner* (1928). The committee was made up of titans of the American legal and medical establishment of that era, including Roscoe Pound, dean of Harvard Law School, and John Henry Wigmore, dean of Northwestern Law School.

The committee stated forcefully, in blunter terms than used today, that the coroner's office is an anachronistic institution, predating the Magna Carta. The office "has conclusively demonstrated its incapacity to perform the functions customarily required of it." The committee recommended that the office of coroner be abolished and be replaced by a well-staffed office of a medical examiner, headed by a pathologist. A key goal of the committee's recommendations was the professionalization of death investigation, with medicine as its center. That vision relied heavily on the training and credentialing capacities of what was becoming modern medicine.

That effort has continues over the ensuing decades. The subspecialty of forensic pathology was recognized in 1959. The National Association of Medical Examiners (NAME) was established in 1966, and the country saw a gradual conversion of offices, from coroners to medical examiners, encompassing half the population.

The goal of this workshop is to obtain a progress report on the transformation to a more professional system—namely, whether the system exploits the full range of tools from medicine and other scientific disciplines, including the development of standardized protocols and access to high specialty technical services and laboratories, to reduce errors. The workshop also addresses this

overarching theme: the capacity of the nation's legal institutions to take maximal advantage of rapidly developing scientific knowledge.

The 1928 National Research Council Committee recommended that medical examiner offices in urban centers have the duty to furnish to the police, prosecutors, and the courts expert medical assistance at every stage of the investigation, prosecution, and disposition of criminal cases of any description. Furthermore, the committee said, cities should establish properly equipped medico-legal institutes under the control of the medical examiner that, as much as possible, would be affiliated with medical schools and universities. By taking such steps, the committee concluded, "the legal system would be better able to utilize the developing scientific knowledge and the information that all of scientific medicine is in the position to furnish to the forces of justice."

The vision of professionalism and affiliation with medical schools and universities was further developed in another special report 4 years later (1932). In 1932, a National Research Council committee reviewed medico-legal institutes that had been formed, especially in Europe. The committee hoped to use the medical examiner's office and the affiliated institutes to broaden the contribution of medical science to all criminal cases, including those involving nonfatal injuries. A key component of the relevant expertise would be scientific criminology that involved psychiatric assessments of criminal responsibility. In its broadest view, the committee's vision was displacement of the process of adjudication altogether and the substitution, in some respects, of scientific inquiry for adversary litigation in the courtroom.

Needless to say, that ambitious vision has not been realized, neither in relation to the crime nor to the criminal. For one thing, there is much less confidence today in the ability of science to solve all the problems of criminal adjudication, not to mention crime prevention and punishment. Today, perhaps, the promise lies more in molecular genetics than in clinical psychiatry, but the nation is still trying to find the best tools for putting science in the service of the law. In its own modest way, the judiciary is adding an important voice to the effort. Through the 1993 Supreme Court decision in the Daubert case[1] and an

[1] Daubert v. Merrell Dow Pharmaceuticals, Inc. 113 S. Ct. 2786 (1993).

unending sequence of decisions in its wake, the courts are taking some steps to try to assure better science in the courtroom. Court decisions aiming to improve scientific testimony have implications not only for the work of experts investigating death but also for all the technical analyses and judgments on which medical examiners or coroners rely.

The topics covered in this workshop are related to how a modern, professional, scientific system of medicolegal death investigation can diversify its role and increase its utility in connection with public health and surveillance. Examples include serving as a sentinel for unusual deaths, serving as a tool for quality improvement in the health care system, and, of course, dealing with the gravest contemporary concerns: bioterrorism and mass disasters.

3

OVERVIEW OF THE MEDICOLEGAL DEATH INVESTIGATION SYSTEM IN THE UNITED STATES

Randy Hanzlick

The medicolegal death investigation system is responsible for conducting death investigations and certifying the cause and manner of unnatural and unexplained deaths. Unnatural and unexplained deaths include homicides, suicides, unintentional injuries, drug-related deaths, and other deaths that are sudden or unexpected. Approximately 20% of the 2.4 million deaths in the US each year are investigated by medical examiners and coroners, accounting for approximately 450,000 medicolegal death investigations annually.

Death investigations carry broad societal importance for criminal justice and public health. Death investigations provide evidence to convict the guilty and protect the innocent, whether they are accused of murder, child maltreatment, neglect, or other crimes. Death investigations aid civil litigation, such as in malpractice, personal injury, or life insurance claims. Death investigations are critical for many aspects of public health practice and research, including surveillance, epidemiology, and prevention programs, most often in injury prevention and control but also in prevention of suicide, violence, or substance abuse. And death investigations are emerging as critically important in evaluating the quality of health care and the nation's response to bioterrorism.

The term *medicolegal death investigation system* is something of a misnomer. It is an umbrella term for a patchwork of highly varied state and local systems for investigating deaths. Death investigations are carried out by coroners or medical examiners. Their role is to decide the scope and course of a death investigation, which includes

examining the body, determining whether to perform an autopsy, and ordering x-ray, toxicology, or other laboratory tests. There are broad differences between medical examiners and coroners in training and skills and in the configuration of state and local organizations that support them. Medical examiners are physicians, pathologists, or forensic pathologists with jurisdiction over a county, district, or state. They bring medical expertise to the evaluation of the medical history and physical examination of the deceased. A coroner is an elected or appointed official who usually serves a single county and often is not required to be a physician or to have medical training. The evolution of today's diverse death investigation system traces back to medieval England.

Historical Origins

Coroners date back to 9th and 10th century England. They were formalized into law in the 12th century under King Richard I (Richard the Lion-Hearted). The king dispatched coroners to death scenes to protect the crown's interest and collect duties (*coroner* is derived from Anglo-Norman *corouner*, the "guardian of the crown's pleas"). Coroner laws were imported into the colonies with the early colonists. For example, the British Colony of Georgia followed British Common Law in 1733; the first state constitution mentioned coroners; and subsequent statutes described coroner duties. The first move toward reliance on a medical examiner took place in 1860 with the passage of Maryland legislation requiring the presence of a physician at the death inquest. Thus, the role of the coroner and medical examiner evolved from a highly decentralized system rooted in local or county ordinances. With awareness of the need for expertise in death investigations, there has been a nationwide trend, since 1877, to replace coroners with medical examiners, but efforts have been stalled since the middle 1980's (Hanzlick and Combs, 1998).

Current Distribution of Coroner and Medical Examiner Systems

Today, 11 states have coroner-only systems, wherein each county in the state is served by a coroner. Another 22 states have medical examiner systems, most of which are statewide and are administered by state agencies. And 18 states have mixed systems: some counties are served by coroners, others by medical examiners,

and still others by a hybrid known as a referral system, in which a coroner refers cases to a medical examiner for autopsy (Hanzlick and Combs, 1998). Approximately, half the US population is served by coroner systems and the other half by medical examiners. Regardless of who runs the system, most death investigations are handled at the county level. Approximately 2185 death investigation jurisdictions are spread across the nation's 3137 counties.

System Variability

The historical origin of death investigations as a local responsibility has led to wide variation in the scope, extent, and quality of investigations. The variability is manifest in the responsible office's organizational placement in the government; statutory requirements, including credentials and training of personnel performing the investigations; and funding levels.

The most common placement for a medical examiner or coroner office is as a separate office of city, county, or state government. About 43% of the US population is covered by this type of system placement. The second most common placement is under a public safety or law enforcement office. The least common placement (14% of the US population) is under a forensic laboratory or health department. Thus, at a time of growing public health needs, few coroner or medical examiner offices have formal relationships with health departments.

The quality of a death investigation system is difficult to assess, but it can be measured with several indicators. One is accreditation by NAME, the professional organization of physician medical examiners. Only 42 of the nation's medical examiner offices, serving 23% of the population have been accredited by NAME in recent years. Most of the population (77%) are served by offices lacking accreditation. Another indicator of quality is statutory requirements for training: about 36% of the US population lives where minimal or no special training is required of those responsible for death investigations (Hanzlick, 1996). In Georgia, for example, the typical requirements for serving as a coroner are being a registered voter at least 25 years old, not having any felony convictions, having a

high-school diploma or the equivalent, and receiving annual training of 1 week.

Funding levels also vary greatly. County systems range from $0.62 to $5.54 per capita, with a mean of $2.6 per capita. Statewide systems are generally funded at lower levels: $0.32-$3.20 per capita, with a mean of $1.41 per capita. Third-party payers generally do not support the costs of operations, nor are there medical billing systems. Funding is almost exclusively from tax revenues. Because of insufficient funding, salaries of medical examiners are much lower than those of other physicians. Lower salaries lead to difficulty in recruiting and retaining skilled personnel.

Major Issues Facing the Medicolegal Death Investigation System

One major issue is the shortage of skilled personnel. Since 1959, only about 1,150 forensic pathologists have been board-certified. There are 41 training programs that can accept approximately 70 forensic residents each year, however, many of those positions remain unfilled. Given that there are 2,000 death investigation jurisdictions in the United States, it is clear that there are not enough board-certified forensic pathologists to meet the nation's public health and criminal justice needs. The shortage of skilled personnel contributes to the overall problem of inadequate death investigations in many jurisdictions. The problem is perpetuated by insufficient funding by local governments for operations and personnel.

The other major issue is readiness of the death investigation system for the growing nationwide demands of public health and criminal justice.

Two emerging issues are ensuring the quality of the nation's health care system, especially for nursing home care, and responding to the threat of bioterrorism.

The medicolegal death investigation system could be improved by:

- *Creating a referral-based medical examiner system*. A county-based (local) system would be best with regard to the need for communication, travel, and investigative response time, but it may

be impossible because of an insufficient population or tax base. A referral-based medical examiner system could improve the function of coroner systems that do not have ready access to qualified pathologists and needed services.

- *Insuring that death investigation systems are headed by trained and qualified medical professionals*. The qualifications of those in charge of and working in death investigations need to be raised at virtually all job levels in many areas of the United States. Inspection and accreditation of systems should eventually be required.
- *Increasing the investment in personnel and facilities*. Increases in medical examiner salaries and incomes. Current salaries are substandard and need to be higher to attract qualified people. Increasing the level of education, training, and qualifications of death investigators, and in modernization of facilities.
- *Revisiting of the Model Postmortem Examinations Act of 1954* (Model legislation developed by the National Association of Counties to promote the shift from coroners to professional medical examiners trained and credentialed in medicine). Death investigation statutes in various states should be more uniform and modernized.

4

INFRASTRUCTURE AND TRAINING

INFRASTRUCTURE OF THE MEDICAL EXAMINER SYSTEM

Victor Weedn

In 2001, NAME conducted an infrastructure study of medical examiner and coroner facilities. In the absence of a nationwide list of those offices, the survey was sent only to individual members of NAME (primarily medical examiners but also some coroners). Some 125 jurisdictions, covering 39 states, replied. The jurisdictions covered a total of 175,000 deaths and 90,000 autopsies per year. The survey dealt with funding, workload, staffing, services, and facilities. Overall, the survey revealed that systems were small, poorly funded, and housed in outdated facilities.

There was wide variation in funding, ranging from $30,000 to $16 million per office. The average expenditure was $1-2 million, which translates to $1-2 per capita. Most offices spent $2,000-3,000 per autopsy. Accredited offices spent more per capita than did nonaccredited offices.

Findings on workload revealed even greater variation. The number of autopsies performed each year, on a per capita basis, varied by a factor of about 40. The average office performed 707 autopsies per year. More than half the offices were doing more than the NAME-

recommended standard of 250 autopsies per pathologist. By that measure, most jurisdictions have heavy workloads. NAME bars accreditation if a pathologist performs more than 350 autopsies per year.

The number of pathologists per office varied from one to 24, and 10% of the medical examiner slots were vacant. Of the 379 pathologists who replied, 80% were board-certified, but the questionnaire neglected to ask whether they were board-certified in anatomic pathology or in forensic pathology. Offices averaged 6.4 death investigators (range, 1- 44). Death investigators work with medical examiners and coroners to obtain and document information on reported deaths, conduct scene investigations, and participate in other parts of death investigations as directed by medical examiners or coroners.

The overwhelming majority of offices had body transport and radiology. Only 37% had in-house toxicology laboratories, and 14% in-house crime laboratories or DNA testing. Spending for toxicology was inadequate: an annual average expenditure of $50,000, including salaries. Many medical examiner facilities were a half-century old, but the average facility was 20 years old; many had inadequate space.

Quality indicators revealed deficiencies. Although 83% had mass fatality plans, only 38% had bioterrorism plans. Slightly less than half of jurisdictions (43%) had both in-house toxicology facilities and death investigators; nonaccredited offices were far less likely than accredited offices to meet this quality measure. Medical examiner and coroner systems need more funding to enhance quality with greater staffing, lower workloads, and modernized facilities.

Training and Certification in Forensic Pathology

Ross E. Zumwalt

Training programs in forensic pathology are monitored by the Accreditation Council for Graduate Medical Education (ACGME), which confers accreditation on the residency program. ACGME carries out its function through residency review committees, one of which is devoted to pathology. The pathology residency review

committee covers not only forensic pathology programs, but all general pathology and other subspecialty programs.

There are 41 forensic pathology training programs with full accreditation and three applications for new programs. The 41 programs sponsor a total of approximately 76 positions; thus, most carry fewer than 2 positions. Most programs are in the coroner or medical examiner office rather than under the institutional umbrella of a medical school. Among the core competencies required of trainees for accreditation is performance of at least 200 but not more than 300 autopsies per year. Those figures are lower than the former requirement of at least 250 but not more than 350 because of the increased complexity of cases and the greater number of tests to interpret.

Manpower is a major concern. Since 1959, about 1,150 certificates have been awarded. In 2002, 34 forensic pathologists were newly certified. The failure rate on the American Board of Pathology examination in forensic pathology has been about 38% but this rate represents a disproportionate number of failures of candidates qualifying for the exam by experience rather than by formal fellowship training. Recent changes requiring all candidates for examination to have formal accredited training are expected to increase the pass rate while ensuring quality. A greater pass rate, however, cannot fulfill the demand for sufficient board certified forensic pathologists for all medicolegal autopsies in the United States. More training programs and more trainees are needed.

Training, Registry, and Certification of Death Investigators

Mary Fran Ernst

The origin of lay examiners who work for medical examiners traces back to the 1950s. In the last half-century, greater training opportunities have emerged, but they remain jeopardized by scant funding. The first formal 1-week training course was offered in 1974 by St. Louis University. Seven states now mandate minimal training requirements for death investigators.

The basic week-long course for death investigators includes death-scene investigation, examination of the decedent at the scene,

estimation of time of death, evidence recognition, notification of next of kin, legal issues, mass-casualty instant response, organ and tissue donation, and testifying in court. There are lectures on the ancillary forensic sciences, such as anthropology, odontology, toxicology, archeology, and forensic psychiatry.

Credentialing of individual death investigators has improved over time. Death investigators can now be recognized as affiliate members of NAME or members of the American Academy of Forensic Sciences (AAFS), a society of diverse professionals dedicated to the application of science to the law. In 1995, NIJ organized the first technical working group to develop national guidelines for scene investigation by death investigators. The guidelines, which were released in 1998, specify 29 essential components of a thorough death scene investigation. Also in 1998, the American Board of Medicolegal Death Investigators was created to certify death investigators. It confers two levels of certification—registry and board certification—and recertifies people every 5 years. The goals of certification are to identify professionally qualified death investigators and to assist the courts and public in assessing their competence. A key threat facing the profession is the overall shortfalls in state budgets. Training funds have been most adversely affected and in some cases eliminated.

Research Issues

Kurt Nolte

The field of medicolegal death investigations is strikingly limited in its research capacity. Only 11% of the nation's 125 medical schools have full-time faculty members who are forensic pathologists—39 total faculty members. Only two are principal investigators on research grants, one other forensic pathologist has some degree of research funding (co-investigator), and the field's research potential is curtailed by a shortage of future researchers. Only 38% of forensic pathology training programs offer any research opportunities to trainees.

In 2002, there were 113 scientific reports in the field's two forensic pathology journals. The vast majority were descriptive studies

in the form of case reports or case series. Only 31 (27%) were experimental (hypothesis-driven) studies. Of the latter, less than one-third (29%) had received funding, mostly from foreign sources. Of the five funded by US sources, none had a forensic pathologist as principal investigator. Over a 3-year period, 1993-1996, Morbidity and Mortality Weekly Report (MMWR) included 48 articles to which a medical examiner or coroner contributed (Hanzlick and Parrish, 1998).

The most frequently cited reasons for lack of research commitment were time constraints, lack of academic institutional support for research in forensic pathology, and isolation from academic institutions. Other reasons were regulations covering confidentiality, poorly standardized data acquisition and information technology, and lack of federal research support.

A small amount of research funding is available from several agencies: the Centers for Disease Control and Prevention (CDC), NIJ, AAFS, and the National Institutes of Health (NIH). The latter has the largest commitment, totaling six studies, but none has a forensic pathologist as principal investigator. Despite the low level of research support, there is an abundance of research opportunities in forensic pathology, largely through collaborations with other fields: epidemiology and surveillance of violent deaths, substance abuse, unintentional injuries, environmental hazards, and infectious diseases. Forensic pathology researchers can also play a key role in research on public health interventions, trauma care, pharmacogenomics, and pathogenesis. Forensic pathology has a treasure trove of research assets including population based epidemiologic data, a window on unnatural deaths, and the only remaining significant source of autopsy tissues. None of the field's research opportunities can be realized, nor can the evidence base of the field grow, without greater funding from federal research institutions.

Toxicology Issues

Alan Trachtenberg

One prime example of the role of death investigations in epidemiology and public health policy is in the arena of substance abuse. Death investigations have been an essential resource for shedding light on a dramatic rise in opioid-overdose deaths during a

10-year period (1985-1995). Epidemiology researchers found that the poisoning death rate in men 35-54 years old nearly doubled in that period, and the drug-related poisoning rate nearly tripled in the same group. About three-fourths of those deaths were caused by drug overdoses (Fingerhut and Cox, 1998). The reasons behind the trend were not well understood, so researchers set out to obtain fuller accounts of the drugs or combination of drugs used in the overdose deaths. What was required was a re-examination and subclassification of more than 1,000 drug-related deaths.

The Substance Abuse and Mental Health Services Administration (SAMHSA—the government agency responsible for surveillance of drug-abuse trends, funding of treatment services, and regulation of methadone clinics serving 200,000 patients in more than 1,000 programs nationwide—wished to understand the trend in substance abuse deaths so that it could shape regulatory policy.

The surge in drug-related deaths in one state, North Carolina, was probed through research collaborations with the CDC. The research uncovered that the source of methadone at the death scene identified by the medical examiner was a tablet form of methadone used in pain treatment. The tablet form turned out *not* to be the same as the type of methadone used in drug-treatment programs. That suggested that the methadone was not being diverted from the state's treatment programs regulated by SAMHSA. SAMHSA and other government agencies could thus focus their prevention and control efforts on the illicit market, which was the source of the methadone tablets. The epidemiologic research and medical examiner involvement in this case was key to defining the nature of the problem and to public health policy. Epidemiologic research using death scene investigations has also been critical in other states and has pointed to a problem with multiple drug use, as distinct from use of single agents (Cone et al., 2003).

Discussion

Discussants voiced their views on the following:

- *Insufficient resources*. Not enough resources are devoted to the field of medicolegal death investigations. Cutbacks in state and local funding have led to elimination of essential ancillary

services, such as toxicologic testing in traffic-related deaths.(*Victor Weedn, Alan Trachtenberg*).

- *Lack of competitive salaries*. Salaries are low, and so impair recruitment and retention of forensic pathologists (*Richard Bonnie, Randy Hanzlick, Ross Zumwalt, Victor Weedn*).
- *Lack of modernized equipment and poor working conditions.* These hamper the field and its development (*Victor Weedn*).
- *Lack of research*. Researchers frequently use medical examiners' data without including the medical examiners as collaborators (*Randy Hanzlick*). Lack of research stymies public health and precludes development of an evidence base for the field itself (*Richard Bonnie, Randy Hanzlick*).
- *Opportunities for growth*. The field has a genuine opportunity for growth because of burgeoning interest by the public health and criminal justice communities. Public health had ignored forensic pathology for years until it began to focus on violence as a public health issue. The time is ripe for greater collaboration with public health and criminal justice, as long as the field expands its manpower through an infusion of funding and trainees (*Marcella Fiero, Alan Trachtenberg*).
- *New forms of financing*. User fees are used in some jurisdictions for select purposes, but they often have idiosyncratic purposes and so fail to promote standardization and comprehensiveness in data acquisition (*Victor Weedn*). A piecemeal approach to disease or injury however, is not a good way to garner resources (*Kurt Nolte*). New forms of financing need to be cultivated for the field (*Richard Bonnie*).
- *Commitment to the field*. Greater efforts are needed to interest first- and second-year medical students in forensic pathology before they begin to commit to other specialties (*Mary Fran Ernst, Kurt Nolte*). Forensic nurses could be used to assist medical examiners and coroners in handling the increasing public interest in addressing nursing home deaths (*Vincent Di Maio*)

5

PROFESSIONALISM, STANDARDS, AND QUALITY

NATIONAL ASSOCIATION OF MEDICAL EXAMINERS ACCREDITATION OF MEDICAL EXAMINER OFFICES

Garry Peterson

NAME began development of its accreditation process when the organization was formed in the 1960s. It recognized the importance of accreditation and quality assurance because of the isolation of most forensic pathology offices. By 1975, the first inspections by NAME were accomplished, and the accreditation process was revised to a checklist format in 1995.

The 1995 checklist contains 294 questions covering 13 topics: facilities; safety; personnel; notification, acceptance, and release; investigations; body handling; postmortem examinations; identification; evidence and specimen collection; support services[2]; reports and records; mass-disaster plan; and quality assurance.

NAME selects individuals who are required to work in a NAME-accredited office and take specific training before qualifying

[2] Photography, radiology, histology, toxicology, clinical chemistry, microbiology, forensic science, consultations

as inspectors. Inspectors scrutinize facilities and provide a report to NAME for accreditation. Deficiencies cited by the inspectors can be of two types: phase 1 deficiencies, which are less serious; and phase 2 deficiencies, which bar accreditation (for example, if a medical examiner performs more than 350 autopsies per year). Full accreditation lasts 5 years. Provisional accreditation is possible if deficiencies are corrected within 1 year (and is renewable each year over the next 5 years). NAME views its accreditation process as a catalyst for improving offices throughout the country. But unlike hospital accreditation by the Joint Commission on Accreditation of Healthcare Organizations, for example, accreditation by NAME is not a requirement for funding of medical examiner and coroner offices.

NIJ Guide for Death Scene Investigations

Steven C. Clark

In 1998, NIJ promulgated the first guidelines for death-scene investigations. The publication was the culmination of a 5-year process that had been triggered by a national needs-assessment survey: in 1994, 60% of medical examiners and coroners had reported their dissatisfaction or extreme dissatisfaction with the level of investigative service that they received, either externally or internally. CDC and NIJ funded the development of the guidelines. The guidelines were reviewed by the National Medicolegal Review Panel, a review group of 263 members in 46 states. The guidelines cover 29 specific kinds of duties and 148 tasks.

To translate the guidelines into action, performance criteria for each were established. A trainer curriculum was later developed and implemented at instructor-training academies. The purpose of the academies was to establish a core of certified trainers skilled in both investigative and pedagogic skills. The academies also offer continuing education to medical examiners, coroners, and law-enforcement personnel.

When the guidelines were tested on 100 coroners and deputy coroners in Indiana, researchers from Occupational Research and Assessment, Inc. found that nearly 80% failed the examination. The dismal results prompted Indiana to mandate training programs for death-scene investigation. Later tests in other states revealed similar

failure rates. Coroners with medical backgrounds (other than forensic pathologists) performed as inadequately as did coroners.

Quality Assurance in Medical Examiner Practice

Ross E. Zumwalt

Formal programs in quality assurance for medical examiner practice are in their infancy. Most states do not require quality assurance in statute or regulation. A review of 2000 articles in forensic professional journals revealed only one article on the topic; it was a proposal for an autopsy-protocol review rather than a formal evaluation of a quality-assurance program.

NAME accreditation requires a quality-assurance program, but it does not specify the type of program. It merely requires a written policy or standard operating procedure that is scheduled and implemented regularly, with documentation of corrective action for identified deficiencies. The American College of Pathology and the American Society of Clinical Pathology have various types of exercises for individual pathologists. They typically consist of several case histories, microscopic slides, and questions to answer. But these efforts are voluntary and infrequently used.

More systematic efforts are needed for in-house evaluation. The two most common methods are conference reviews and random case reviews. Conference reviews are regularly scheduled conferences held to discuss difficult cases. An interested pathologist presents a case, and then it is discussed. Some offices vote on the determination of death and keep logs of the case reviews.

A more valuable direction is random case reviews, which are endorsed by NAME. Random case reviews can be accomplished by a group or by an individual, anonymously or not. A pathologist other than the one who worked on the case reviews the entire case file—the autopsy report, the microscopic slides, x-ray pictures, police reports, and medical records. Then he or she fills out a checklist and gives the form to the pathologist who performed the original autopsy. However, there is no method for assessing the effectiveness of this program, that is, whether the reviews improve the quality of investigations.

One possible mechanism for quality assessment is case-type reviews. Similar cases are grouped according to cause of death (such as drug-related deaths or drowning) to determine how consistently they are handled. Another mechanism is an undetermined-cause-of-death review, in which an office takes every case of an undetermined cause of death and assigns it for review.

Discussion

The overarching barrier to professionalism and quality, according to several participants, is budgetary. Lean budgets leave insufficient funding for training and for programs in quality assurance. An office's budget is the most important determinant of the number of autopsies that it performs in a given year—not the scientific evidence from the scene (*Steven Clark, Vincent Di Maio, Kris Sperry*).

The discussion focused on ways to promote greater commitment to quality assurance, especially for coroner offices that lack NAME accreditation, including

- Setting up a dedicated fund for training by charging the public $1-2 per death certificate (*Steven Clark, Mary Fran Ernst*).
- Promoting professional partnerships across small offices in remote locations with offices that more well-staffed (*Ross Zumwalt*).
- Raising awareness by challenging incumbent coroners' lack of training during county elections (*Steven Clark*).
- Encouraging states to require coroners and medical examiners to complete training courses, and to set up a coroners-training board with responsibility for maintaining standards (*Steven Clark*).

A final discussion item focused on the type of quantitative outcome measures that could be used to evaluate the efficacy of quality-assurance programs. One approach was case-type reviews (such as accidents or electrocutions) that compare each case type with an office's own guidelines for that type. Several participants did not feel that winning or losing a legal case would be a good outcome measure of a quality-assurance program (*Kurt Nolte, Garry Peterson*).

6

COMPARING MEDICAL EXAMINER AND CORONER SYSTEMS

Advantages and Disadvantages of the Medical Examiner System

Marcella Fierro

There are numerous advantages of instituting a medical examiner system, especially a statewide system. Virginia's statewide medical examiner system is decentralized: it has a chief administrative officer and four regional offices. Other statewide systems, such as those of New Mexico or Rhode Island, are centralized. The degree of centralization should be dictated by state geography, demographics, and ease of administration; but whether centralized or decentralized, medical examiner systems are highly desirable in comparison with coroner systems and mixed systems.

The major advantages of a statewide medical examiner system are the quality of death investigations and forensic pathology services and their independence from population size, county budget variation, and politics. Certification of death is accomplished by highly trained medical professionals who can integrate autopsy findings with those from the crime scene and the laboratory. The professionals have core competency in assessing immediate and earlier medical history, interviewing witnesses, and physical examination. The recognized excellence of and confidence in a medical examiner system in Virginia

have been vital for adjudicating the state's death penalty cases and for prompt payment of insurance claims.

Another major advantage of a statewide system is uniformity. Virginia's uniformity comes from its statute covering types of cases automatically in the jurisdiction of the medical examiner. One example, set to take effect in 2003, is automatic referral of all deaths in state mental institutions. High-profile investigations had uncovered abusive practices in the handling of patients in those institutions, which resulted in preventable deaths. Automatic referral to medical examiner offices was instituted by the state legislature to promote more humane treatment and avoid abuses. Uniformity also covers credentialing, training, and continuing education of medical examiners and death investigators; coding of deaths; access to case files through archive and retrieval policies; criteria for exhumation and disposition of unclaimed bodies; and appeals processes. Those features benefit not only death investigations but also public health epidemiology and surveillance. Virginia's office reports to the legislature each year on child fatalities, family violence, and domestic violence. The state office is striving to set up a new information-technology system that will permit greater access to its data; the goal is to develop a system with great utility not only for criminal prosecutions but also for epidemiologic and surveillance purposes.

A final set of advantages of a statewide system are related to central administration. A statewide system like that in Virginia can have statewide guidelines for case management and death scene investigation. It also can have 24-hour consultation with any site in the state, which is an especially important feature for isolated areas with little experience. Furthermore, a large cadre of forensic pathologists (Virginia has 13) gives the state the flexibility to shift manpower in case of a mass disaster. Centralized administration can sustain the cost of central laboratories, and it can take advantage of economies of scale and purchasing power. Virginia's centralized administration devotes personnel to writing grants, which can be extremely time-consuming.

The growth of Virginia's centralized system depended heavily on obtaining seed money from federal grants expressly for infrastructure. Virginia's system was awarded $8 million in 1970 to establish a forensic science laboratory and a DNA laboratory. The DNA databank, which stores data on 200,000 people, has proved

valuable to law enforcement. Virginia's centralized system was expensive to start but is inexpensive to sustain; it spends $0.79 per capita, which is less than many other jurisdictions spend. The first wave of infrastructure grants was discontinued decades ago, but Congress passed the Coverdell Act/National Forensics Science Improvement Act (NFSIA) in 2000. Still, the current appropriation level under the act is only about $5 million for all 50 states. When Virginia recognized that it would be eligible for less than $100,000 under the legislation, it decided that the funding was too meager to justify the cost of writing a grant application.

A centralized medical examiner system also poses challenges. It requires strong leadership, attention to state budget priorities and competition with other public health and criminal justice programs, and human-resource management to ensure recruitment and retention of multiple types of professionals.

An ideal statewide system has a medical examiner system to a medical school and subspecialty pathologists, forensic science laboratories and scientists, and public health systems and laboratories. Such proximity facilitates sharing of knowledge, system refinement, and access to new technologies.

In addition to grants for infrastructure, the most efficient expenditure of federal funds would be for uniform data elements collected in a way that allows easy comparability across jurisdictions and that could be used by all coroners and medical examiners nationwide.

Advantages and Disadvantages of the Coroner System

Carl Parrott

The major differences between coroners and medical examiners are embedded in the manner of their selection—by electoral process versus appointment—and their professional status. Coroners are elected lay people who often do not have professional training, whereas medical examiners are appointed and have board-certification in a medical specialty. The coroner system has advantages, but they are heavily outweighed by its disadvantages. [The speaker is a forensic pathologist who was elected coroner in Hamilton County, Ohio. His

office is a regional facility that provides forensic services to surrounding counties on a fee-for-service basis. Services cover autopsies, examination of firearms, serology, toxicology, and others.]

The major advantages of the coroner system concern autonomy, access to power, and the ability to represent the will of the electorate. As an elected official, a coroner has the power to make decisions and has equal footing with other local elected officials. That places the coroner in a strong position to withstand political pressures imposed by other elected officials and to compete vigorously for the office's budget allocation. Furthermore, due to their English commonlaw origins, coroners also have subpoena and inquest powers. Finally, being an elected official resonates with American political culture, which views elected officials as the best representatives of a community's needs and values.

Two important disadvantages are that coroner systems are less likely to be medically proficient and that their structure often reflects piecemeal legislative reaction to inadequacies, rather than intelligent design. The coroner system is steeped in the vagaries of history rather than in a forward-looking, planned system that capitalizes on professional depth and knowledge. Coroner statutes are less specific about which types of cases are reported or investigated, and they tend to reflect the lowest common denominator in the qualifications of the office holder and the quality of investigations. The coroner may be deficient in knowledge and may have conflicts of interest; especially when funeral directors, prosecutors or sheriffs act as coroners. As elected officials, they cannot be dismissed for incompetence, except by the electorate after highly visible transgressions.

The coroner position as derived from England is specifically a county official. The county nature of the coroner system is a fundamental flaw as applied to the U.S. because the jurisdictional base is often too small to support a modern medicolegal office. The result is that coroner systems vary widely, with many counties having only a part-time elected coroner with few resources for operations or even training. The creation of medical examiner systems permits governments to consider regional or state systems that can provide more uniform coverage in an efficient manner. Ohio counties vary by a factor of 30 in the number of autopsies they perform. The key

determinant is the resources of the county, as opposed to the circumstances of the cases. Cities have far greater resources than rural areas. The homicide rate is higher in cities, but homicides are less frequent than injury and suicide deaths, which vary less between urban and rural areas (2002). Thus, the variability in circumstances of death between urban and rural counties cannot account for the enormous spending disparities. Other disadvantages are poorer quality of coroner investigations, poorer integration across jurisdictional boundaries, poorer information transfer, and poorer information-gathering.

A coroner system can approximate the high quality of a medical examiner system, but greater impediments stand in the way.

Discussion

The discussion focused on the scientific and administrative advantages of medical examiner systems over coroner systems (*Thomas Pearson*).

One key outcome of this workshop could be national endorsement of the abolition of the coroner system and endorsement of the establishment of greater professionalism through a medical examiner system (*Ellen Clark*). The endurance of the coroner system is best explained by voter inertia, lack of awareness of the problem, and high capital expenditures for system start up (*Carl Parrott, Vincent Di Maio*). Transformation in individual jurisdictions from a coroner to a medical examiner system will not solve the disparities within a state unless the commitment to reform is undertaken statewide through legislation (*Carl Parrott*). It is difficult for states to make such changes, because elected officials find it unpopular to promote removal of elected officials from office and state constitutional amendments may be required in some states even if a change might impact only one county (*Randy Hanzlick*).

The NFSIA could be used by states to move to a medical examiner system (*Randy Hanzlick*). To be eligible for funding for infrastructure grants, a state is required to have accreditation or to show progress toward accreditation; financial incentives for accreditation and the possibility of sizable awards of infrastructure grants might give states sufficient motivation to transform their system (*Marcella Fierro*). Furthermore, NAME has formed a committee to

work with the American Bar Association to determine how the 1954 model legislation could be updated with state systems to incorporate scientific advances of the last 50 years (*Victor Weedn*). Efforts to abolish coroner systems in Georgia were propelled by the Georgia Association of County Commissioners, which passed a resolution to eliminate the coroner offices on the basis of cost and inefficiency (however, the elimination of coroner offices has not been realized) (Kris Sperry).

7

MEDICOLEGAL DEATH INVESTIGATION AND THE CRIMINAL JUSTICE SYSTEM

THE VALUE OF MEDICAL EXPERTISE IN DEATH INVESTIGATION

Vincent Di Maio[3]

Medical expertise is crucial in death investigations. It begins with body examination and evidence collection at the scene and proceeds through history, physical examination, laboratory tests, and diagnosis—in short, the broad ingredients of a doctor's treatment of a living patient. The key goal is to provide objective evidence of cause, timing, and manner of death for adjudication by the criminal justice system.

The value of medical expertise is apparent in the screening process. In one county, for example, 8,000 cases are reported to the medical examiner's office, but only 2,000 are accepted. Screening, which eliminates three-fourths of potential cases, must be handled in a scientifically defensible manner by people with medical training, knowledge, and objectivity. The medical examiner's office is especially important in subtler cases of criminal activity, where there

[3] Dr. Di Maio's presentation was impromptu as he took the place of Dr. Hirsch who was unable to attend the meeting.

is a possibility of a missed homicide. Such cases often are not aggressively pursued by either police or non-medical coroners. Confronted with the death of a 30-year-old woman, who dies apparently of a heart attack, a lay coroner would most likely not do an autopsy, but a medical examiner would, given its medical implausibility. Similarly, many lay coroners do not autopsy burned bodies, but a medical examiner would investigate the possibility of homicide masked as an accident. By interviewing, the medical examiner might uncover evidence of a crime.

A medical examiner brings important skills to the interview of next of kin and others who provide a medical history.

Scientific Evidence in the Courtroom: Introductory Comments

David H. Kaye

One of the most important issues facing the legal system is the development of a credible and objective process to determine which deaths to investigate, how to investigate them, what constitutes a thorough investigation, and how to keep suspicious deaths and homicides from being overlooked. Accurate evidence from a death investigation should be used in court to convict the guilty and protect the innocent.

Our current legal system has two problems. The first is its adversarial nature: expert witnesses can be pressured, or selected, to take one-sided positions. The courtroom can be turned into a battle of experts, which is highly confusing to a jury. How can the system be structured to produce objective evidence that will not produce such battles?

A second problem arises from the disparity in resources between criminal prosecution and defense. It is a rarity for the defense to mount its own death investigation with the same resources as the prosecution. If the prosecution's coroner or medical examiner is negligent, biased, or inept, miscarriages of justice are inevitable. In an egregious example, a pathologist in Texas single-handedly performed 450 autopsies a year for 40 Texas counties. Exhumations of some of the corpses revealed an absence of marks on the bodies, indicating that no autopsy had been performed. The system needs to be structured in

such a way as to prevent miscarriages of justice or to capture them early in the process.

The Prosecutor's Perspective

Jeff Dusek

San Diego County has a medical examiner's office with six board-certified forensic pathologists and 15 death investigators. It has a toxicology laboratory with six bachelor's-level toxicologists overseen by a doctoral-level toxicologist. It has access to forensic dentists, forensic entomologists (who can determine time of death by the types of fauna on the corpse), and a forensic anthropologist for skeletal remains and it has sexual-assault response nurses for homicide victims who have been or are suspected of having been sexually assaulted.

After each homicide or suspected homicide, the medical examiner and an investigator go to the scene. Their tasks are to examine the body and to survey the scene for vegetation. The medical examiner directs the death investigator and assumes responsibility for transporting the body from the scene to the medical examiner's office. Photographs of the scene are taken by the medical examiner and the police. At autopsy, a second medical examiner signs off on the report; this is a critical backup system in case the original medical examiner is not available for testimony.

A prosecutor looks to the medical examiner's office for accuracy, promptness, and the ability to state opinions clearly in court. Accuracy must prevail as to the manner of death, the cause of death, and the time of death. Because of California's legal requirements for a quick preliminary hearing, San Diego County requires its medical examiner's office to perform the autopsy within 24 hours of finding the body. The autopsy report must be generated within the 10-day period after someone has been charged and before his or her preliminary hearing. San Diego County allows a defense medical examiner to participate in or watch an autopsy. The latter rarely occurs because of the timing; the defendant is usually unable to identify and retain a medical examiner within 24 hours. The prosecutor's advice to the medical examiner is to simplify the investigation for the jury, make it understandable, and make it persuasive. Visual aids and diagrams

are valuable. It is also important for medical examiners to restrict their testimony to what they are comfortable with without extending themselves in a way that leaves them open to cross-examination by a defense lawyer.

All the features of a strong and credible medical examiner's office were on display in the notorious case of child abduction. A suspect was charged even before the child's body was found. When the body was found several days later, the death investigation had to proceed quickly during the 10-day window before a preliminary hearing. The medical examiner, presented with a badly decomposed body, summoned the on-call forensic entomologist and dentist. The dentist was able to identify the victim and ruled that suffocation was the cause of death; some of the victim's teeth were missing, and the forensic dentist attributed that to their falling out from the pressure of suffocation. The case was successfully prosecuted on the basis of the quality of the medical examination. The only testimony that the jury requested be reread was that of the medical examiner and the entomologist. When asked why they concluded as they did, the jurors responded that "the medical examiners were the objective fact finders in the case. We relied upon them."

The Defense's Perspective

Barry Scheck

There is a crisis in this country with respect to the quality of death investigations. Many errors lead to convictions of innocent people. The Innocence Project was created in 1992 as a nonprofit legal clinic representing inmates with legitimate claims of innocence. The project undertakes postconviction DNA testing of samples from each case. If it does not find a match with the DNA from the crime scene, the project works pro bono to secure convicts' release from prison. Since 1992, the project has exonerated 125 people wrongfully incarcerated. The project has exposed substandard practices even in accredited crime laboratories.

The field of medicolegal death investigation should work to widen as much as possible what the legal profession calls "scientific facts". Scientific facts are observations that do not require interpretation, such as the position of the body, identifying marks, and

results of analysis of blood and other physical evidence. There should be no differences between the defense perspective and the prosecution perspective on scientific facts. The only medical examiner findings with potential for debate should be the manner and cause of death, because they require interpretation of facts.

One particular subject in which the quality of death investigations needs vast improvement is childhood death from shaken-baby syndrome. That syndrome is an extremely serious form of abusive head trauma associated with high morbidity and mortality (Duhaime et al., 1998). It occurs after a child has been subjected to acceleration, deceleration, and rotational forces that produce a cluster of intracranial, intraocular and cervical-spinal injuries. Shaken-baby syndrome has been difficult to study with postmortem examination partly because the syndrome spans many specialties, including pediatrics, neuropathology, and biomechanics. There continues to be disagreement about the nature and type of impact needed to produce the syndrome. An assessment by the National Academy of Science might help to defuse scientific controversy. There may continue to be scientific disagreement about causation, but several people have been wrongfully charged or convicted on the basis of incompetent death investigations.

To ensure the quality and integrity of death investigations, medical and criminology professionals should form institutions that are truly independent. It is not sufficient for a program to have accreditation and training. The institutional framework should be deeply embedded in academe—not be a stepchild of medical schools—and it should be independent, not under the control of the prosecution. Placement in academe will help to ensure sound science and ensure that the latest technological and scientific developments are incorporated into criminal forensic investigation.

The Role of the Crime Laboratory in Medicolegal Death Investigations

Susan Narveson

The crime laboratory provides assistance in two key parts of medicolegal death investigations: personal identification and

determination of cause of death. Personal identification can be accomplished through analysis of DNA and fingerprints. Determination of the cause of death can be aided by laboratory analysis of firearms, toolmarks, controlled substances, and toxic substances. The crime laboratory can also draw on national databases of DNA (the Combined DNA Index System), fingerprints (the Automated Fingerprint Identification System) and ballistics (the National Integrated Ballistics Identification Network).

Factors that affect whether a medical examiner or coroner office takes full advantage of a crime laboratory include its proximity and working relationships, knowledge of which laboratory services are available, the workload of the crime laboratory, and knowledge of the laboratory's requirements for sample collection, packaging, and preservation. Careful handling of specimens is important in guarding against contamination.

The utility of the crime laboratory in death investigations can be improved by promoting effective partnerships with medical examiner and coroner offices; by encouraging discussion of the range, value, availability, and use of crime laboratory capabilities; and by supporting the development of procedures that maximize the contribution of the crime laboratory's expertise.

Adequacy of Expertise and Services Available to Death Investigations

Mary Fran Ernst

Several types of professionals apart from the medical examiner or coroner serve death investigations. Each type has its own credentialing organization, but a general observation is that the professions are aging.

The medicolegal death investigator is an agent of the medical examiner and is generally the first point of contact for law enforcement. That person is responsible for determining the details of the death and for assisting in the scientific identification of the deceased and in locating and notifying next of kin. The American Board of Medicolegal Death Investigations has two levels of credentials. There are 635 registered and another 60 board-certified

death investigators. They are an average of 40 years old—somewhat younger than the rest of the professionals in the field.

Toxicologists can be certified by the American Board of Forensic Toxicology. The board has two levels of certification: board-certified toxicologist and forensic-toxicology specialist. About 185 people are certified at one of those levels.

Forensic odontologists apply dental science to the identification of human remains and make bite-mark comparisons by using both physical and biologic evidence. They are required to have a doctorate in dental science and specialized forensic training. About 90 people are certified by the American Board of Forensic Odontology.

Forensic anthropologists are physical anthropologists who assist in the identification of skeletal remains. They can determine whether the remains are of human or animal origin; the deceased person's sex, age, and race; marks of trauma and occupational stress; and health status. Many are also trained in archaeologic procedures. They are often used in facial reproduction when only the skull of the deceased person remains. The 64 people certified by the American Board of Forensic Anthropology are an average of 44 years old.

Eight forensic entomologists are certified by the American Board of Forensic Entomology. They study insects and other arthropods to identify the time of death, and, to help to determine the location of death, they can analyze whether fauna are indigenous or foreign to the site where the body was found. There is a crucial need for investigators at the scene to collect specimens properly and preserve them for transport to one of those eight certified forensic entomologists.

DISCUSSION

Infrastructure Funding

Several participants reiterated the need for more federal funding for infrastructure (*Kurt Nolte, Marcella Fierro, Randy Hanzlick, Victor Weedn*). Because both prosecution and defense value the accuracy and integrity of death investigations, they are natural

allies in to advocating for higher funding levels for infrastructure under the NFSIA (*Tom Andrew)*.

Wrongful Convictions and Oversight Mechanisms

Greater understanding of the circumstances of wrongful convictions is imperative (*Richard Bonnie, Barry Scheck, Garry Peterson*). The Innocence Project is undertaking systematic study of the nature of forensic science errors in its cases of successful exonerations; the study is also examining errors in witness identification and false confessions (*Barry Scheck*). Through several state task forces, the American Judicature Society is looking at wrongful convictions to determine how to improve the overall system (*Susan Narveson*).

Professionals involved in death investigations need to be more active in trying to understand the problem of wrongful convictions and in supporting organized efforts to expedite disciplinary actions incompetent members of the profession and those engaged in fraudulent practices; in several cases, years elapsed before successful action was taken, although many were aware of, but failed to organize action against, the incompetent or fraudulent member (*Barry Scheck, Vincent Di Maio, Tom Andrew*). Judicial authorities are not aware of the importance of valid scientific testimony (*David Kaye, Garry Peterson*), and the field has not organized itself sufficiently to undertake disciplinary action against bad actors (*Vincent Di Maio, Tom Andrew*). There needs to be greater oversight of the field of death investigation by the medical and judicial communities through independent institutions (*Barry Scheck, Tom Andrew*). New York established a Forensic Science Review Board, which includes judges and defense lawyers, to oversee all crime and forensic laboratories in the state (*Barry Scheck*). That so many professional credentialing boards are involved in the field of death investigation means that peer review has a potential role in disciplinary action (*Richard Bonnie*).

Organizational Placement of Medical Examiner Offices

There are many instances of potential or actual conflict of interest between coroner or medical examiner offices and law enforcement (*Ellen Clark*). In some counties and states, the coroner is

also the district attorney; and in many locations, the medical examiner hires death investigators that are currently employed or retired law-enforcement officers (*Ellen Clark, Mary Fran Ernst*). During training, educators should make students aware of the potential for conflict of interest (*Ellen Clark*) and the limits of their knowledge in a particular field and the understanding of the roles played by other professionals in the legal process (*Richard Bonnie*).

To ensure their independence, objectivity, and integrity, medical examiner offices should be removed from departments of public safety (*Garry Peterson*). They should be independent agencies associated with academic institutions (*Barry Scheck*).

Forensic Epidemiology

Forensic epidemiology is a relatively new subspecialty of epidemiology (*Steve Hargarten, Kurt Nolte, Marcella Fierro*). It began to emerge in importance in the context of toxic-tort litigation, in which epidemiologists would discern patterns of cases that were not detected by physicians (*David Kaye*). The field branched into hospital deaths by examining correlations between staff and times of death (*Vincent Di Maio*). It later grew with public health interest in family and interpersonal violence and in substance abuse (*Marcella Fierro, Carl Parrott*).

Several high-profile medical examiner offices have created positions for forensic epidemiologists in research or surveillance. For example, New Mexico recently hired an epidemiologist to work on a bioterrorism mortality surveillance project. The Maryland medical examiner's office has a staff epidemiologist to study deaths in firefighters and an epidemiologist in the Office of the Armed Forces Medical Examiner, is developing a military mortality database. (*Kurt Nolte*). Virginia's forensic epidemiologist performs surveillance of child fatalities and family violence (*Marcella Fierro*); the surveillance function emerged from awareness that 29 children in the state witnessed their mothers' murders, and the surveillance data were critical in drawing attention to a hidden public health problem and the importance of protective orders and stalking laws (*Marcella Fierro*).

8

MEDICOLEGAL DEATH INVESTIGATION, PUBLIC HEALTH, AND HEALTH CARE

THE USE OF MEDICAL EXAMINER AND CORONER DATA FOR PUBLIC HEALTH SURVEILLANCE

Dan Sosin

Medical examiner and coroner (ME/C) data hold great potential for public health surveillance and, ultimately, public health intervention. But barriers stand in the way of adopting a national surveillance system that uses common data elements from ME/C offices. Understanding the value of ME/C data for public health and surveillance and the barriers to developing a national system might be appropriate for an IOM study.

ME/C data have a proven ability to detect clusters and unusual deaths. They can be probed more deeply by using the detailed information collected during a death investigation. The data might be used to discern risk factors that are key to developing preventive interventions. If tissue is banked, it can be analyzed to characterize the natural history of a new and emerging illness, such as those caused by hantavirus or HIV. Finally, ME/C data can yield timely and specific information about an unfolding epidemic. The data provide considerable potential—in real time—for addressing terrorism and bioterrorism.

The value of a nationwide ME/C surveillance system was dramatically illustrated with respect to a previously unknown and preventable public health problem: children's deaths from entrapment in car trunks. Over a 2- month period in 1998, 11 child deaths were identified through death investigations in three states: New Mexico, Utah, and Pennsylvania. The cluster of cases triggered a broader investigation, which uncovered a total of 21 deaths nationwide from 1987 to 1999. That investigation led to identification of the major risk factor: children's inability to get out of a car trunk. An expert panel was convened by the National Highway Traffic Safety Administration (NHTSA), and it recommended an interior trunk release. NHTSA responded by setting a new safety standard for automobile manufacturers in September 2001. That example illustrates that over a 3-year period surveillance can be actively translated into a new public health intervention, once a risk factor is found. If the case cluster had not been identified by pooling data from many jurisdictions, an opportunity to prevent deaths of children would have been lost.

There are major impediments to the development of a national surveillance system with ME/C data: variability in data quality with respect to training and experience, investigation procedures, and reporting requirements (for example, common nomenclature); variability in technology and standards; and the lack of policies for data interchange. To determine the extent of the child-entrapment problem, for example, CDC searched media databases because there was no standardized means of tallying the cases across all ME/C offices.

An IOM study could help to spearhead standards for death investigation. Standards are the key to reducing the high variability in data quality. They could cover death investigation practice and data collection, storage, and exchange of data. IOM could assess the feasibility of an integrated information system, including how long it would take to establish and what types of resources and steps would be necessary. IOM could also provide an independent and systematic assessment of the benefits and costs of a national system to improve all death investigations. IOM's credibility comes from its expertise and its independence. For almost a century, there has been widespread agreement that the current system is inadequate. An IOM study could

help to elucidate understand the barriers to and build momentum for systemwide transformation.

Medical Examiner and Coroner Data for Public Health: A Model Linked System

Steve Hargarten

ME/C data serve as the cornerstone for a model surveillance system in the injury field— the Violence Fatality Reporting System (VFRS). That system was launched as a result of a recommendation in the IOM 1999 report, *Reducing the Burden of Injury: Advancing Prevention and Treatment* (1999a). After being piloted in Wisconsin, the system has now expanded to cover six states.

The VFRS is a partnership that links ME/C data, law enforcement data (such as, crime reports), and crime-laboratory data, including those on ballistics testing from the Bureau of Alcohol, Tobacco, and Firearms. The system was modeled after NHTSA's Fatal Analysis Reporting System, which has been in operation since the 1960s to study trends in circumstances of fatal motor-vehicle crashes.

Wisconsin's role in the VFRS dates back to 1994, when the speaker (an emergency-room physician) approached the Milwaukee medical examiner. The first meeting spawned a partnership among agencies. The system now contains nearly 20 data elements on the victim, the environment, and the agent (such as, a firearm). Data elements from the ME/C office include victim demographics, cause of death, alcohol and drug use, wound information, and circumstances of death. This linked dataset is a treasure trove for understanding trends and risk factors associated with firearm homicides and suicides and for evaluating the impact of different prevention strategies in curbing firearm deaths.

Quality of Death Certificate Data

Robert Anderson

Data from death certificates have well-recognized strengths and weaknesses. Their strengths are universal coverage, uniformity in content and format, and standardization in coding, processing, and

data presentation. Their weaknesses are of two types: classification and coding errors and certification errors. The former can be addressed by the National Center for Health Statistics (NCHS), which is the CDC center that compiles death-certificate data submitted by each state's vital-statistics office. The most important classification and coding errors pertain to the Word Health Organization's *International Classification of Diseases* (*ICD*) (now in its 10th revision) which sets criteria for selecting the underlying cause of death. Errors in *ICD* coding are handled by the Mortality Reference Group, an international committee that deals with proposals for changes in *ICD* mortality coding. Its recommendations are translated to the field through annual updates to the NCHS automated coding systems.

Certification errors cannot be readily addressed by NCHS. The foremost errors are inclusion of uninformative information on modes of death. For example, cardiac arrest is mentioned in 0.6% of deaths, but this is uninformative. Although NCHS discourages its use, the rate has not dropped over the last decade; this is one indication of continuing quality problems with death-certificate data. Other types of certification errors are an implausible sequence in the listed causes of death, late or unfiled amendments to original death certificates, and incorrect diagnoses.

Various studies have attempted to determine the frequency of incorrect diagnoses. Their findings have been highly variable, depending on the disease studied, and on the studies methodology, geographic coverage, and results. The problem is that there is no gold standard, such as, the actual cause of death with which to compare a reported cause of death. In the absence of a gold standard, studies can assess the reliability of death-certificate data by comparing them with autopsy records or medical records. Such studies have shown greater reliability for some causes of death—cancer and external causes—than for others, such as digestive diseases. Another way to assess the quality of data is to monitor trends in unknown causes of death and ill-defined conditions. Increasing rates would indicate a growing problem in data quality.

NCHS is interested in investigating whether the type of certifier—physician, medical examiner, coroner, or, in some jurisdictions a nurse practitioner—affects the reliability of the coded data. That kind of analysis is not yet possible, because NCHS does not

collect identifying information on the certifier. But it will be possible with the introduction of a new standard death certificate. The new certificates are already being used in some states in 2003, but they will not cover all US states and territories until 2006. NCHS will be working to improve the quality of the new certificates through better and clearer instructions, physician education and training, more timely filing of amendments, electronic death registration, and querying the states about cause of death. When a physician or other certifier writes "cardiac arrest" on a death certificate, for example, NCHS will electronically prompt the provision of more information or reexamine what has been coded.

Medical Examiner and Coroner Information Systems: Making the Case for Standardization & Integration

Samuel Groseclose

In 1986, CDC created its Medical Examiner and Coroner Information Sharing Program. The goal of the program has been to facilitate the utility and availability of ME/C data. Among other activities, the program published in 2000 an assessment of the ME/C information systems in six US jurisdictions, including two states (New Mexico and North Carolina). The assessment (unpublished) was designed to examine the relationship between death investigation and the information-collection activities used for surveillance.

The assessment found common processes and information content but wide variability in the vocabulary used to capture the same content and in the expertise and resources devoted to information technology. ME/C offices were found to have little capacity for information management and dissemination, despite the fact that at least 16 other agencies used their information. The "customers" of the data spanned local and state agencies, and national data systems of the Department of Justice, the Department of Health and Human Services (DHHS), the Department of Transportation, the Department of Labor, and the Consumer Product Safety Commission. In DHHS, five surveillance systems relied on ME/C data. ME/C jurisdictions used highly variable information systems, ranging from paper-based systems and combinations of paper and computer spreadsheets to

comprehensive, relational databases that were effective at capturing information.

Because of the lack of integration among ME/C systems, CDC has no capacity to act in the public interest in problems that fall outside the borders of current data systems. Existing systems, for example, missed childhood-entrapment deaths highlighted by Dr. Sosin. To determine the extent of the entrapment problem, CDC resorted to media database searches instead of the ME/C systems.

Wisconsin undertook a systematic approach to enhancing the utility of its ME/C data. Its Department of Public Health and the state's ME/C association collaborated to determine the needs for data, software, an integrated data repository and data interchange. The assessment identified about 150 data elements that, if collected uniformly, would meet the multiple reporting requirements of its customers. In 2001, it also determined that fewer than two-thirds of medical examiner and coroner offices had dedicated office space. The collaborators leveraged funding from DHHS to develop an integrated data repository covering all 150 data elements.

Overall, the findings from the CDC program and Wisconsin suggest the importance of systematic activities to define data requirements, in recognition that there are different responsibilities across law enforcement, public safety, and public health; to standardize data quality through death-investigation methods and data standards; and to integrate and coordinate data through information management, data interchange, and information resources. The best and most efficient approach is to leverage money from different agencies that track many of the same data elements rather than to proceed health outcome by health outcome. The need for homeland security has generated overlapping concerns in many federal agencies and created incentives for states to standardize and coordinate their data-collection activities.

The Role of the Medicolegal Autopsy in Health Care

George Lundberg

Autopsies are vitally important to medicine, especially as a tool for quality assurance— as a means of exposing medical errors and promoting quality and trust in medicine.

Since the 1960s, rates of nonforensic autopsies have dropped precipitously. From their peak in 1965—when they were performed in 50% of hospital deaths—autopsy rates declined by 1995 to less than 9%. (Lundberg, 1984). The downward trend came in spite of an extensive body of evidence that revealed a high rate of errors in clinical diagnosis uncovered by autopsy. Comparing antemortem clinical diagnoses with postmortem findings, researchers over several decades consistently documented 40-60% discordance (Agency for Healthcare Research and Quality, 2002). A substantial part of the discordance stems from cases of undiagnosed causes of death, two-thirds of them treatable (Nichols et al., 1998).

An autopsy study in the 1970s of 100 consecutive deaths found a 49% rate of error. In 1983, JAMA devoted a theme issue to the problem and called on the medical community to perform more autopsies as a service to the community and as teaching tools for medical students and residents (Lundberg, 1983).

Numerous social, economic, and legal factors are behind the declining trend in autopsies. The foremost are physician's discomfort in facing a family that has lost a member under their care, hospital administrators' fear of liability, lack of reimbursement except for Medicare patients, and public ignorance about the value of autopsies and the availability of reimbursement under Medicare (Lundberg, 1984). Every Medicare patient is entitled to a prepaid autopsy, as long as the hospital accepts Medicare patients. The overwhelming majority of hospital administrators are either unfamiliar with the policy or disbelieve it, partly because the Centers for Medicaid & Medicare Services (formerly the Health Care Financing Administration) fails to publicize the policy.

Many attempts have been made to combat the decline in autopsies and to raise awareness about their benefits (Hanzlick and

Combs, 1998). The Joint Commission for the Accreditation of Health Care Organizations in 1983 set criteria for autopsies and underscored their value for quality assurance. But there are no policies on autopsies in organizations representing nursing homes, home health providers, and hospices. Furthermore, the organizations fail to collect data on death rates or autopsy rates. Each year, 3 million Americans are admitted to nursing homes each year and 600,000 die. Most are not autopsied, largely because the most frequent payer, Medicaid, does not reimburse for autopsies. About 4.5 million people enter home care, and 1.5 million enter hospices, but their death rates are completely unknown. Because the vast majority do not have third-party coverage, the only recourse for families is to pay the $2000-6000 charge for private autopsies plus the cost of transportation to one of the nation's few private autopsy facilities.

Recent grounds for optimism have emerged from publication of an extensive meta-analysis by the Agency for Healthcare Research and Quality. The analysis found that the likelihood that an autopsy would reveal a missed diagnosis that affected the outcome was 10.2%. And the probability that an autopsy would detect a major error in a given case was about 26%. (Agency for Healthcare Research and Quality, 2002). The analysis concluded that autopsies have two key benefits for the health-care system: better quality of care and better quality of data (such as, vital statistics and epidemiology) for health policy.

Finally, health-care organizations representing hospitals and nursing homes appear to be recognizing that autopsies afford them legal protections. In the past, those organizations failed to support autopsies, because of concern that results would give ammunition to families in lawsuits against them; but they are now beginning to recognize that autopsies may offer a shield to protect them against liability claims.

Medicolegal Death Investigation and Medical Malpractice and Other Civil Suits

Garry Peterson

Medical examiners often find themselves ill-equipped for malpractice cases and other civil suits. The cases are different from

criminal cases with respect to what is at stake and the role of the medical examiner. In criminal cases, the stakes are extremely high, considering that a defendant faces a potentially long confinement or a judicial execution. In civil cases, money is at the heart of the issue—monetary damages for the plaintiff and contingency fees for the plaintiff's attorney. The pursuit of monetary damages as the driving force in civil cases leads to an adversarial process in which the medical examiner is likely to be vigorously challenged in ways that transcend his or her medical training.

The challenge often takes place outside the courtroom in depositions. Depositions are rare in criminal cases but highly common in civil cases, and they can be used in lieu of courtroom testimony. Attorneys often badger the medical examiner and ask aggressive questions that are rarely asked in front of a jury, because the attorney would lose the jury's sympathies. Medical examiners are thus highly uncomfortable at the prospect of a deposition.

Common types of civil cases involve torts (such as, malpractice), contract disputes (such as, life-insurance claims), worker compensation, and equity actions (such as, requests for exhumations). Malpractice actions are the most common torts involving a hospital pathologist. They are negligence cases in which a plaintiff claims that a clinician has failed to conform to a standard of care. A negligence action has four key elements: duty to the plaintiff (which is usually assumed to be the case in a doctor-patient relationship), breach of that duty, damages, and a causal connection between the breach and the damages.

The question of a causal connection is most often addressed by the hospital pathologist and it is the most difficult to answer. Often, there are several disease processes, and it is difficult to determine the sequence and the consequences. A common question posed to the pathologist is whether a patient's death resulted from an error or a complication of therapy or diagnosis. The 1999 IOM report *To Err Is Human* highlighted the problem of 44,000-98,000 medical errors made each year (1999b). Identifying those errors in the context of a court case places the hospital pathologist in the position of feeling caught in the middle—between the family, which is distrustful of the treating physician and the hospital, which is wary and uncooperative. The determination of errors is commonly made by hospital pathologists

because medical examiners often are not statutorily required to handle such cases. None of the parties is eager to pay for the services of the pathologist. The best guideline for attributing causation is known as the "Oh, My God!" rule. If those are the first words of a physician's reaction to what happened in a malpractice case (for example, hooking up an anesthesia machine backwards), the causation is likely to be blatant.

Apart from questions of causation, commonly encountered issues are the contribution of natural disease, mental competence, pain and suffering, workers compensation, insurance issues surrounding motor-vehicle fatalities, and manner of death (such as, accident or suicide). Because the outcome of the case often hinges on how law and medicine intersect, the medical examiner, more than the hospital pathologist, is best suited to handle such a case, but the medical examiner often is not given sufficient resources, staffing, and training to play an effective role.

DISCUSSION

Hospital Autopsies

Medical errors increasingly fall under the purview of the medical examiner as a result of the forces working against hospital pathology, especially the broader cultural issue of death denial. The ME/C system is the last bastion of people who know how to do autopsies and know how to do them well. In England, coroners routinely have the option of coding 13 manners of death, one of which is therapeutic misadventure. In the United States, there are only five manners of death, and therapeutic misadventure is not one of them (*George Lundberg*). Medical examiners should play a greater role in malpractice cases as long as they are given the tools, the training, and the budget (*Garry Peterson*). Hospital pathologists are not allowed to charge families for autopsies of Medicare patients (*George Lundberg*).

Value of Death Certificates

Given its wide-ranging uses, ME/C data should be comprehensive enough to answer the full spectrum of data needs, and

it is in everyone's best interest to leverage resources to enable collection of information *(Lois Fingerhut, Dan Sosin, Sam Groseclose, Kathleen Toomey*).

Physicians are often unaware of the widespread use and value of death certificate data (*Jonathan Arden, Lois Fingerhut*). If their awareness were increased, they would have greater motivation to code certificates accurately; greater and more sustained training of medical students and residents in filling out death certificates correctly is needed (*Robert Anderson, Kathleen Toomey, Steve Hargarten*). Working through the Federation of State Medical Boards to mandate more training might be considered (*Alan Trachtenberg, Garry Peterson*).

The new death certificates issued by NCHS will reinstate coding to indicate whether an autopsy has been performed and whether it was used for the death investigation. Those data elements will be used to monitor trends in autopsy rates. The questions had been deleted in 1995, so there has been a data gap of about 8 years (*Robert Anderson, Kurt Nolte*).

Despite the good intentions behind nationally based datasets, it is unrealistic to expect coroners and medical examiners to obtain all the detailed information that is needed, because of limited resources (*Vincent Di Maio*). The first priority of coroners and medical examiners is to serve their jurisdiction, not to do research.

Toxicologic Testing

The quality of toxicologic testing, except for alcohol testing, is highly questionable in most jurisdictions (*Vincent Di Maio*).

Many rural jurisdictions do not perform any toxicologic testing during a death investigation, because they lack resources; that means that national datasets that rely on ME/C toxicologic data are skewed to urban deaths and so are not necessarily representative of the national picture (*Steve Hargarten*). Also needed is the actual concentration of the toxicant (such as alcohol), not just its presence or absence (*Alan Trachtenberg*).

9

HOMELAND SECURITY AND EMERGENCY PREPAREDNESS

THE POTENTIAL ROLE OF MEDICAL EXAMINERS AND CORONERS IN RESPONDING TO AND PLANNING FOR BIOTERRORISM AND EMERGING INFECTIOUS DISEASES

Kurt Nolte

An emerging infectious disease is either a newly recognized, clinically distinct infectious disease or a known infectious disease whose reported incidence is increasing or threatens to increase in the near future in a given place or among specific populations (2003). In addition to emerging pathogens, we need to be concerned about the emergence of bioterrorism as a threat. Bioterrorism is the deliberate use of a biologic agent or toxin against a civilian population to induce fear or terror. Bioterrorism related infections can be viewed as a subset of emerging infections because they have increased in incidence and threaten to increase in the near future. Together emerging infections and bioterrorism constitute a strong rationale for improving our overall disease and death reporting system. If the nation builds the capacity to recognize fatalities from emerging infectious diseases and from other infections of public-health consequence, then it will have the capacity to recognize fatalities from bioterrorism.

Two case studies underscore this point. In 1993, an alert medical examiner in New Mexico was the first to report a cluster of fatal cases of respiratory disease. Three days later, an Indian Health Service physician reported similar cases to the New Mexico Health Department. A rapid multiagency investigation followed, and it led to the identification by CDC of an emerging infectious disease, hantavirus pulmonary syndrome, within weeks of recognition of the

index case. Also in New Mexico, a young woman who died of anticoagulant poisoning from the suicidal ingestion of rat poison had a presentation that mimicked a fatal infection. The two cases illustrate the importance of a high-quality death investigation system in recognizing fatal emerging infections and infections of public health importance and in sorting out conditions such as toxins which may mimic infections.

Autopsy-based surveillance of infectious agents is superior to use of death certificates because it is faster and it is not restricted to the coding categories listed on death certificates. Since 1919, US forensic pathologists have detected, several emerging diseases, including plague, malaria, and West Nile encephalitis. Overall, infectious disease mortality increased by 58% from 1980 and 1992 (Pinner et al., 1996). Autopsy pathologists were the first to identify an outbreak of anthrax in 1979 in the former Soviet Union, and they even identified the route of infection as inhalation (Walker et al., 1994). Today, autopsy-based surveillance not only has the capacity to determine pathogenesis, but it has broader reach and more rapid detection through diagnostic advances in immunohistochemistry and nucleic acid probes.

Despite its potential, the ME/C system's many limitations impede recognition of emerging infectious diseases. The bias of most ME/C systems is toward violent death. Forensic pathologists are well equipped to make general pathologic diagnoses (such as pneumonia) rather than organism-specific diagnoses (such as pneumococcal pneumonia). Many systems do not have access to sensitive diagnostic tests. If an autopsy is performed on an infectious disease death, there is no guarantee that the causative organism will be identified. The interpretation of postmortem microbiologic cultures is fraught with difficulties including issues of postmortem overgrowth and contamination. Serology has its limitations in that death may precede a detectable immune response. Investigators and pathologists may lack the training or the resources to recognize potential infections.

Medical examiners and coroners form an important part of the complex response to a known bioterrorist event. Bioterrorism is the use or threatened use of biological agents or toxins against civilians with the objective of causing fear, illness, or death. Deaths as a consequence of a known bioterrorist or terrorist attack are homicides,

so they fall under the jurisdiction of medical examiners and coroners. All five fatalities due to anthrax inhalation in 2001 were referred to medical examiners, and all five victims were autopsied. Bioterrorism has the potential for causing mass fatalities. Medical examiners are adept at responding to mass disasters; their skill sets having been honed through aviation accidents, heat wave deaths, and other large scale catastrophes.

An unknown or covert terrorist attack is more difficult to detect. If sentinel cases die unexpectedly without a clear diagnosis, they would fall under ME/C jurisdiction. The quick response to the hantavirus pulmonary syndrome offers a good frame of reference because its symptoms mimic how a bioterrorism agent might present itself. Another event to use as a reference is the ME/C's quick response to 1985 fatalities from cyanide-contaminated acetaminophen (Nolte et al., 2000).

The New Mexico medical examiner's office and the Health Department have established a model, with funding from CDC, known as Med-X, for surveillance of bioterrorism mortality. The model is being replicated in Louisiana, New Hampshire, Oregon, and Wisconsin. The system features automatic referral for autopsy in the event of at least one of a predetermined set of symptoms (e.g., flu-like symptoms- fever, or chills or myalgias). The Health Department is immediately notified of the autopsy presence of at least one of a pre-defined set of pathologic syndromes (e.g., community acquired pneumonia/diffuse alveolar damage). The medical examiner endeavors to make an organism-specific diagnosis in each case with a defined pathologic syndrome. Thus far, New Mexico has determined that uniform autopsy and reporting criteria increase recognition of public health conditions and the likelihood of recognizing bioterrorism deaths. Timely reporting is possible but difficult. Because bioterrorism is rare, and fatal infectious diseases of public-health consequence are far more common, having a combined surveillance system serves the public good. The system, when used, can be tested and modified daily.

Autopsy workers, because of direct inoculation and aerosolization, have the highest rates of laboratory-acquired infections (Grist, 1994). Several prominent cases in urban and rural settings have brought to light the problem of inadequate ventilation and insufficient respiratory precautions in ME/C and hospital pathology facilities

(Nolte, 2000). Facilities are aging, many are not in compliance with existing standards. Ideally, autopsy rooms should function at Biosafety Level 3 (BSL 3) (Centers for Disease Control and Prevention, 1997) which provides protection from aerosolized pathogens, but very few function at that level. The Disaster Mortuary Operational Response Team (DMORT), which most people mistakenly think can respond to an emerging infectious disease or bioterrorism event, have no capacity for biosafety stringency and no capacity for microbiologic diagnosis. Overall, the current infrastructure is inadequate for responding to infectious-disease outbreaks or for responding to fatalities from bioterrorism.

There should be uniform standards are needed for infectious-disease mortality surveillance; access to routine and advanced microbiologic testing, which is critical for generating organism-specific diagnoses; improved biosafety infrastructure; more funding; and a national strategy for federal agencies to assist with large numbers of infectious-disease fatalities.

The Challenge of Terrorism and Mass Disaster

Marcella Fierro

Terrorism and mass disasters pose enormous challenges to ME/C systems. The systems have dealt with plane crashes, train crashes, fires, and floods—but not with mass homicides. The magnitude of the deaths is a challenge, considering that terrorism brings the prospect of thousands of simultaneous deaths. The types of working relationships are different. Systems rarely have dealt with the federal government in the management of local disasters. In Virginia, which handled several anthrax cases in 2001, no one in the health department had ever worked with the Federal Bureau of Investigation (FBI).

Money and manpower pose the greatest challenges. ME/C systems must be better prepared than ever before, particularly with gear for biohazards and radiation. There also are jurisdictional issues related to access to the scene and to working cooperatively with the FBI.

The anthrax experience in Virginia uncovered other problems of preparedness. It pointed to the likelihood that sentinel bioterrorism deaths would probably be declined by the medical examiner system because the event would not necessarily have been identified as resulting from bioterrorism, leaving the private physician with the responsibility for signing the certificate. Virginia does not have a surveillance system that would allow the identification of bioterrorism deaths with any certainty. If cases are identified, one of the first decisions will be whether the bodies can be dealt with on site, at the ME/C facility, which might risk site contamination. Questions also arise about which types of cultures to take and who else is exposed, including health-care and EMS workers who transport the bodies from the hospital to the medical examiner facility. Most facilities do not operate at BSL 3. Surge capacity (especially if there are multiple simultaneous events), record-keeping, and traumatic stress on staff are other issues to consider. Research has documented that mass disasters impose enormous strain; measures must be taken to help workers cope with the overwhelming stress of death and destruction.

A final issue—one that is highly sensitive—is disposition of bodies. Bodies containing some infectious agents cannot safely be returned to families. In other cases, the medical examiner or coroner may not be able to identify human remains at all. This is a very difficult issue for a nation that has never resorted to mass graves.

The Office of the Air Force Medical Examiner

Victor Weedn

The Office of the Armed Forces Medical Examiner (OAFME) is the only federal medical examiner system in the United States. The office has experience with more mass disasters than has any other medical examiner office in the world.

The OAFME was created largely as a response to the problems incurred in the handling of the autopsy of President John F. Kennedy. It is in the Armed Forces Institute of Pathology, and its primary jurisdiction covers military personnel who die on federal property, military personnel who die abroad (in accordance with the Status of Forces Agreement), and senior executive officials of the federal administration who die in office, including the president. In the

case of military deaths, the office and its regional military network of medical examiners often waive jurisdiction to local medical examiner offices because of resource constraints. Recently, authority was extended to include limited jurisdiction in commercial-airline mishaps. The office also serves the pathology community through consultation, education, and research. For a fee, it assists local medical examiners. Support staff includes photographers, investigators, and an anthropologist.

The office has a small forensic science laboratory, but a substantial toxicology laboratory and DNA Registry. The DNA Registry includes the Armed Forces DNA Identification Laboratory and a specimen repository of DNA specimens from all service members. The DNA Registry reflects the high priority accorded by the military to identifying service members who die in battle. The military's commitment to individual identification dates back to the Civil War. The US Army was the first in the world to bury its war dead in individual graves, as opposed to mass graves. During the Civil War, and even before, soldiers devoted half-month's salary to inscribe their name on a piece of metal to ensure their identification if they fell in battle. The indestructible metal tags were so useful and so widespread that the military adopted the "dog tag" as early as 1906. Dog tags remained the standard method of identification for decades. During the Vietnam War, the military adopted fingerprints and, later, dental records as the primary means of identification. Dog tags had been found to be too unreliable because, like any other personal effects, they could be misplaced, dislodged, removed, worn by someone else, or simply not worn. Therefore the military moved to positive means of identification, specifically fingerprints and dentition. Fingerprints and dental records also had shortcomings, especially when those body parts were missing. In the Gander, Newfoundland air crash of 1985 (256 died in the worst military aviation crash in history), dentition identified two-thirds of victims, and fingerprints identified half, but 11% could not be identified except by exclusionary means and presumptive identification. The military now relies on DNA identification that can apply to most remains. DNA identification was first used by the military during the first Persian Gulf War. It can provide identification in the face of severe fragmentation, partial incineration, and decomposition. In some cases, it may also be quicker.

Disaster Mortuary Operational Response Team

Paul Sledzik

Created in the 1980s, DMORT has gained prominence in responding to mass fatalities. Although an offshoot of the National Funeral Directors Association, DMORT was in the early 1990s formally incorporated into the federal government's emergency-response capability. In 2003, DMORT was situated in the Department of Homeland Security (DHS) as part of the National Disaster Medical System (NDMS). On activation for a natural disaster, terrorism event, or aviation or technologic disaster, its 1,200 trained volunteers—forensic, morgue, family-assistance, and management personnel—become temporary government employees. They supply portable morgue units, computerized morgue management, and specialized protocols for victim identification and family assistance. If the site qualifies for federal disaster assistance, the federal government pays for DMORT's costs; otherwise, the state pays.

DMORT is comprised of private citizens, each with mortuary or forensic expertise and with licensure and certification recognized by all states. Teams can be activated in any region of the United States when the capabilities of local resources are exceeded. They work under the jurisdiction and guidance of all local authorities or federal agencies. The local authorities still sign the death certificates. During the terrorist attacks of 2001, DMORT teams were summoned to the site of the airplane crash by the coroner of Somerset, Pennsylvania.

DMORT has a team to handle postmortem collection of DNA evidence, and the team works closely with the Armed Forces DNA Identification Laboratory. DMORT has a Weapons of Mass Destruction Team, but the team handles only chemical fatalities, not biologic or nuclear fatalities; this leaves a large hole in the federal response mechanism.

Some issues facing DMORT are unresolved: what kinds of new roles will DMORT have in DHS? In addition to its strength in victim identification, should DMORT develop more forensic-pathology services? Finally, DMORT's statute allows it to remain at the scene for only 2-3 weeks, but it is unclear what will be needed if a response takes longer.

The Potential Federal Role in the Death Investigation System

Victor Weedn

State and local governments often look to the federal government as a role model, as well as for assistance, funding, and guidance. But at the federal level the forensic community is not truly owned by law enforcement, public health, or traditional medicine. Policy-makers and administrators often equate funding of forensic pathology as wasting money on the dead, and they fail to recognize that the community exists for the living.

Forensic-Pathology Services

The only federal medical examiner system in the United States is OAFME. OAFME is often consulted by other federal agencies, including the FBI, which has no internal medical examiner capability. OAFME also serves the pathology community through consultation, education, and research. OAFME reviews cases submitted to it for a fee. Its DNA Identification Laboratory is a useful asset to ME/C offices.

The Department of Defense does not have a great interest in furthering forensic pathology, considering that OAFME was downsized to a low point of two forensic pathologists in 2002. OAFME has not been a strong research center. One important problem for the office is a lack of routine and typical forensic casework. Military-aircraft mishaps are the standard fare for the office. Thus, the forensic pathologists are often not highly experienced in routine forensic pathology. It is likely that the office will survive and even grow, but it has not been a substantial leader in the field of forensic pathology, as might be expected considering that it is the federal government's sole medical examiner office.

DMORT is an element of the NDMS, which can be mobilized to assist local efforts in times of a declared disaster. It has provided valuable service to jurisdictions in need. Its services are most critical when a mass fatality occurs in a coroner jurisdiction that has forensic-pathology resources, training, or experience.

Even well-funded state and local offices often have limited contingency or surge capacity, as noted by Marcella Fierro, the chief

medical examiner for Virginia. Unfortunately, DMORT's mission is generally limited to victim-identification services. Time will indicate how well the program will fare in its new home in DHS.

Thus, the federal government has the ability to assist state and local agencies in times of emergency on a limited basis and often at local expense. The federal government does not have a federal office equivalent to that of state and local jurisdictions. Thus, federal forensic pathology services are minimal.

Research

NIJ has a forensic budget of about $75 million per year. Its mission is to support state and local law enforcement, including forensic-science services. NIJ has catered primarily to the crime-laboratory component but in recent years broadened its scope, even in forensic entomology.

Accordingly, NIJ has shown interest in the medical examiner community and funded this IOM workshop. However, despite the prominence of forensic pathology among the forensic disciplines over the years, very few research projects even remotely related to forensic pathology have been funded. No funds have actually flowed to the medical examiner offices, other than their crime-laboratories. The most important NIJ support was for the establishment of the death-investigation guidelines. To be fair, NIJ has had substantial funding for the forensic sciences only recently. It also is probably true that the medical examiner community has not aggressively pursued NIJ projects. Regardless, NIJ could and should play a greater role in the support of the law-enforcement aspects of medicolegal death investigations. Substantial funding of the Paul Coverdell National Forensic Sciences Act and the National Forensic Science Improvement Act would help. However, NIJ most recently announced a DNA initiative to the exclusion of all other segments of forensic-science funding.

CDC, which has a $7 billion budget, has also been a supporter of the medical examiner community and its public-health functions. The most direct support has been a small but important subsidy for the NAME annual meeting over many years. In the past, CDC has with some success facilitated the computerization of medical examiner

offices. CDC has funded several projects, such as investigation of unrecognized sudden deaths due to infectious diseases.

NIH despite having a budget of more than $20 billion, has not been an important source of research funding, even for the medical examiner community, because forensic-pathology research is not considered basic research. Seen as translational or applied, it is not a favored field of NIH research.

Medical examiners have occasionally been asked to serve as consultant reviewers for investigations on drowning, SIDS, and the like. As forensic pathologists become the major experts in autopsy examinations, as medical examiners conduct more hospital autopsies, and as autopsies become more important sources of human tissue, NIH interest may increase.

Total funding in forensic- pathology research from the federal government may range from zero to tens of thousands of dollars per year, not millions, and virtually no funding goes to support medical examiner offices or demonstration projects in medical examiner offices. Perhaps most important, the federal government seemingly has no interest in forensic pathology or medical examiners. Other than the small office in the military, there are no medical examiner offices in the federal government. It might seem logical that the CDC, FBI, National Transportation Safety Board, or the Office of Emergency Preparedness would have forensic-pathology staff but they do not. They might, however, maintain contracts with experts to provide forensic pathology consultation.

Lack of Federal Commitment and Oversight

The message seems to be that the federal government has no interest in forensic pathologists or medical examiners. One might conclude that crimes resulting in death are not given a high priority in federal investigations. Certainly, dead victims will not bring lawsuits, complain to newspapers, or testify before Congress.

As states look to the federal government as a role model, they see a medical examiner office in the military. That is not very relevant to the states. An ME office could be situated in public health, but experience shows that it will always lose out in priority to live patients. An ME office could be situated in law enforcement, which

has a substantially better political lobby, but then it would not be seen as objective, would be misunderstood, and would lose out to the cop on the street.

A medical examiner office is probably too small an endeavor to stand on its own as an agency in the federal government. It would stand a far better chance if combined with the federal crime laboratory as a department of forensic-science services, as is done in England.

Indeed, it has often been argued that the forensic sciences should conceptually be on neutral turf and not in a prosecutorial or investigative agency. Theoretically, DHS is a possible home for a medical examiner office. Medical examiners deal with homeland-security issues in a public-safety, public-health, and national-security context. Indeed, emergency-consequence management for disasters is being placed in DHS, in the Federal Emergency Management Agency and NDMS.

For better or for worse, there is no effective regulation of medical examiner offices. Theoretically, state medical licensure boards could oversee the medical practices, but in reality they fail to do so. In fact, some forensic pathologists continue to practice without medical licenses. Judicial scrutiny seems ineffective to weed out poor practices. Voluntary NAME accreditation standards have yet to be adopted by a majority of medical examiner jurisdictions. Medical examiners often lose their jobs over scandals when longstanding poor practices or misunderstood practices are publicized.

Investigations of deaths from child abuse, elderly abuse, and domestic violence are important to many federal agencies but do not support the offices that form the basis of the investigations. Investigations of deaths from infectious disease are important to CDC. Investigations of deaths from consumer products are important to the Consumer Product Safety Commission. Investigations of transportation deaths are important to the Department of Transportation. Investigations of workplace-related deaths are important to the Occupational Safety and Health Administration. Investigations of deaths in mines are important to the Bureau of Mine Safety.

It is a recognition of the need for this information among the various federal agencies that has led Randy Hanzlick to suggest the

formation of a National Office of Death Investigation Affairs (NODIA). One might consider medical examiner work to be essentially an unfunded federal mandate. Unless NIJ and CDC truly adopt the medical examiner community or a new lead federal agency is created, possibly in DHS, the ME/C community will continue as an orphan without to a parent to care for and feed it.

Discussion

A priority mandate for NIJ and the federal government is to abolish or replace antiquated coroner investigation systems with medical examiner systems staffed by competent forensic pathologists (*Ellen Clark*).

One of the greatest barriers to collaboration between ME/C offices and public health is unfamiliarity with each other's mission. Public health has failed to develop formal collaborations with ME/C offices for bioterrorism (*Marcella Fierro*). To expand collaborations, there needs to be broader education of the public-health community about the value of death investigations to public health—not just for vital statistics but also for collaborative investigations (*Kathleen Toomey*). ME/C collaborations with public health should also include the county health department. The county health department has been largely overlooked throughout the workshop (*Randy Hanzlick*).

DMORT is expensive for states. The state of Georgia paid DMORT $250,000 per week for its assistance during the crematorium investigation (*Kris Sperry*). In an effort to reduce costs, DMORT is planning to offer partial services rather than the full complement of services (*Paul Sledzik*).

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CLOSING REMARKS

Richard Bonnie

Many of the workshop participants made the observation that that there are significant weaknesses in this country's current "system" of death investigation, and as a result, there are significant gaps in the adequacy of the information now available. It is clear that there is a need to study this problem in greater depth and to propose solutions. One possibility is through an IOM study, which, after thorough investigation, could consider many of the solutions proposed during this workshop.

Based on the discussions, it is clear that there is a substantial public need for accurate death information. One particularly compelling need is for information about the cause and manner of death for criminal adjudication. It is paramount necessity to protect the interests of the innocent and to convict the guilty. Often overlooked is substantial public interest in public health and civil adjudication, notwithstanding the fact that civil disputes are often between private parties. One example is the use of autopsies as a means of documenting medical errors and of promoting quality and trust in medicine. Another area of substantial public need is in victim identification; again, the personal interests of families are subsumed with the overall interest of the community in identifying and memorializing its lost ones. The public also has a powerful and broad interest in learning from data assembled about death to facilitate prevention interventions. That interest is dependent on adequate and

systematic surveillance, especially of deaths due to injury and infectious disease. That enables the society to detect causal factors, and thereby to design interventions. Concerns about containing incipient bioterrorism have been added to the very long list of problems that can be addressed with good data about circumstances and causes of death.

All those public needs are national needs. For many historical reasons, the responsibility for death investigation is rooted largely, although not entirely, at the state and local level, particularly at the county level. Yet, over time, the national need has become increasingly apparent. Consequently, there has to be greater priority at the national level.

The national need is not being adequately met in most parts of the country. If death information is being obtained at all, it often is not obtained carefully and accurately. Research has borne this out, as have the professional experience of the workshop speakers. Approximately 20 % of the nation's deaths are subject to death investigations. While this fraction was the focus of the workshop, it also must be pointed out that, in the other 80 percent of deaths, the information is also deficient for purposes of compiling valid vital statistics. Further, how do we know that deaths are selected for the in-depth medicolegal death investigation? There are deficiencies and inconsistencies in the referral process—the decision-making surrounding which deaths to investigate in the first place.

We have heard anecdotal evidence that the budget of a medical examiner or coroner office is the overriding determinant of the number of autopsies and the types of tests conducted. However, there do not appear to be any systematic studies. That leaves a gross deficit in our knowledge about the way the ME/C system is working. The deficit appears greatest for deaths in hospitals, hospices, and nursing homes. The only area in which the system appears to be working is mass disaster, in which the jurisdiction is sometimes federal. But even at the federal level there are gaps in the response, particularly with respect to infectious diseases.

In all probability, the adequacy or inadequacy of death information can be aligned on a continuum. The major determinants appear to be resources, quality of expertise and professionalism, and

the legal structure. At one end of the continuum is a sparsely populated county with a coroner system, few resources, and insufficient expertise. On the other end is the gold standard—a highly professional, well-endowed medical examiner office with access to all necessary technical expertise. The variation between those two ends is determined by those three factors.

Many workshop participants felt, as was argued in the 1928 NRC report, that the coroner system should be replaced by the medical examiner system. The coroner system lacks proper training and is fraught with potential conflicts of interest, particularly when coroners are funeral directors, as they often are, for whom publicity affects business.

What are the deficiencies in the ME/C system? To a varying extent, depending on jurisdiction, the major deficiencies are inadequate resources; inadequate expertise; imperfect legal structure; inadequate facilities; inadequate technical infrastructure especially for detecting infectious diseases and bioterrorism; inadequate training of the professional disciplines involved in death investigations; lack of practice standards and standardization of information; lack of quality measures and quality control mechanisms; lack of adequate access to and use of information technology and information systems to collect and retrieve data; and lack of research.

The foremost area for improvement regards system financing. Creative thinking is needed to develop funding mechanisms that support a major leap forward. Another area for improvement regards legal structure, including the requirement that the coroner or medical examiner have the proper training and expertise; the scope of the ME/C jurisdiction; and state responsibility for planning and overall quality. The question is not whether the system should be state or local, but rather whether all states should have better planning for effective death investigations throughout their state. That may involve having a state medical examiner system, a well-organized regional system, or multiple county system. Other areas of focus include manpower training, infrastructure (capital investment in physical plant), and information. The speaker's observation is that many agencies and institutions of government rest on the backs of a very small group of death investigators.

A final area to explore is impediments to change. Concerns have surfaced about the ME/C system for almost a century. Even though progress has been made, it seems to have stalled. Understanding impediments to change will help to rejuvenate the system. One impediment, reported by several speakers, is the lack of prestige associated with death investigations. Another raised by several speakers is the lack of advocacy and political support for the dead. Speaker Victor Weedn captured it best by characterizing the entire death investigation system as a political orphan. The emerging emphasis on mass disasters and bioterrorism has illuminated longstanding neglect of death investigations by the federal government despite the broad public need that has been highlighted by this workshop.

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APPENDIX A
WORKSHOP AGENDA

Institute of Medicine
Workshop on the Medicolegal Death Investigation System
March 24-25, 2003

Day 1 NAS Auditorium

8:00-8:30 am	Coffee and Registration	
8:30 – 9:00	Welcome, Introductions, and Brief	R Bonnie (Chair)
	Discussion of Conference Goals	G Schmitt (NIJ)
9:00 – 11:15	**Panel 1: Status, Infrastructure, and Training**	Chair: Richard Bonnie
9:00- 9:20	The Medicolegal Death Investigation Systems in the US	R Hanzlick
9:20-9:50	The Infrastructure of ME System Especially ME/Coroner Facilities	V Weedn
9:50-10:05	Training and Certification in Forensic Pathology	R Zumwalt
10:05-10:20	Training, Registry and Certification of Investigators	MF Ernst
10:20-10:35	Research Issues	K Nolte
10:35- 10:50	Toxicology Issues and Infrastructure	A Trachtenberg
10:50 – 11:15	Discussion (led by Panel 1 Chair)	
11:15-12:15pm	**Panel 2: Professionalism, Standards, and Quality**	Chair: Bob Wallace
11:15-11:30	NAME Accreditation of Offices	G Peterson
11:30-11:45	NIJ Guide for Death Scene Investigation	S Clark

11:45-12:00	Quality Assurance in Medical Examiner Practice	R Zumwalt
12:00 – 12: 30	Discussion (led by Panel 2 Chair)	
12:30 – 1:30	Lunch in NAS cafeteria	
1:30 – 2:10	**Panel 3: Comparison of ME and Coroner Systems**	Chair: Tom Pearson
1:30-1:50	Advantages and Disadvantages of ME System	M Fierro
1:50-2:10	Advantages and Disadvantages of the Coroner System	C Parrott
2:10 – 2:45	General Discussion (led by Panel 3 Chair)	
2:45 – 3:00	Break	
3:00– 5:00	**Panel 4: Medicolegal Death Investigation and the Criminal Justice System**	Chair: David Kaye
3:00-3:20	The Value of Medical Expertise in Death Investigation	C Hirsch*
3:20-4:20	The Adequacy of Evidence Derived from DI Systems	
	• Scientific Evidence in the Court Room (in General)	D Kaye
	• The Prosecutor's Perspective	J Dusek
	• The Defense's Perspective	B Scheck
4:20-4:50	Adequacy of Expertise and Services Available to DI Systems	
	• Crime Lab	S Narveson
	• Other Consultants and Services	MF Ernst
4:50-5:30	General Discussion (Led by Panel Chair)	
5:30 pm	Closing Remarks and Adjourn	

DAY 2 NAS Auditorium

8:30 – 9:00 am	Coffee and Registration	
9:00 – 9:15	Welcome and Brief Introduction	R Bonnie
9:15 – 12:00	**Panel 5: Medicolegal Death Investigation and Public Health and Health Care**	Chair: Tom Pearson
9:15-9:45	The Use of ME/C Data for Public Health Surveillance	D Sosin, S Hargarten
9:45-10:00	Quality of the Death Certification Data	B Anderson
10:00-10:15	ME/C Information Systems	S Groseclose
10:15-10:30	Break	
10:30-11:00	The Role of Medicolegal Autopsy in Healthcare (Medical Errors, Untoward Outcomes in Hospitals, Nursing Homes, Home Care, Hospice)	G Lundberg
11:00-11:30	Medicolegal Death Investigation and Medical Malpractice and Other Civil Suits	G Peterson
11:30-12: 00 pm	General Discussion (Led by Panel 5 Chair)	
12:00-1:00	Lunch	
1:00-3:00PM	**Panel 6: Homeland Security and Emergency Preparedness**	Chair: Kathleen Toomey
1:00-1:30	The Potential Role of ME/Cs in Responding to and Planning for Bioterrorism and Emerging Infectious Disease	K Nolte
1:20-1:40	Terrorism and Mass Disaster	C Hirsch*
1:40-2:30	The Federal Role in DI System) • OAFME (10-15 min • Disaster Mortuary Operational Response Team (10-15 min) • Overview (20-30 min)	 C Mallack* P Sledzick V Weedn
2:30-3:00 PM	General Discussion (Led by Panel 6 Chair)	

3:00-3:30	Closing Remarks and Summation	R Bonnie
3:30 PM	Adjourn	

*Drs. Hirsch and Mallack were unable to attend the workshop.

APPENDIX B
PANEL MEMBERS AND INVITED SPEAKERS

Richard J. Bonnie, LL.B. (IOM Panel Chair)
John S. Battle Professor of Law and Director,
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University of Virginia
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Robert Anderson, Ph. D.
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Samuel L. Groseclose, M.D.
DHHS/CDC/EPO/DPHSI, Branch Chief
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Randy Hanzlick, M.D.
Associate Professor of Forensic Pathology
Emory University School of Medicine
Chief Medical Examiner
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Atlanta, GA

Steve Hargarten, M.D., MPH
Director, Injury Research Center at the Medical College of Wisconsin
Milwaukee, WI

Charles S. Hirsch, M.D.
Chief Medical Examiner, City of New York
Chairman, Department of Forensic Medicine, NYU Medical School
New York, NY
(Dr. Hirsch was unable to attend the workshop)

David H. Kaye, M.A., J.D. (IOM Panel Member)
Regents' Professor
Arizona State University, College of Law
Tempe, AZ

George D. Lundberg, M.D.
Editor-in-Chief
Medscape
New York, NY

Craig T. Mallak, M.D., CDR, MC, USN
Office of the Armed Forces Medical Examiner
AFIP/OAFME, AFIP Annex
Rockville, MD
(Dr. Mallak was unable to attend the workshop)

Susan D. Narveson, MFS
Administrator, Laboratory Services Bureau
Phoenix Police Department
Phoenix, AZ

Kurt Nolte, M.D.
Assistant Chief Medical Investigator
New Mexico Office of the Medical Investigator
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Carl Parrott, M.D.
Hamilton County Coroner
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Thomas A. Pearson, M.D. (IOM Panel Member)
Albert D. Kaiser, Professor and Chair, Department
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Garry Peterson, M.D., J.D.
Hennepin County Medical Examiner
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Barry Scheck, J.D.
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Glenn Schmitt, J.D., MPP
Deputy Director
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National Museum of Health and Medicine
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