

Testimony of Mary Ann Sens, MD, PhD
Professor and Chair of Pathology, UNDSMHS

October 30, 2013

Madame Chair and Honorable Members of the Health Services Sub-committee:

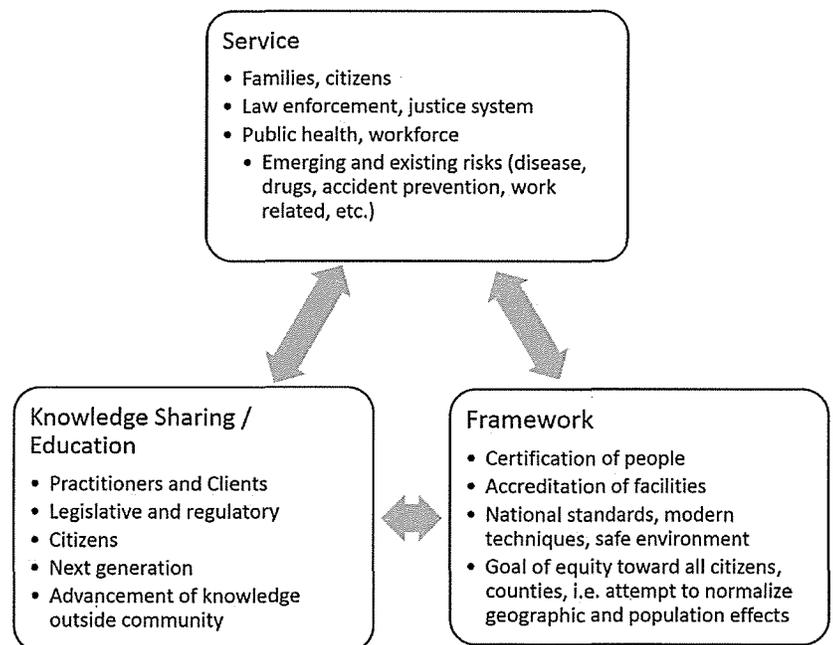
Thank you for allowing me this opportunity to share my perspective with you today. I am dedicated to providing the best medicolegal death investigation services to our State, to structure those services and health delivery to best meet the unique needs of our state and accomplish this in an effective and efficient manner by utilizing the assets and talents of many stakeholders. I welcome your initiative to bring standards for medicolegal death investigation to national standards and assure excellence in performance throughout the entire State. I promise to work with you and all other parties involved to accomplish that goal.

These are the major points I will address in formal comments:

- Recognition of the totality of impact of medicolegal death investigation
- National perspective and population based standards (at request of NDDH)
- Structure and Expenses of Grand Forks Facility
- Potential general models for consideration

1. **Broad Base of Impact:** The impact of medicolegal death investigation services extends well beyond the deceased. Three broad areas can readily be identified; these are not mutually exclusive and the list is not completely inclusive but give a framework from which to consider impacts.

- a. First, the basic delivery of services directly impacts families and citizens, usually in a time of extreme need and stress. In a broader context, law enforcement and the justice system rely on excellent and timely investigations and autopsies to achieve their roles when deaths occur which intersect with their responsibilities. Forensic autopsy and death investigation services must serve the demanding needs of the criminal justice system within our society. Although we often equate the role of forensic death investigation with criminal justice, a greater role is played in public and population health. Emerging and recurrent diseases, changing patterns of disease and risks in the workplace, home, agriculture and industrial arenas are identified in part through forensic investigations. Changes in drug use and deaths, motor vehicle accidents, child and infant deaths – all are important components of medicolegal death investigations. Importantly, this information flows not only to the families, courts or individuals involved with a specific death but should be viewed cumulatively and longitudinally, such as occurs with Child Fatality Review Panels, Workplace reviews and our recently convened drug death initiatives in Grand Forks.



- b. Knowledge Sharing and Education: Many agencies and individuals are involved in learning from medicolegal death investigation. There is a responsibility to educate current and future practitioners, agencies and many stakeholders, including those charged with legislative and regulatory responsibilities so that knowledge gained can improve health and environments for living and future citizens.
 - c. All this is optimally delivered within a framework of standards and credibility.
 - i. CERTIFICATION OF PEOPLE: Those involved in regular activities of medicolegal death investigation must achieve individual certification by the appropriate body within their field. For physicians, this is Certification in Forensic Pathology by the American Board of Pathology. For investigators, this is Certification by the American Board of Medicolegal Death Investigators (ABMDI).
 - ii. ACCREDITATION of FACILITIES: Facilities performing forensic autopsies should meet standards of the National Organization of Medical Examiners (NAME). Achievement and maintaining accreditation from NAME, College of American Pathologist (CAP) or similar national accrediting body is an important assurance that quality and national expectations of services are met.
 - iii. The goal of equity toward all citizens, counties and agencies served is ideally addressed within the framework and the recommendations of this committee. Although “exactness” will never occur simply because the structure for cities such as Fargo and Bismarck will differ from Rugby and Bucyrus; the operations of Cass County will differ from Golden Valley; the goal of equity and fairness to all citizens is important as systems structure evolves from your work.
2. **National Metrics for Consideration:** I am a member of a Federal panel, the Scientific Working Group for Medicolegal Death Investigation (SWGMDI). One of the reports of our committee reviews staffing and system costs for the delivery of medicolegal death investigation services from all areas of the county. This report in its entirety is given as an Appendix. The following table illustrates, on a population base, what space and personnel are required for a system to function at a level of national certification and full accreditation. There are variations that will regionally occur; personnel must be differently distributed in Cleveland Ohio compared to Cleveland, ND but this is a good baseline for comparison. All the information is taken directly from national data.

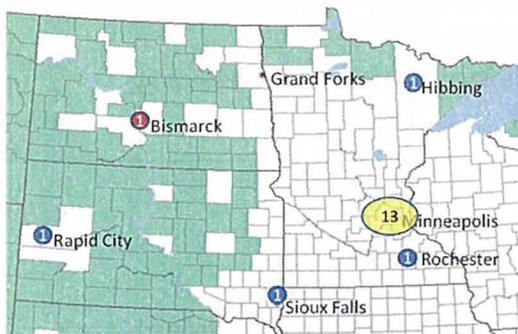
Data from offices throughout the country are remarkably congruent in space, body storage and overall personnel. Obviously, transportation costs vary considerably with increasing distance. The metric of number of autopsies needed per population base is also remarkably constant if judicial and public health missions of the medicolegal death investigation system is met in a manner which accomplishes full accreditation of the system. The following table are the national metrics for services to a base of 1,000,000 people. It assumes a relatively compact area for body transport and court obligations.

Space and Facilities Needed:			
Parameter	National (per 1000 people)	Test population	Comments
Population		1,000,000	
Area		compact	Minimal transportation and court travel
Facility Space	19.5 sq. ft.	19,500 sq. ft.	
Autopsy Space	2.4 sq. ft.	2,400 sq. ft.	
Body Storage	0.042 places	42	Factors: Release times; Culture, Numbers of Unidentified and Unclaimed Bodies; Social services available; Family economics (ND likely LOWER than this number)
# Autopsies	1	1000	Pretty constant; rare exceptions (Oil Patch is likely increased in this number)

Personnel Needed:			
Parameter	Per 1000 Autopsies done	Test population 1,000,000 with 1000 autopsies	Comments
Forensic Pathologists	6	6	Includes 1 Chief Medical Examiner with Administrative Oversight and Responsibilities
Death Investigators	7	7	
Autopsy Assistants	7	7	
Histotechnologist	1	1	
Other support staff	17	17	(IT, security, laboratory, photography, maintenance, secretarial, etc.) Exact titles and functions will be office dependent.
Total	38	38	Average Operating Budget per 1M people: 3.8 – 4.2 Million annually.

The average per capita expenses from 2012 for all NAME accredited offices throughout the country was \$3.79 per capita, per year. This is a baseline for medicolegal death investigations meeting national standards. With increased transportation distances or with additional services (such as DNA laboratories, molecular testing capability, owning advanced imaging (CT and MRI scanners)), the cost is increased. Although there was a small difference in County vs. State systems in previous years, with state systems seeing economies of scale, this difference is now negligible and both state and county-based systems are converging at \$3.75 – \$4.00 per capita annual costs for a baseline medicolegal death investigation system.

- History and Structure of Grand Forks Facility: The start of forensic pathology services at UND was modest and small. In 2002, I (Mary Ann Sens) was recruited to UND to Chair the Department of Pathology. My primary mission was academic, to teach medical and health science students and to establish a base of pathology research at the school. We have many successes in the academic area which I will not delineate here. Since UND does not have a hospital, there was no place to practice pathology. The initial clinical service of autopsies was envisioned to be very small, about 10 – 20% effort so I could maintain clinical skills and share with students’ my clinical experiences. I arranged with Altru hospital to perform autopsies for them at their hospital and also perform some autopsies for the Grand Forks County Coroner, Dr. Polovitz at Altru Hospital.



Regional Forensic Pathologists, 2004
 ● State only, FP (Bismarck, ND)
 ● Hospital Pathologist, part time FP
 ● 4 forensic groups, FP only, ~ 13 FTE

Within a year, it was clear there was an unmet need for autopsy and forensic services in the region. As this map demonstrates, forensic pathologists were at a considerable distant from the Red River Valley region. In addition to clinical needs, the substantial educational requirement for medical students (over half of the second year of medical school as well as some first and fourth year electives) in pathology was increasingly difficult with decreasing numbers of Altru pathologists who traditionally had taught this part of the UND curriculum. Other UND students needed pathology education, such as Medical Laboratory Science (Med Tech) and graduate students. Establishing an autopsy and forensic practice was a win-win for the communities, UND and the State of North Dakota. UND Pathology faculty could teach and fulfill academic duties while fulfilling an unmet and specialized clinical need in the region.

This also helped the entire state of North Dakota in Dec. 2006 – June, 2007 when the State Forensic Examiner in ND abruptly resigned; the presence of forensic pathology at UND allowed relatively smooth transition and recruitment of the current State Forensic Examiner.

The facility in Grand Forks is detailed in the appendix material. The practice model is the performance of autopsies, including forensic, family-requested and hospital requested cases with all income going to clinical practice revenue at UND. This allows development and maintenance of skills in autopsy pathology for UND faculty, best serves the region and needs of citizens and importantly allows for a flexible cost recovery model which significantly defrays the high fixed overhead operational costs of a laboratory facility.

The facility was designed to serve the region. Remarkably, even though the national figures for morgue construction were not available, we came very close to the ideal numbers (data available on request).

4. **Potential models for North Dakota.** The committee has a difficult task to design an optimal system for the state in a cost effective and community responsive manner. I do not presume to give you an answer but will share some general models of current systems so that you can make an informed decision.
 - a. Tasks of Death Investigation: This is a very rough outline; more detail can be provided.
 - i. Response to Scene / Site of Death (must be a locally based individual; law enforcement is often involved besides a Coroner or Death Investigator response)
 - ii. Body transport to local area for possible evaluation if potentially falling under Coroner's jurisdiction
 - iii. Accommodation of decedent (Driver License or other) or family for tissue donation
 - iv. Scene investigation, including obtaining police reports, medical history confirmation, family interviews, witness or other interviews needed. Appropriate photography and reporting.
 - v. Establishing identification of individual. If visual ID is not possible (burns, decomposition, trauma) or if scientific identification is needed (court charges pending, suspected ID theft/fraud, etc.)
 - vi. Recognition and collection of trace or other evidence on body or scene; recognition and requesting evidence collection by appropriate agency (law enforcement and/or BCI)
 - vii. Security of personal effects, evidence and body
 - viii. Transport to autopsy facility
 - ix. Performance of autopsy
 1. External examination
 2. Radiology / imaging examination as appropriate
 3. Internal examination
 4. Photography
 5. Histology of tissue
 6. Collection and requests for toxicology
 7. Collection of other case appropriate testing (Neuropathology, special cardiac pathology, microbiology cultures, sexual assault examination, etc.)
 8. Report generation
 9. Review and interpretation of all findings
 - x. Death certification
 - xi. Consultation / calls to family, law enforcement, judicial system as appropriate to case
 - xii. Release to funeral home for final disposition at conclusion of initial autopsy performance
 - xiii. Review of case material, participation in State or regional systems (such as Child Fatality Review)
 - xiv. Education of first responders, law enforcement, medical personnel or others relative to case
 - xv. Reporting to appropriate agencies, such as FAA, OSHA or others as case appropriate
 - xvi. Occasional additional certification, for example if body is shipped overseas, clearance for transport is needed.

- b. Models of Death Investigation / Forensic Pathology: The two extremes are the State model and the County model. North Dakota is currently a hybrid of the two, with some responsibilities at the county level and others at the State level. Variations of the hybrid model are very common.
- i. Pure State Model: In a pure county model, all responsibility for the entire system falls to the State. This generally is used in geographically small states, such as New England states, Delaware, etc.; although some larger states (Maryland, New Mexico) operate under this model. There is generally single, centrally located office and all personnel involved in death investigation are from the State Office.
- Advantages:
- Specialization of services, more physicians, more staff, more specialized equipment possible such as CT scanners, MRI, neuropathologists, pediatric pathologists, etc.
 - Counties do not worry or provide services or financial support
 - Generally most economical for small geographic states
 - Clear delineation and required independence from judicial and law enforcement branches
- Disadvantages:
- Border and geographic issues
 - Reduced county and local accountability
 - Tends not to follow medical referral lines, difficulties with records, trauma reporting etc.
 - May have significant transportation expenses and access issues
 - May not be responsive to local issues and needs
- ii. Pure County Model: In the pure county model, the state pays nothing for forensic and death investigation services. Most states have some performance standards but with variable means to enforce them. This model is very effective for a populous county, ideally the population must exceed 1M people; greater populations work best. It becomes increasingly infeasible with populations below 500,000.
- Advantages:
- Most responsive to local constituents (family, law enforcement, hospitals, trauma committees, etc.)
 - Flexible model with staffing and cases
 - Follows natural medical referral lines already in existence
- Disadvantages:
- Fragmentation within an area and a state possible; significant differences in services and quality within a state
 - Often large discrepancies in services and investigations across county lines
 - Poor coordination of public health and other data to State
 - Generally more difficult to assure quality assurance and control initiatives
 - May not have independence from law enforcement or judicial systems
 - Totally infeasible for small and rural counties.

I thank you for this opportunity and will be happy to provide any additional information you desire.

Attachments:

1. Synopsis of Informal Testimony provided July 31, 2013 to Committee
2. Scientific Working Group, Report on Infrastructure and costs
3. PowerPoint of UNDSMHS Forensic and Autopsy Facility.
4. Complete National Academy of Science report, 2009: "Forensic Science in the US: A path forward". Chapter 9 deals with Medical Examiner and Coroner systems.
5. NAME Autopsy Standards
6. NAME Accreditation Standards

Goal of Study:

1. Assessment of current and optimal provision of medicolegal death investigation (MLDI) service in North Dakota including death investigation, autopsy performance and death certification.
2. Identify current and unmet needs, obstacles and practices within MLDI system in North Dakota
3. Identify costs associated with MLDI and construct framework for State, County, Health systems and family responsibilities in financing.
4. Assess other models and systems for MLDI with advantages, disadvantages of each relative to needs of North Dakota
5. Identify legislative obstacles, if any, in implementation or improvement of MLDI in North Dakota and prepare appropriate legislation if needed.

Outcome:

Develop a plan for MLDI in North Dakota responsive to needs of primary and secondary stakeholders, identify funding and resources for delivery, establish statewide standards and expectations for achieving national standards for death investigation. If indicated, draft appropriate legislation and appropriation requests with emphasis on accountability, cost-effective use of resources, equity, transparency and sustainability.

Initial Questions and Issues

1. Review current medico legal death investigation practices and systems in North Dakota as baseline; historical development of current system.
2. Identify needs and expectations of primary stakeholders – families, public health, law enforcement, criminal justice judicial system, health care systems, local (County) and State government
3. Identify needs and expectations of secondary stakeholders – funeral homes, tissue and organ procurement agencies, UNDSMHS, NDDH and other state agencies (Board of Pharmacy, Board of Medicine, Highway Patrol, DSS, CPS, etc.), civil judicial system, county associations (NDACo), insurance and similar entities
4. Identify unique needs of state relative to MLDI such as impact from “Oil Patch” development, distance to facilities and investigations, service to ND potential for UNDSMHS, rural / ranching / farm expertise, high acceptance/desire of anatomic gift donation in population, cultural needs for Native American and other population or ethnic groups.
5. Identify current costs of entire system including local investigation, coroner budgets, transportation, death review and certification, performance of autopsies, autopsy / death investigation reviews, criminal justice activities and interface with review / regulatory or other agencies.
6. National standards: Review accreditation and certification expectations, costs and cost ranges for system, expected and ideal service delivery.
 - a. Consider several models (i.e. State, County and hybrid systems) for medico legal death investigation with defined responsibilities and funding streams.
 - b. Assure any unique needs of the state or key expectations of stakeholders are accommodated in desired model.
 - c. Consider requesting formal or informal review / study of MLDI models from Federal Work Group: SWGMDI (Scientific Workgroup on Medico-legal death investigation). This group is non-binding in any recommendations but is a national resource for information.

7. Review findings of National Academy of Sciences “Forensic Science in US: A Path Forward”, 2009 for national goals of death investigation.
8. Catalog existing capital resources and buildings involved in Medico-legal Death investigation and in the performance of required autopsies and compare to National standards permitting accreditation by National Organization of Medical Examiners. Compare resources with nationally recommended and technologies expected within the next decade and draft plan for achieving and maintaining.
9. Identify any deficiencies / suboptimal delivery of desired MLDI within the state and assign responsibilities to correct / improve these areas.

Potential groups / individuals / agencies for information: (some groups will appear in several categories)

1. Family members and citizens
2. NDDH
 - a. State Forensic Examiner
 - b. Vital Statistics (Death Certification)
 - c. Other public health issues / missions
 - d. Microbiology testing
3. UNDSMHS
 - a. Pathology
 - b. Public health interface
4. ND Judicial system, both State and County level, including Crime Lab (Toxicology, DNA, other)
 - a. State: Attorney General, State Crime lab (Toxicology, DNA, other testing)
 - b. States Attorney / staff from larger and smaller counties
5. Law Enforcement
 - a. State: BCI, ND Highway Patrol
 - b. Local/County level: Sheriffs, Police
 - c. State or regional Law Enforcement Associations
6. ND DSS (CPS, Child Fatality, Elder, Domestic violence, other interfaces and issues with DSS)
7. State Professional Boards
 - a. ND Board Medical Examiners
 - b. Pharmacy
 - c. ? Nursing, others
8. Suicide groups / interest / mandated responsibilities
 - a. State associations / Mental health
 - b. Military / National Guard
 - c. Others
9. Child death groups / interest/ mandated responsibilities
 - a. Infant / child sudden death
 - b. Child Fatality review
 - c. ND SIDS Coordinator / Infant death coordinator
10. Trauma services
 - a. State EMS and local EMS
 - b. Hospitals, trauma registry,

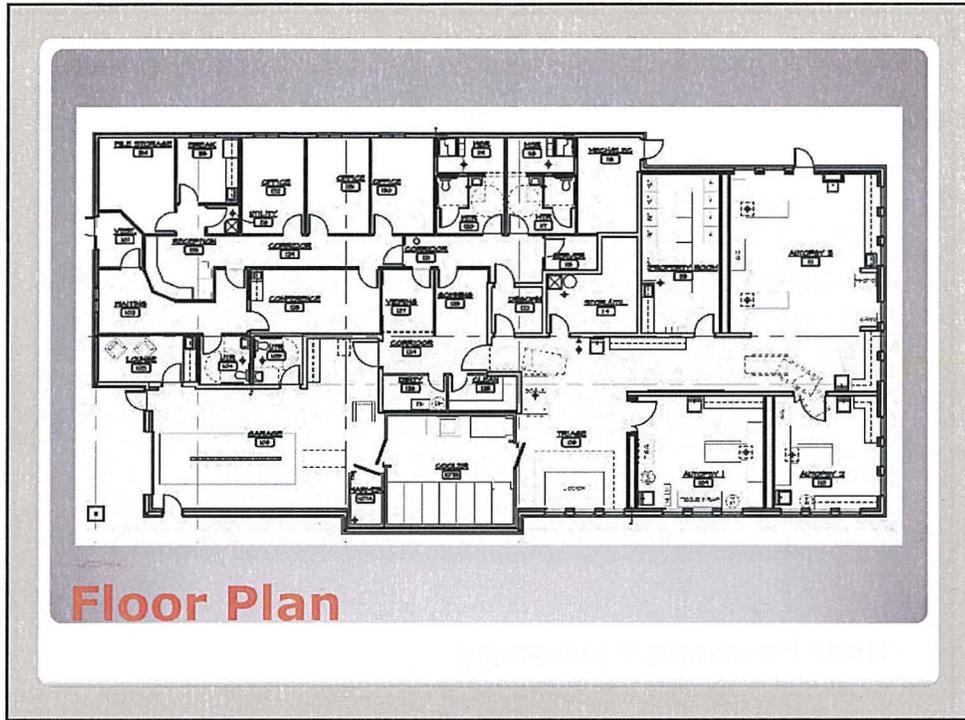
- c. Injury and prevention groups, both within State Government and private sector, medical, community based
 - d. SADD/MADD and similar associations
 - e. Statewide trauma registry and services
11. Public health issues
 - a. NDDH
 - b. Trauma surveillance
 - c. Infectious disease surveillance
 - d. Role in other surveillance (cancer, work, traffic, others?)
 - e. Pharmaceutical and other drug use patterns
 - f. Traffic fatalities / ND Highway Patrol
 - g. Farm, ranch and agricultural deaths / risks
 - h. Work-related deaths
 - i. Elder / Domestic violence / maternal deaths (interfaces with other groups, agencies, reporting)
 12. NDACO (for county systems in place, challenges, county representation, budgets from counties and expenses / needs)
 13. Individuals doing death investigation
 - a. Coroners (MD, non-MD, larger city, rural)
 - b. ABMDI (American Board of Medicolegal Death Investigators) certified (local and possible national)
 - c. Forensic pathologists
 14. Funeral home representative / associations
 15. Native American representatives, including tribal government, BIA, cultural issues, geographic issues
 16. ND Bar – Civil implications of death investigation; defense bar expectations
 17. Organ /tissue procurement organization (Lifesource, ND EyeBank)
 18. Insurance representative and issues
 19. Federal interface in Death investigation:
 - a. Military (base deaths, active duty / recent discharge)
 - b. Reservation: (BIA, FBI)
 - c. Regulatory / Investigative: (OSHA, FAA, NTSB, others)
 20. Hospitals
 - a. Pathology
 - b. Trauma services
 - c. Quality Assurance / risk management
 21. SWGMDI (Federal panel on Medicolegal Death Investigation; convened by National Institute of Justice and FBI) May be willing to assist with background information
 22. Professional organizations / inspection / accreditation issues; regional review
 - a. NAME (National Association of Medical Examiners)
 - b. American Board of Medicolegal Death Investigators
 - c. Regional: MN Coroners and Medical Examiner Association; possibly others
 - d. Potential reviews of State systems, hybrid systems most closely aligned with North Dakota.
 23. Miscellaneous regulatory and investigative agencies (Railroad, Insurance, ?others)



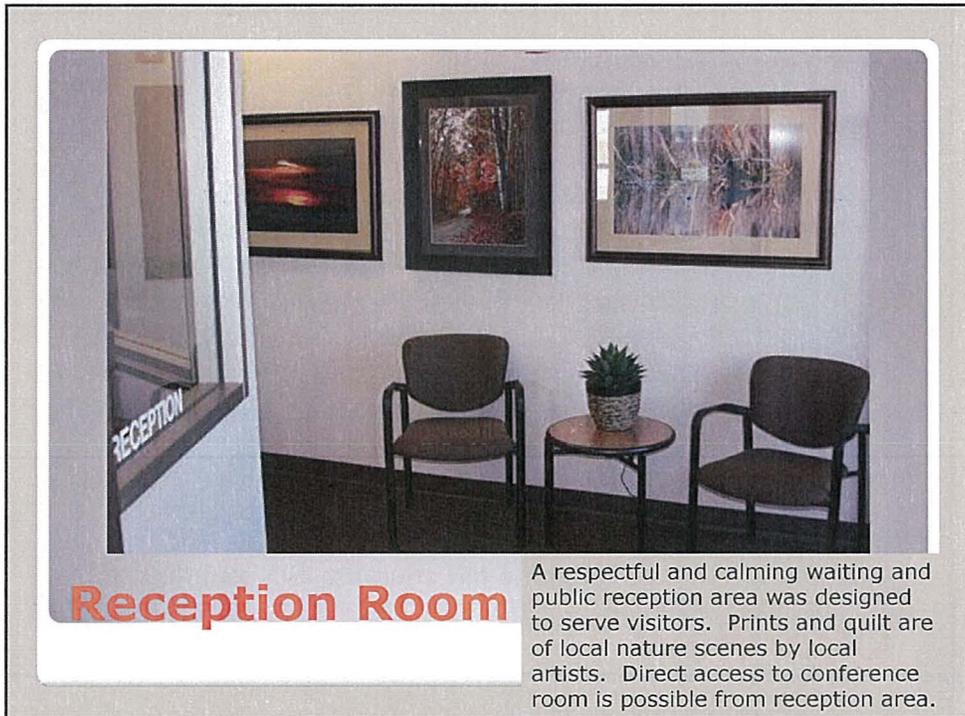
UND Forensic Pathology

- 7,400 square foot facility
 - Hospital site south of Grand Forks
 - Leased to UND for 25 years
 - Constructed to meet NAME Accreditation Standards
- About half of cost of construction from Federal grant (~1.7 M) and clinical income from practice.
- All operating, technical personnel, rent and infrastructure costs from practice income; some income toward MD salaries
- Serves regional area; all income to UND accounts
 - ND Counties
 - Coroner, Grand Forks County (fixed fee + transportation)
 - Contracts with regional hospitals for autopsy services
 - Contracts with MN Counties (per capita)
 - Fee for service for some MN counties, SD counties and private requests

Overview

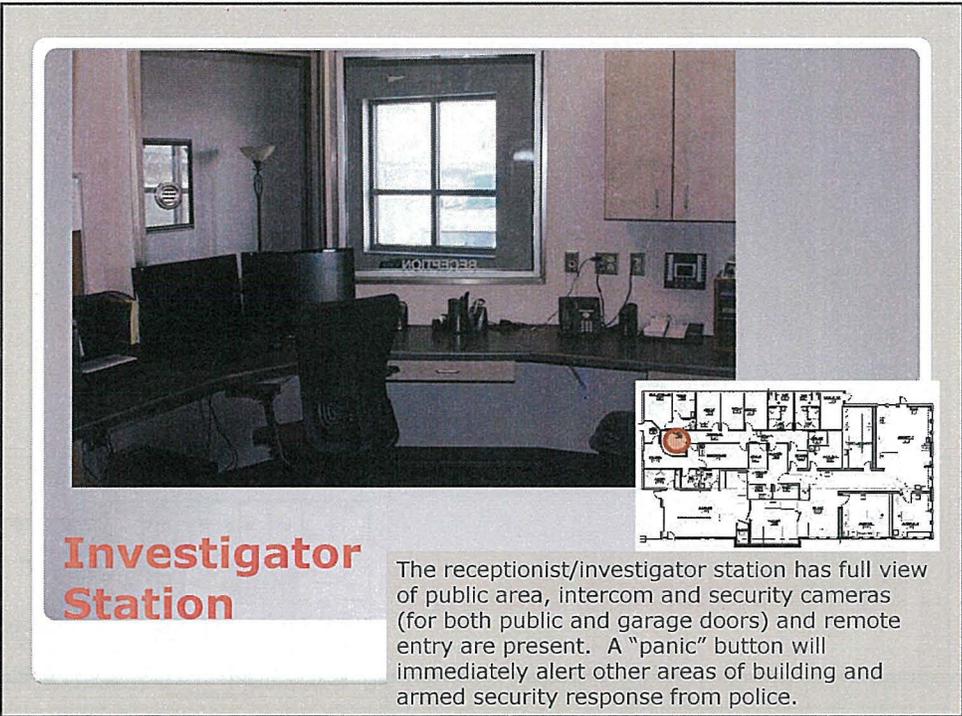
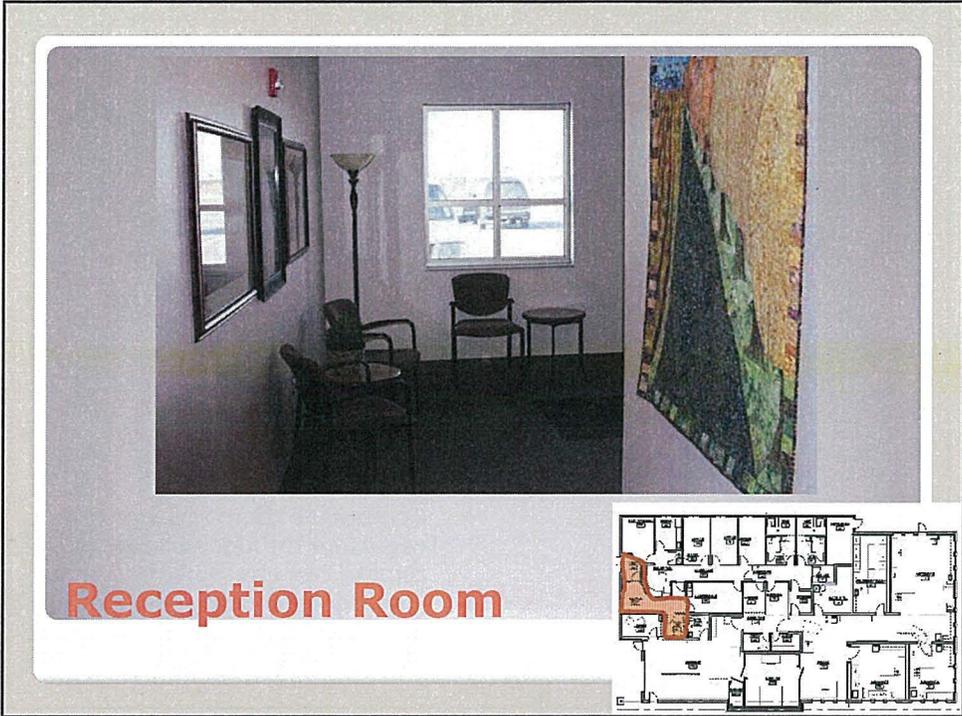


Floor Plan



Reception Room

A respectful and calming waiting and public reception area was designed to serve visitors. Prints and quilt are of local nature scenes by local artists. Direct access to conference room is possible from reception area.





Conference room has viewing capability through window or by remote camera. Full videoconferencing and case review is possible. Door leads to secure office area and is security coded.

Conference Room

This photograph shows a conference room with a round wooden table and six black chairs. On the left wall, there are three framed pictures. A door is visible in the background, and a window with blinds is on the right wall.



Conference Room

This photograph shows a conference room with a large black wall-mounted screen. A desk with a printer and a chair are visible in the foreground. The floor plan diagram in the bottom right corner shows the room's location within a larger office layout, with the room highlighted in blue.

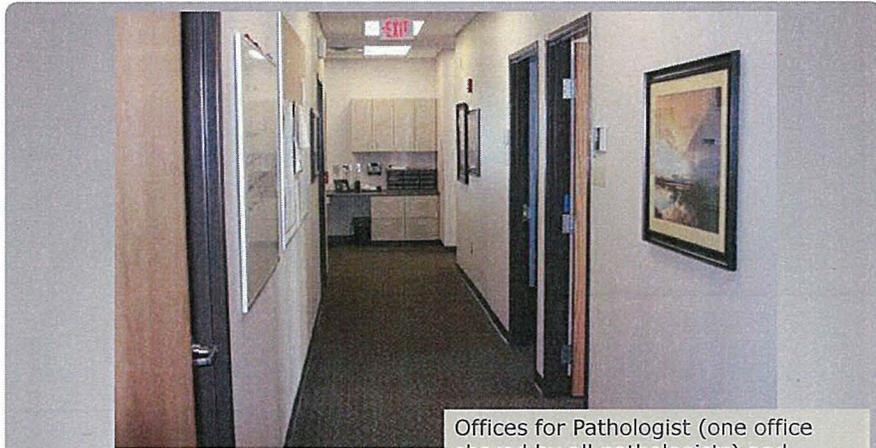


Ceremonial room:

The viewing area for bodies behind the window of conference room is dual purposed as a Ceremonial Room.

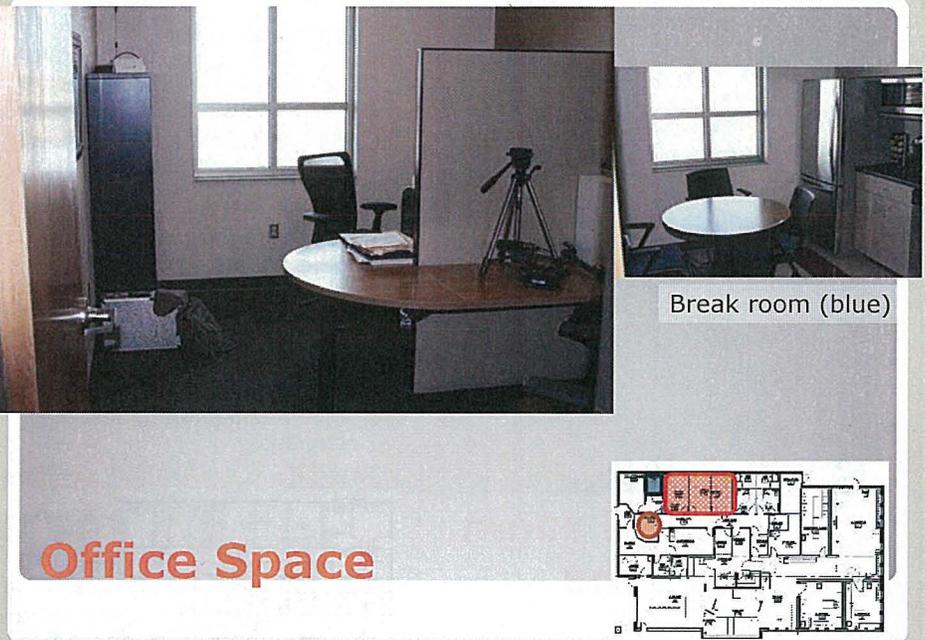
Accommodation for Native American rituals of sage and tobacco smoking to start the journey to afterlife is approved with special venting, fans, ability to disconnect smoke alarm in area and privacy for participants. This was designed in facility to accommodate Native American population

Ceremonial room, viewing area



Administrative Area

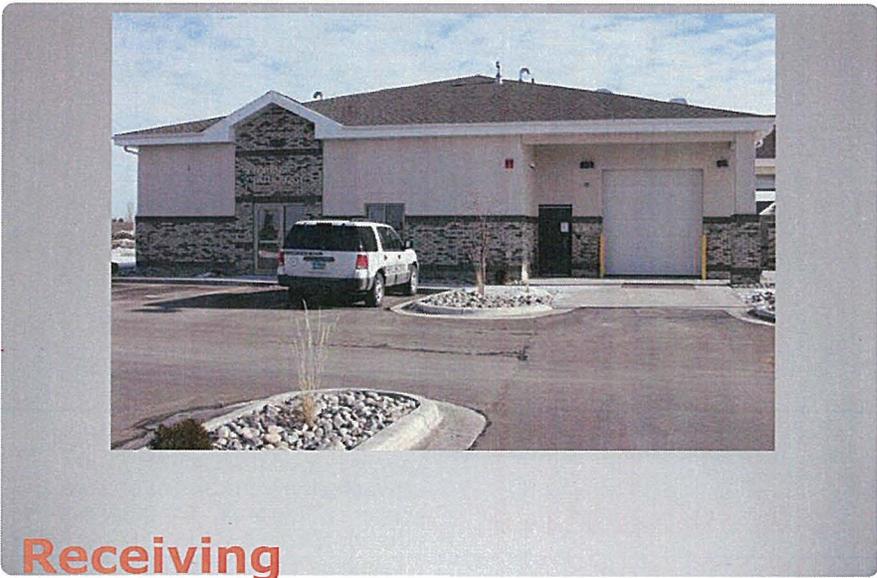
Offices for Pathologist (one office shared by all pathologists) and Investigators on call are present in secure office area. Far desk area is the receptionist station. Office space is smaller than normal since pathologists all are faculty at UND and have their main office at UND



Office Space

Break room (blue)

The image block contains two photographs and a floor plan. The larger photograph on the left shows an office space with a round wooden table, a black office chair, a window, and a tripod-mounted camera. The smaller photograph on the right shows a break room with a round table and chairs. The floor plan at the bottom right highlights the office and break room areas in red and blue respectively.



Receiving

The image block contains a single photograph of a building's exterior. The building is a single-story structure with a light-colored facade and a dark roof. A white SUV is parked in a paved area in front of the building. The foreground features landscaped areas with rocks and small plants.

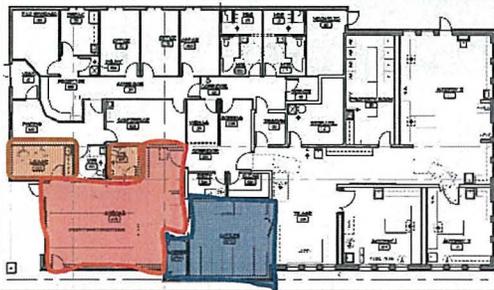
- Enclosed garage for privacy; large enough to allow law enforcement secure workup of complex vehicle accidents with fatalities by moving entire vehicle to garage.
- "Drivers room" Small room with TV, coffee, microwave for drivers who often wait during autopsy due to large geographic area served
- Rest room off garage
- Secure evidence lockers for off hours admission
- Direct access to coolers from garage
- Special design of small cooler to elevate temperature to thaw frozen bodies (common during winter)

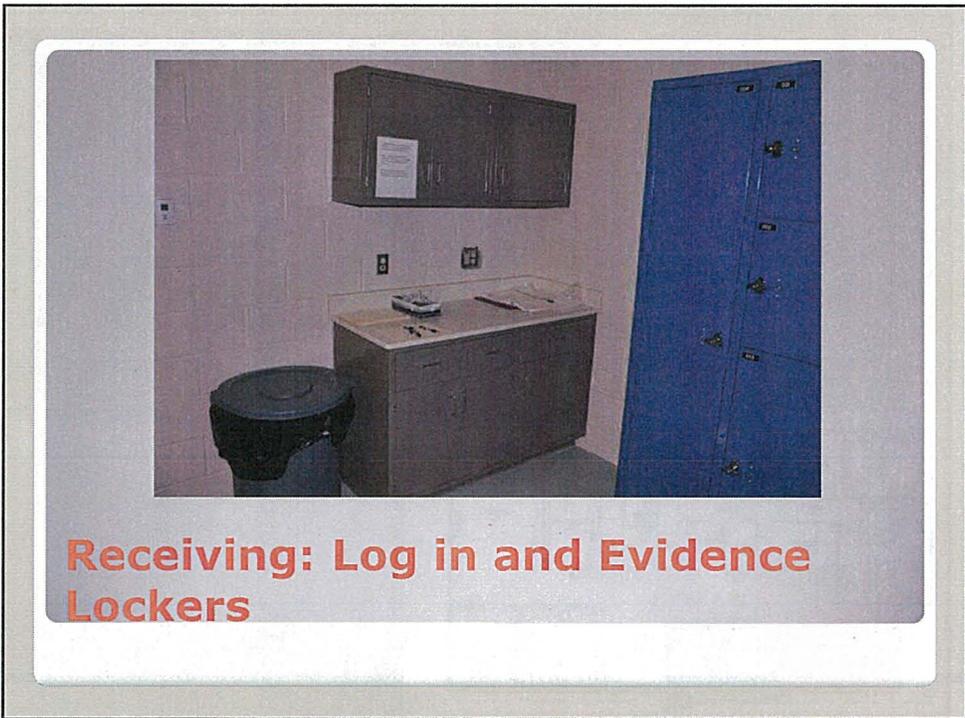
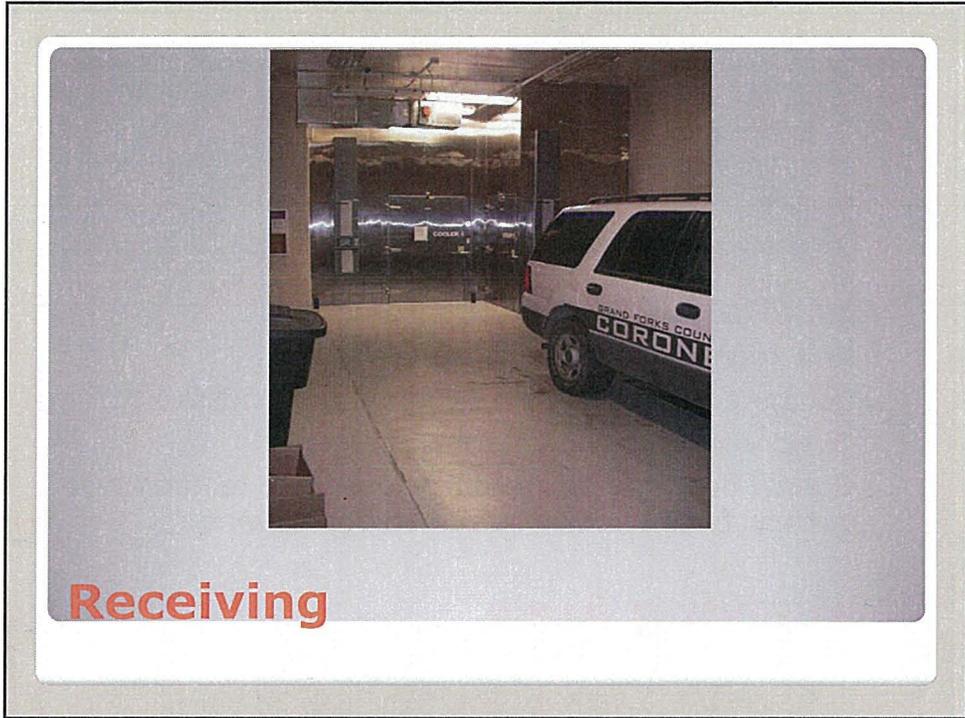
Receiving Area

**Enclosed
Garage (red)**

**Dual, secure
Coolers (Blue)**

**Driver Waiting
Area and
restroom (gold)**

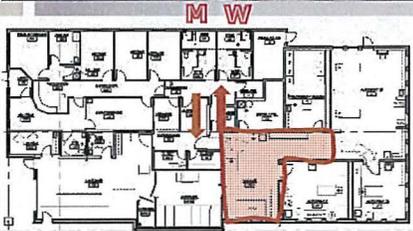
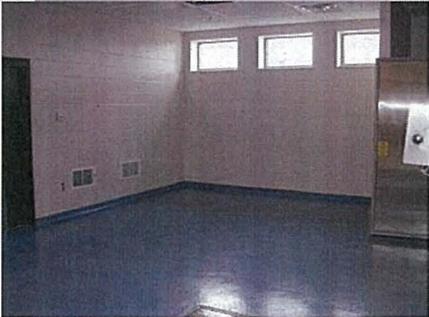








Triage area

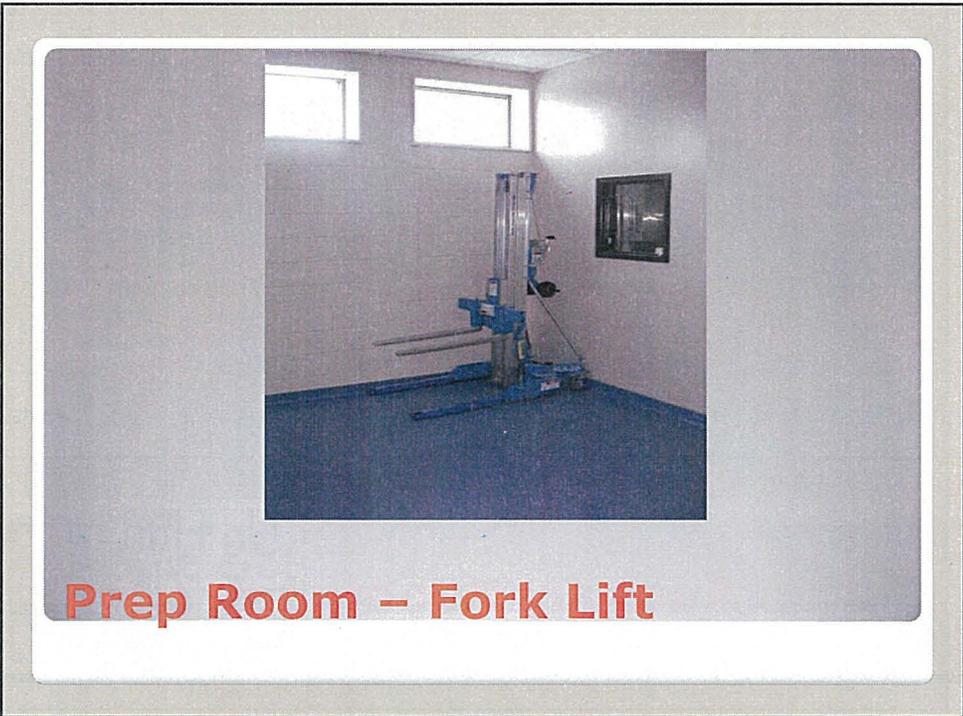
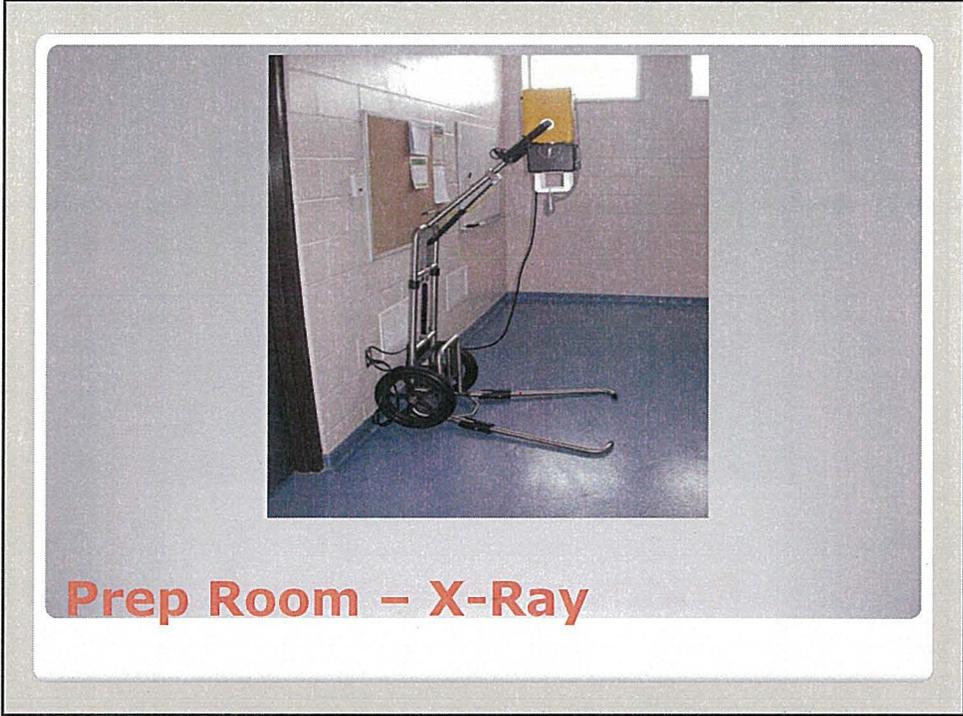


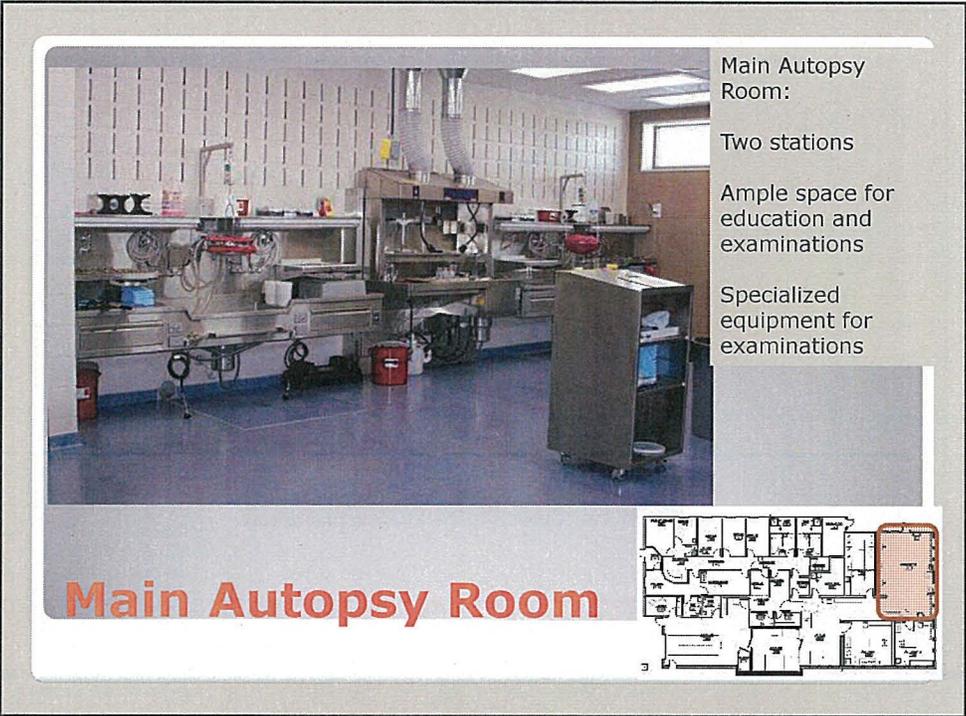
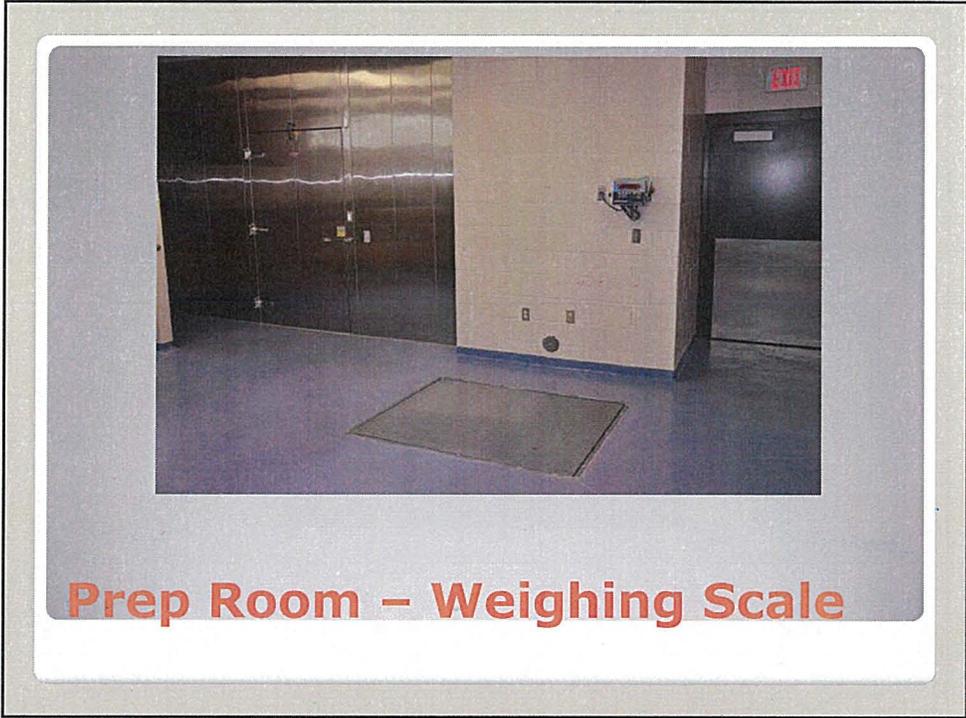
Floor scales, digital radiography in place

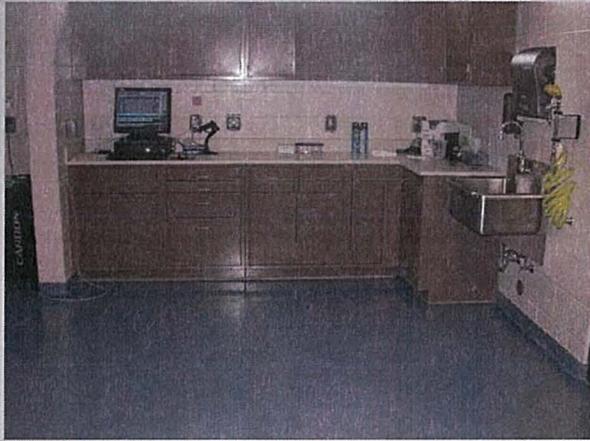
Wired / place for LODOX scanner

Room and ease for students / trainees to maintain personal protection;
two changing rooms, "in" and "out" flow

The triage area photograph shows a room with a blue floor, light-colored walls, and a window. The floor scales and radiography equipment photograph shows a room with a blue floor, a white wall, and a door. The floor plan diagram shows a complex layout of rooms with a red arrow pointing to the triage area.







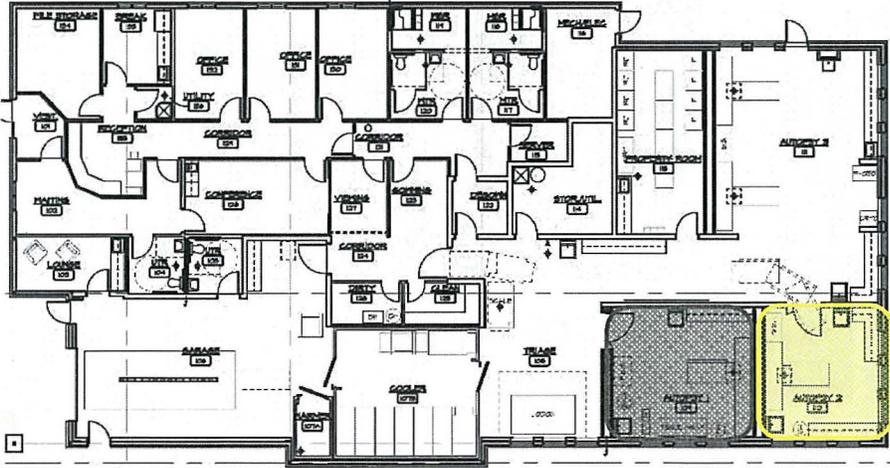
Main Autopsy Room:

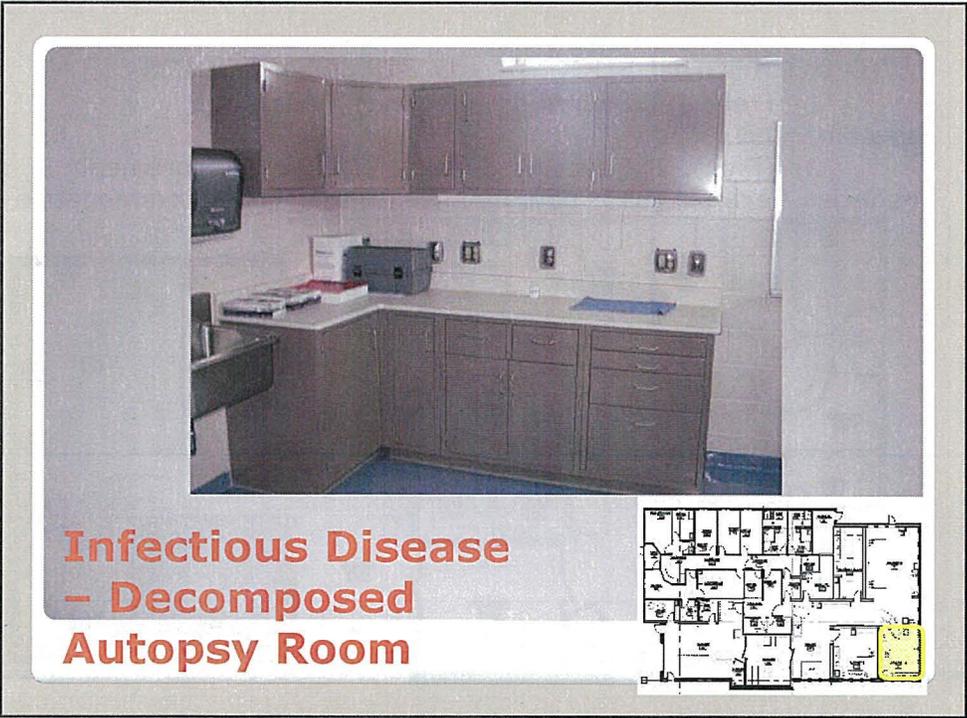
- Two separate cabinet areas for recording; one "clean" and one "dirty" – for specimen processing.
- Two portable writing lecterns for notes
- Areas for photography, radiology

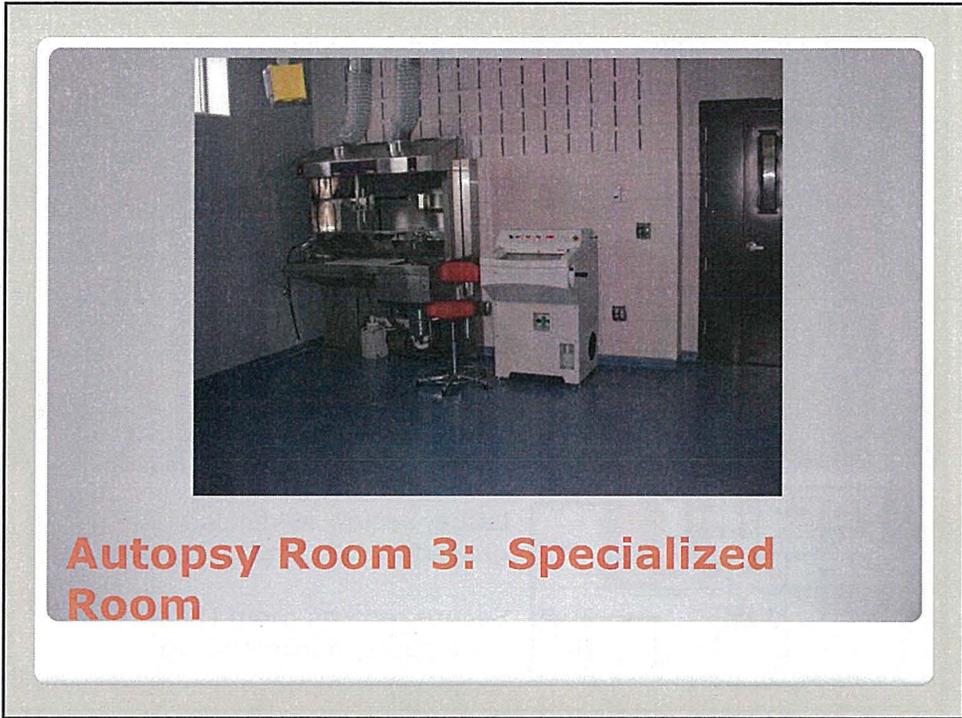
Main Autopsy Room

Two additional specialized autopsy rooms

- 1) (Yellow) Required for infectious /hazardous /decomposed cases
- 2) (Blue) (1) Specialized cases, (2) tissue procurement agencies / eye banks (3) potential use for religious accommodation



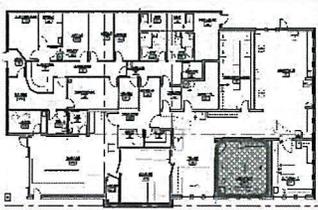




Specialized room

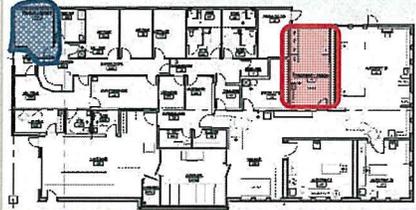
Specialized room:

- Tissue procurement agency use (needed for large rural geographic area; area has the highest % of donors in county but few facilities available).
- Specialized dissections and frozen section cryostat
- Potential for religious accommodation ceremonies



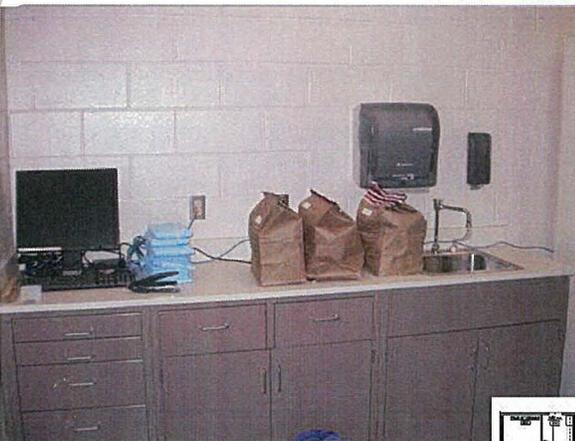
This block contains a photograph of a specialized room, a list of bullet points describing its uses, a floor plan diagram, and another photograph of the same room. The text 'Specialized room' is written in red. The bullet points list: 'Tissue procurement agency use (needed for large rural geographic area; area has the highest % of donors in county but few facilities available)', 'Specialized dissections and frozen section cryostat', and 'Potential for religious accommodation ceremonies'. The floor plan diagram shows the room's location within a larger facility. The second photograph shows the room from a different angle, highlighting the stainless steel table and the white machine.

Security

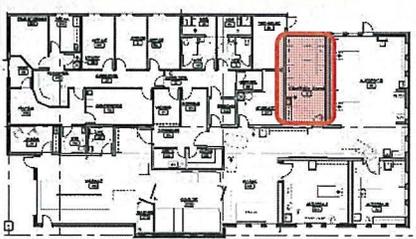


Large, secure evidence / property room (red)

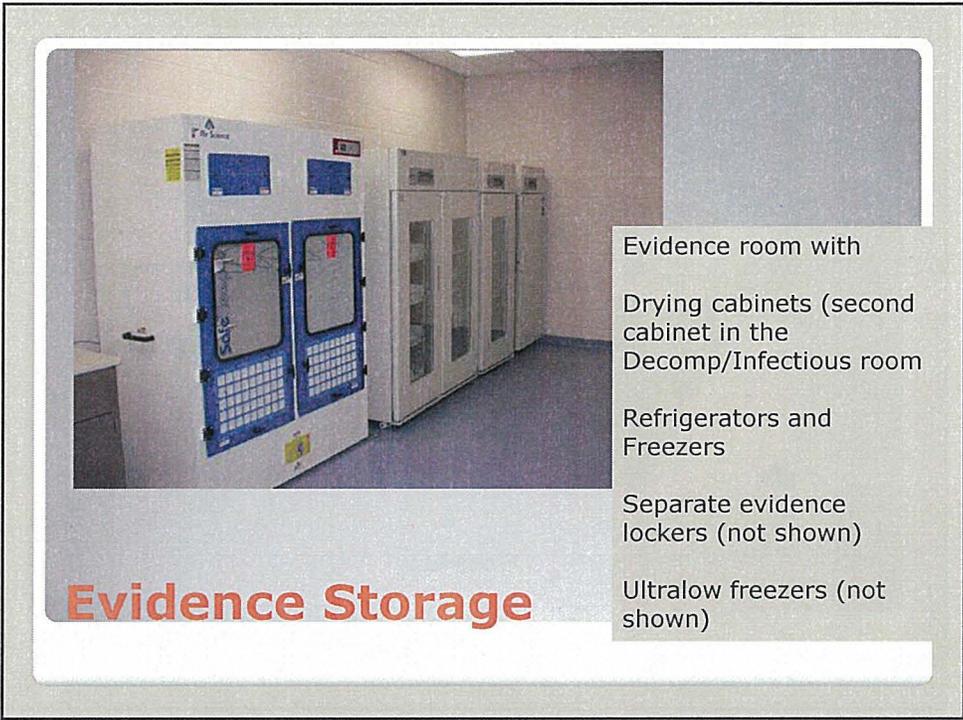
Secure records room (blue) for files, paper, non-biohazards

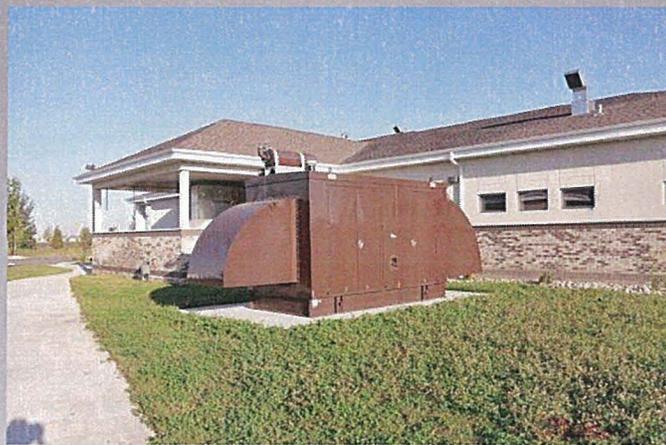


Evidence room:
Highest security
Cement walls to roofline and reinforced floors
Camera security when door opened
Evidence logging area



Evidence Room





Generator

Generator

Capable of full building operation in case of disaster



Lift

Lift

Allows "loading dock" delivery of heavy materials

In mass disasters can couple to Refrigerated trucks to increase capacity

Efficient use of Space



- Space Increases: Only areas not required by Accreditation are:
 - Drivers room off garage (to accommodate funeral directors and Coroners traveling a distance to Grand Forks and waiting for body)
 - Specialized autopsy room (used by Lifesource and Eyebanks for tissue procurement); allows eye and tissue donation when family desires. Many donations would be impossible without this. This room is available for mass disasters or other needs of UND Forensic Pathology.
 - Shared viewing room with potential for accommodation for Native American afterlife passage. No additional space, just planning dual use.
- Space decreases over accreditation requirements:
 - Decreased office space (shared office for pathologists) since main faculty offices at UND
 - Many support functions provided by UND at UNDSMHS site (secretarial, administrative, histology, etc.)





Mark Koponen, MD: Native of Minot, MSU/NDSU and UNDSMHS Graduate; recruited back to ND with new building
Mary Ann Sens, MD, PhD
Ed Bina: Native of ND, Hazen, Northwood; ABMDI Death Investigator; (2nd in ND; now 5 total)
Sarah Meyers, MD (not pictured), joined in July, 2012. She is a native of MN and trained at UM and Hennepin County Medical Examiners Office.

Medical Examiner and Coroner Systems: Current and Future Needs

The role of coroner emerged in England in the ninth or tenth century. In the twelfth century, under King Richard I, the role of coroner was formalized in the Articles of Eyre.¹ Coroners or “crowners” were “guardians of the crown’s pleas.” The office originally was created to provide a local official whose primary duty was to protect the financial interest of the crown in criminal proceedings. On behalf of the crown, the crowner was responsible for inquests to confirm the identity of the deceased, determine the cause and manner of death, confiscate property, collect death duties, and investigate treasure troves. Through the implementation of British Common Law, settlers in North America brought coroner laws to the early colonies.² Moreover, early state constitutions explicitly mentioned the position of coroner, often without defining the role.³ Georgia’s state constitution was the first. Article XL stated that, “[i]n the absence of the chief justice, the senior justice on the bench shall act as chief justice with the clerk of the county, attorney for the State, sheriff, coroner, constable, and the jurors.”⁴

The first formal acknowledgment of the need for medical training for coroners occurred in 1860, when Maryland passed legislation allowing coroners to require that a physician be present at an inquest. In 1877, Massachusetts became the first state to replace its coroners with medical

¹ Institute of Medicine (IOM). 2003. *Medicolegal Death Investigation System: Workshop Summary*. Washington, DC: The National Academies Press, p. 8.

² Ibid.

³ Ibid.

⁴ GA. CONST. of 1777, art. XL.

examiners, who were required to be physicians. Physician medical examiners began performing autopsies for coroners in Baltimore in 1890. In 1918, New York City instituted a medical examiner system.⁵

The National Academy of Sciences first addressed the state of death investigation in 1928. The National Research Council's (NRC's) Committee on Medical Legal Problems, whose members included Roscoe Pound, Dean of Harvard Law School, and John Henry Wigmore, Dean of Northwestern Law School, released a harshly critical report entitled *The Coroner and the Medical Examiner*.⁶ In its first four recommendations, the 1928 committee suggested the following: (1) that the office of coroner be abolished. It is an anachronistic institution which has conclusively demonstrated its incapacity to perform the functions customarily required of it; (2) that the medical duties of the coroner's office be vested in the office of medical examiner; (3) that the office of medical examiner be headed by a scientifically trained and competent pathologist, selected and retained under civil service, and compensated by a salary which will attract men of genuine scientific training and ability; and (4) that the office of medical examiner be provided with the services of a staff competent in toxicology, bacteriology and other sciences necessary in the scientific investigation of causes of death, and with adequate scientific equipment. . . .⁷

Additionally, the 1928 committee recommended the development of medicolegal institutes, which would affiliate medical examiners with hospitals and universities.⁸ In 1932, another NRC committee produced a review of existing medicolegal collaborations, which were mostly located in Europe.⁹ This committee again advised a larger role for medical doctors within forensic science and criminal proceedings.¹⁰

In 1954, the National Conference of Commissioners on Uniform State Laws issued the Model Post-Mortem Examinations Act (the Model Act).¹¹ In its prefatory note, the Model Act stated the following:

The purpose of the Post-Mortem Examinations Act is to provide a means whereby greater competence can be assured in determining causes of death where criminal liability may be involved. Experience has shown that many

⁵ IOM, 2003, op. cit.

⁶ Bulletin of the National Research Council, No. 64. 1928. *The Coroner and the Medical Examiner*. Washington, DC: National Research Council.

⁷ Ibid., p. 89.

⁸ Ibid., p. 90.

⁹ Bulletin of the National Research Council, No. 87. 1932. *Possibilities and Need for Development of Legal Medicine in the United States*. Washington, DC: National Research Council.

¹⁰ Ibid., pp. 111-112.

¹¹ The model act has been posted by the National Association of Medical Examiners (NAME) at http://thename.org/index.php?option=com_content&task=view&id=97&Itemid=41.

elected coroners are not well trained in the field of pathology, and the Act should set up in each state an Office headed by a trained pathologist, this Office to have jurisdiction over post-mortem examinations for criminal purposes. The Office would supersede the authority of Coroner's Offices in this field.¹²

Following the release of the Model Act, a number of states implemented the proposed guidelines. Between 1960 and 1979, 12 states converted from coroners to medical examiners.¹³ However, in the subsequent decades, updates to death investigation organizations slowed considerably. Between 1980 and 1999, only three states converted from coroner to medical examiner systems.¹⁴ Since then, 11 states with coroners have remained unchanged, and only a handful of individual counties have independently implemented recommendations from the Model Act.¹⁵ Several of the remaining coroner states have provisions in their state constitutions requiring that coroners be elected.¹⁶ Although these provisions may be amended or removed, to do so will require political momentum. However, these provisions do not prohibit the addition of appointed medical examiners. For example, Kentucky has maintained county coroners, as dictated by its constitution, while also implementing medical examiners to serve at the state and district levels.¹⁷

MEDICAL EXAMINERS AND CORONERS (ME/C)

About 2,342 medical examiner and coroner offices provided death investigation services across the United States in 2004.¹⁸ Individual state statutes determine whether a medical examiner or coroner delivers death investigation services, which include death scene investigations, medical investigations, reviews of medical records, medicolegal autopsies, determination of the cause and manner of death, and completion of the certificate of death.

¹² Ibid.

¹³ Hanzlick, 2003, *op. cit.*

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ ARK. CONST. art. VII, § 46; COLO. CONST. art. XIV, § 8; IDAHO CONST. art. XVIII, § 6; IND. CONST. art. VI, § 2; MISS. CONST. ANN. art. V, § 135.

¹⁷ KY. CONST. § 99; KY. REV. STAT. ANN § 72.210 (2007).

¹⁸ Hanzlick, 2007, *op. cit.* The Bureau of Justice Statistics omits Louisiana and classifies Texas as a medical examiner state, and accordingly reports the total as 1,998. According to Hanzlick, many of Texas's 254 counties maintain justice of the peace/coroner's offices.

ME/C JURISDICTION

ME/C jurisdiction is determined by each state code and generally extends to deaths that are sudden and unexpected, deaths that have no attending physician, and all suspicious and violent deaths. The actual classes of death over which the ME/C assumes jurisdiction vary from state to state. Classes may include deaths resulting from injury, such as by violence or poisoning; by circumstance, such as related to fire or under anesthesia; by decedent status, such as prisoners or mental health patients; or by time-frame, such as deaths that occur within 24 hours of admission to a hospital. About 1 percent of the U.S. population (about 2.6 million people) dies each year. In 2004, ME/C offices received nearly 1 million reports of deaths, constituting between 30 to 40 percent of all U.S. deaths, and accepted about one half of those (500,000, or 1 in 6 deaths) for further investigation and certification.¹⁹ Depending on the jurisdiction, about 40 to 50 percent of deaths referred to the ME/C will, after investigation and examination, be attributed to natural causes, 27 to 40 percent to accident, 12 to 15 percent to suicide, 7 to 10 percent to homicide, and 1 percent as undetermined.²⁰

ME/C MISSIONS

ME/Cs serve dual purposes. First, they serve the criminal justice system as medical detectives by identifying and documenting pathologic findings in suspicious or violent deaths and testifying in courts as expert medical witnesses. Second, as public health officers, they surveil for index cases of infection or toxicity that may herald biological or chemical terrorism, identify diseases with epidemic potential, and document injury trends.

Additional ME/C responsibilities include the response to and investigation of all deaths resulting from all hazards, including terrorism and mass fatality events, and the identification of the unidentified dead. In addition, some 13,000 unidentified individuals are currently entered into databases for the unidentified dead, and many thousands more are entered as missing persons, as thousands of families search for them. Accessing these databases and matching them to the many thousands of individuals entered as missing persons is a major challenge for all organizations. Eighty percent of surveyed ME/C systems “rarely or never” utilize the National Crime Information Center Unidentified and Missing Persons (NCIC UP/MP) files to match their dead bodies to those reported as missing by law enforcement

¹⁹ J.M. Hickman, K.A. Hughes, K.J. Strom, and J.D. Roper-Miller. 2004. *Medical Examiners and Coroners' Offices, 2004*. U.S. Department of Justice, Bureau of Justice Statistics Special Report NCJ216756.

²⁰ *Office of the Chief Medical Examiner's Annual Report: 2006*. Available at www.vdh.state.va.us/medExam/Reports.htm.

agencies, even though NCIC recently granted access to the files by ME/Cs. Access, however, is not uniform, and the information that may be available could be limited.²¹

The newly established National Institute of Justice (NIJ) Office of Justice Programs, National Missing and Unidentified Persons System, NamUs, remains underutilized. Identification efforts for either of the national government databases require multiple investigative as well as data entry skills, and they are labor intensive. ME/Cs need a functional death investigation system; staff to develop identification features; and the necessary education, training, and equipment to utilize the multiple databases that are necessary to identify the unidentified dead and to meet the increasing societal expectations that ME/C systems should be able to identify the unidentified.²² Critically needed is a federal requirement that ME/C systems enter information on the unidentified into federal databases. A later section in this report discusses the medical examiner/coroner role in homeland security.

VARIATIONS IN ME/C SYSTEMS

As of 2004, administratively, 16 states had a centralized statewide medical examiner system, 14 had a county coroner system, 7 had a county medical examiner system, and 13 had a mixed county ME/C system.²³ Eight states had hybrid arrangements, with coroners and a state medical examiner office that performed medicolegal duties. The District of Columbia relies on a medical examiner system (see Figure 9-1). In large cities and counties, forensic pathologists serve both as medical examiners and pathologists. A few large systems, such as those of Los Angeles, California, and Cuyahoga County, Ohio, bear the historical name of a coroner system, but function essentially under a medical examiner structure. Eighty percent of ME/C offices are run by county coroners.

In total, there are approximately 2,342 separate death investigation jurisdictions.²⁴ Of 1,590 coroner offices in the United States, 82 serve jurisdictions with more than 250,000 people; 660 medium-sized offices serve between 25,000 and 249,999 people; and 848 offices serve small jurisdictions

²¹ J.C.U. Downs, Board Member and Chair, Governmental Affairs Committee, National Association of Medical Examiners; Vice Chair, Consortium of Forensic Science Organizations; Coastal Regional Medical Examiner, Georgia Bureau of Investigation. Presentation to the committee. June 5, 2007.

²² National Missing and Unidentified Persons System, NamUS. See www.namus.gov.

²³ Downs, *op. cit.*

²⁴ R. Hanzlick. "An Overview of Medical Examiner/Coroner Systems in the United States—Development, Current Status, Issues, and Needs." Presentation to the committee. June 5, 2007.

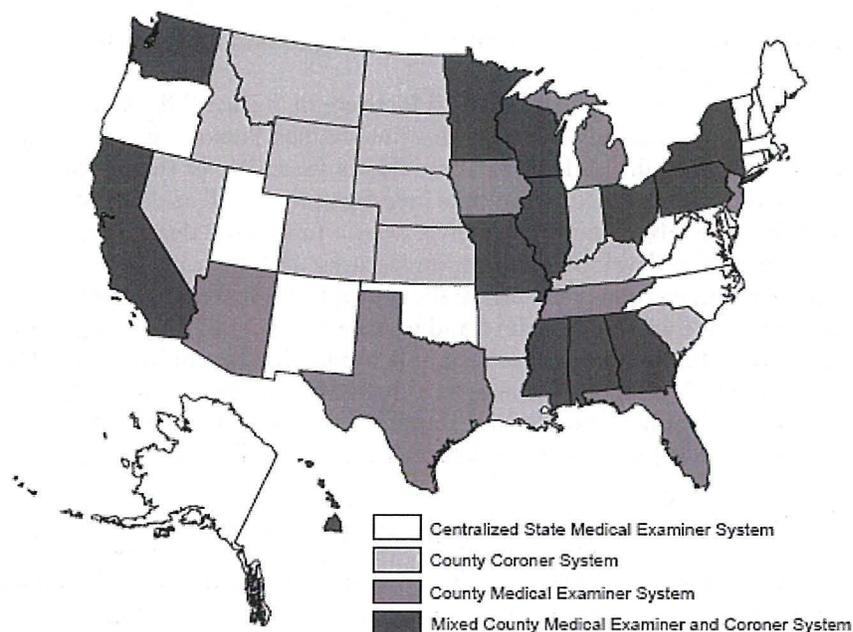


FIGURE 9-1 Death investigation systems in the United States, 2004.

SOURCE: J.M. Hickman, K.A. Hughes, K.J. Strom, and J.D. Roper-Miller. 2004. *Medical Examiners and Coroners' Offices, 2004*. U.S. Department of Justice, Bureau of Justice Statistics Special Report NCJ216756. (In 2007, Kentucky became legally a mixed county ME/C system.⁴)

⁴ Constitution of the State of Kentucky, § 99.

of fewer than 25,000 people.²⁵ The hodgepodge and multiplicity of systems and controlling statutes makes standardization of performance difficult, if not impossible. Some observers believe that a revisiting of the model code is required, as has been proposed by numerous study groups over the years, in order to work toward the development of a modern model code for death investigation systems that utilizes new and available technologies that are responsive to the needs of the citizens.²⁶

²⁵ Ibid.

²⁶ Ibid.

QUALIFICATIONS OF CORONERS AND MEDICAL EXAMINERS

Jurisdictions vary in terms of the required qualifications, skills, and activities for death investigators. Coroners are constitutional officers, with 82 percent being elected and 18 percent appointed.²⁷ Coroners as elected officials fulfill requirements for residency, minimum age, and any other qualifications required by statute. They may or may not be physicians, may or may not have medical training, and may or may not perform autopsies (see Box 9-1). Some serve as administrators of death investigation systems, while others are responsible solely for decisions regarding the cause and manner of death. Typical qualifications for election as a coroner include being a registered voter, attaining a minimum age requirement ranging from 18 to 25 years, being free of felony convictions, and completing a training program, which can be of varying length. The selection pool is local and small (because work is inconvenient and pay is relatively low), and medical training is not always a requirement. Coroners are independent of law enforcement and other agencies, but as elected officials they must be responsive to the public, and this may lead to difficulty in making unpopular determinations of the cause and manner of death.

Recently a 17-year-old high school senior successfully completed the coroner's examination and was appointed a deputy coroner in an Indiana jurisdiction.²⁸ In one state, justices of the peace are charged with determining cause and manner of death, but they are not medical death investigators. Whether coroners refer cases to pathologists for autopsy is largely budget driven (an autopsy costs about \$2,000), although access to pathologists may be an issue if regional interjurisdictional arrangements do not exist. Even so, 84 percent of coroner offices see a need for professional standards,²⁹ and they identify resources for infrastructure, staff, and training as continuing needs.

Options for improving death investigation by coroners include (1) replacing coroner systems with medical examiner systems; (2) increasing the statutory requirements for performance of coroners; or (3) infusing funding to improve the capabilities of coroners.³⁰

Some coroners have suggested establishing a "Coroner College."³¹ Coroners want grants for equipment, accreditation incentives, and access to forensic laboratories, NCIC, and automated fingerprint identification

²⁷ P.M. Murphy, Coroner, Clark County Coroner's Office, Las Vegas, Nevada. "The Coroner System." Presentation to the committee. June 5, 2007.

²⁸ "Teen Becomes Indiana's Youngest Coroner." See <http://happynews.com/news/5122007/teen-becomes-indiana-youngest-coroner.htm>.

²⁹ Murphy, *op. cit.*

³⁰ *Ibid.*

³¹ *Ibid.*

Box 9-1
What Is an Autopsy?

An autopsy is the systematic external and internal examination of a body to establish the presence or absence of disease by gross and microscopic examination of body tissues. The pathologist makes a surgical incision from shoulder to shoulder and from the midpoint of the shoulder to shoulder incision to the pubic bone. The skin is reflected, and each organ in the chest, including the neck structures, abdomen, and pelvis is removed and carefully examined. An incision is also made from the mastoid bone on the right to the mastoid bone on the left, and the scalp is pulled forward and the bony cap removed to reveal the brain. The brain is removed and examined. The pathologist takes a small sample or biopsy of all tissues and archives them in formalin to maintain them for future reference. In medicolegal autopsies, all tissues other than the biopsies are replaced in the body, except for perhaps the brain or heart, which may be retained and examined by consultants for diagnoses causing or contributing to death. For hospital autopsies, depending on the list of permissions given by the person qualified to give permission, tissues and organs may be retained for study, research, or other investigations. The pathologist submits small 2 × 2 cm sections of tissue to the histology laboratory, where thin slices a few microns thick are subjected to chemical treatment to preserve them. The tissue blocks are shaved, so that a thin layer can be mounted on a glass slide and stained with dyes to differentiate cells. The pathologist can recognize diseases in the stained tissue. Medicolegal autopsies are conducted to determine the cause of death; assist with the determination of the manner of death as natural, suicide, homicide, or accident; collect medical evidence that may be useful for public health or the courts; and develop information that may be useful for reconstructing how the person received a fatal injury.

systems.³² Lack of direct access to laboratories and insufficient funding for testing impair the expertise of coroners. Some coroners are amenable to protocols that would ensure the use of forensic pathologists for autopsy. However, even with these improvements, the assessment of the dead for disease, injury, medical history, and laboratory studies is a medical decision, as opposed to a decision that would be made by a lay person with investigative and some medical training. The disconnect between the determination a medical professional may make regarding the cause and manner of death and what the coroner may independently decide and certify as the cause and manner of death remains the weakest link in the process.

In contrast, medical examiners are almost always physicians, are appointed, and are often pathologists or forensic pathologists. They bring

³² Murphy, *op. cit.*

the body of knowledge of medicine to bear when assessing the history and physical findings and when deciding on the appropriate laboratory studies needed to determine the cause and manner of death. In statewide systems, cities and counties have local medical examiners that are physicians trained to receive the reports of death, decide jurisdiction, examine the body, and make a determination of the cause and manner of death. They certify locally many obvious natural and accidental deaths. In statewide and regionalized statewide systems, local medical examiners do not need to be forensic pathologists and do not perform autopsies, but they do refer, according to protocols, deaths from violence—particularly suicides, homicides, and deaths occurring under suspicious circumstances—to a central or regional autopsy facility for autopsy and further follow-up by a forensic pathologist. In hybrid or mixed state systems, coroners may refer cases for autopsy to forensic pathologists, but there is no supervision or quality assurance to ensure that the coroner's certification of the cause of death and manner of death is concordant with the pathologist's conclusions.

ME/C ADMINISTRATION AND OVERSIGHT

ME/Cs have varying forms of organizational oversight. Forty-three percent of the U.S. population is served by systems that are independent, 33 percent by offices residing administratively in public safety or law enforcement organizations, 14 percent by offices in health departments, and 10 percent by offices within a forensic laboratory. Government reports over the years have recommended that a medical examiner system should be an independent agency or should report to a commission so that it avoids any conflicts of interest and so that it reports directly to the jurisdictional governing body. When this is not possible, incorporation into a health department, instead of into law enforcement agencies, seems to provide the next most compatible location.³³

ME/C STAFFING AND FUNDING

ME/C offices serving populations of less than 25,000 people employ 1 to 2 full-time equivalent (FTE) staff members, while offices serving populations of 1 million or more employ an average of 50 FTEs.³⁴ Competent death investigations require that trained medical death investigators attend scenes; medically credentialed persons perform external physical examinations; and forensic pathologists perform medicolegal autopsies, employ and

³³ V. Weedn. "Legal Impediment to Adequate Medicolegal Death Investigation." Presentation to the committee. June 5, 2007.

³⁴ Downs, *op. cit.*

interpret radiographs, prepare records, maintain databases, and provide competent and credible testimony in courts. Staff requires training and expensive equipment to utilize and integrate new technologies. Efforts are restricted by budgets, and budgets vary widely, ranging from \$18,000 to \$2.5 million annually for county systems, depending on the size of the population. A 2007 survey conducted for the National Association of Medical Examiners (NAME) by Hanzlick revealed that county systems' per capita cost ranged from \$1.31 to \$9.19, with a mean of \$2.89. State systems benefit from economies of scale and function more economically at \$.64 to \$2.81, with a mean of \$1.76.³⁵ The large variation in qualifications, staffing, budgets, and the multiple skills required for competent death investigations, especially in small jurisdictions, has resulted in marked variation in the quantity and quality of death investigations in the United States.

Physical facilities also vary in adequacy. Only one-third of offices have in-house facilities to perform the histology needed to make microscopic diagnoses on tissues sampled at autopsy. Only one-third have in-house toxicology capabilities to identify drugs present in the deceased that either contributed to or were the primary cause of death. One-third do not have radiology services in-house that would allow the identification of missiles, disease, bony injury or identification features in decedents.³⁶ Some coroner systems do not have any physical facility at all.

It is clear that death investigations in the United States rely on a patchwork of coroners and medical examiners and that these vary greatly in the budgets, staff, equipment, and training available to them, and in the quality of services they provide. No matter what the level of quality of other forensic science disciplines that are supported by a particular jurisdiction may be, if the death investigation does not include competent death investigation and forensic pathology services, both civil and criminal cases may be compromised.

All ME/Cs share the following deficiencies to some degree:

- imperfect legal structure/code controlling death investigations;
- inadequate expertise to investigate and medically assess decedents;
- inadequate resources to perform competent death investigations;
- inadequate facilities and equipment for carrying out body views and conducting autopsies;
- inadequate technical infrastructure (laboratory support);
- inadequate training of personnel in the forensic science disciplines;

³⁵ R. Hanzlick. "An Overview of Medical Examiner/Coroner Systems in the United States—Development, Current Status, Issues, and Needs." Presentation to the committee. June 5, 2007.

³⁶ Murphy, *op. cit.*

- lack of best practices and information standards;
- lack of quality measures and controls;
- lack of information systems; and
- lack of translational research and associations with university research.³⁷

THE MOVEMENT TO CONVERT CORONER SYSTEMS TO MEDICAL EXAMINER SYSTEMS

As mentioned above, the movement to improve death investigations by bringing in medical expertise in the form of medical examiner systems is not new. Early NRC reports were followed in 2003 by an Institute of Medicine Workshop on the Medicolegal Death Investigation System, which also concluded that the medical examiner system is the best organizational structure for utilizing medical expertise to assess the presence or absence of disease and injury and for correlating the medical findings and investigative information to arrive at a determination of cause of death and manner of death. Progress has been very slow.

Additional impediments to progress include the need for some states to change state constitutions or codes, the political constituent base underpinning local coroners, insufficient population and budget to support a competent independent system in small localities, an unwillingness to develop cooperative regionalization for provision of autopsy services, the shortage of physicians—especially pathologists and forensic pathologists—and lack of interest, advocacy, or the perception of need.³⁸ To implement such conversions, the United States will require a national vision, a model code, increased numbers of forensic pathologists, and funding for infrastructure, staff, education, training, and equipment.

One possible model for providing incentives for these conversions could be an initiative similar to the Law Enforcement Assistance Administration (LEAA). LEAA was a federal agency operating from 1968 to 1982 with the purpose of funneling federal funding to state and local law enforcement agencies. The agency created state planning agencies and funded educational programs, research, and matching grants for physical plants and a variety of local crime control initiatives. For example, an \$8 million grant to Virginia established the Virginia Department of Forensic Science, a premier state forensic laboratory that provides forensic science services to all state agencies and the Medical Examiner System in Virginia.³⁹ If

³⁷ Downs, *op. cit.*

³⁸ Downs, *op. cit.*; Weedn, *op. cit.*, Hanzlick, *op. cit.*

³⁹ Law Enforcement Assistance Administration at www.archives.gov/research/guide-fed-records/groups/423.html.

the capitalization of a medical examiner system is the major impediment to progress, an LEAA model can remove that barrier. However, a Medical Examiner Assistance Administration, or MEAA, would need to be structured so that the medical examiner would not be considered a servant of law enforcement and thus would not be placed in a position in which there is even an appearance of conflict of interest. Sensitive cases, such as police shootings and police-encounter deaths, jail and prison deaths, deaths in public institutions, and others, require an unbiased death investigation that is clearly independent of law enforcement. All previous studies have recommended that the medical examiner be independent of other agencies, or if they are to be under the umbrella of a central agency that the reporting chain should be through a health department. The medical examiner is first and foremost a physician, whose education, training, and experience is in the application of the body of medicine to situations that have a legal dimension that must be answered by a practitioner of medicine.

UTILIZATION OF BEST PRACTICES

The tremendous variation in death investigation systems also impedes interagency and interjurisdictional communication and the development of standardized best practices both in death investigation and in the performance of medicolegal autopsies.

NIJ and NAME have attempted to provide guidance for best practices. The NIJ document *Death Investigation: A Guide for the Scene Investigator*; *Medicolegal Death Investigator: A Systematic Training Program for the Professional Death Investigator*; the NAME Autopsy Standards and Inspection Checklist; and NAME's Forensic Pathology Autopsy Standards are available, but there is no incentive for death investigation systems to adopt them for use.⁴⁰

Compliance is further limited because of heavy case loads, deficiencies in trained staff, absence of equipment, nonavailability of required day-to-day and consultative services, and the presence of contradictory policies and practices.

⁴⁰ U.S. Department of Justice, Office of Justice Programs, National Institute of Justice. *Death Investigation: A Guide for the Scene Investigator*. Available at www.ojp.usdoj.gov; S.C. Clark, M.F. Ernst, W.D. Haglund, and J.M. Jentzen. 1996. *Medicolegal Death Investigator: A Systematic Training Program for the Professional Death Investigator*. Occupational Research and Assessment. Grand Rapids; NAME Autopsy Standards and Inspection Checklist at www.thename.org; and G. Peterson and S. Clark. 2006. *Forensic Autopsy Performance Standards* at www.thename.org.

POTENTIAL SCIENTIFIC ADVANCES THAT MAY ASSIST ME/CS

In addition to current technologies, which are often unavailable and underutilized, new technologies are on the horizon to assist death investigators, medical examiners, and forensic pathologists.

Computerization of case records and the development of case information databases should be standard in any death investigation office, so that death data may be tracked for trends, response to public health and public safety interventions can be streamlined and accelerated, and continuing quality assurance measures can be implemented. There is no standard method of sample and data collection for ME/C systems. Multiple systems are commercially available that can be structured to meet the particular needs of any death investigation system. The initial cost of such systems is significant, and they require continuing maintenance, which rules out their utilization by small and/or underfunded offices. Even if such computer systems were present in each office, there is no standardization that would allow them to talk to one another, a necessity in a multijurisdictional event such as the Hurricane Katrina disaster, for which databases across states were critical to the identification of the dead and the tracking of survivors.

Laboratory information systems are available for the management of medical evidence, laboratory specimens, laboratory data, forensic samples, and personal effects. Effective database management allows information to be gathered and utilized by staff and analyzed for trends and quality issues. Effective databases are essential for managing any multiple fatality event. Rapid electronic transmission of reports is feasible if encryption software is available. At this time, ME/C information systems are less interoperable than current Automated Fingerprint Identification Systems (see Chapter 10). Although the standard autopsy report generally covers the internal examination by organ systems, reporting formats are not standardized among jurisdictions. And, although the NAME Forensic Autopsy Performance Standards provide a model for reporting autopsy findings,⁴¹ it is not widely used.

Imaging equipment is critical to documenting findings sufficient for courts, for review by outside experts, and for reevaluation as medical knowledge advances. Fluoroscopy is helpful for locating missiles. Computed tomography scanning and nuclear magnetic resonance imaging may often present a better visual picture of some injuries and would likely reduce the number of autopsies carried out to rule out occult injury and to document in greater detail the extent of injury in accidents. The “Virtual

⁴¹ G. Peterson and S. Clark. 2006. Forensic Autopsy Performance Standards. Available at www.thename.org.

Autopsy,” or “virtopsy,” utilizes multislice computed tomography and magnetic resonance imaging combined with 3-D imaging technology to create vivid images of the interior of the human body.⁴²

The advantages of the virtopsy are that it is not invasive or destructive of tissue and can provide dramatic pictures of skeletal and soft tissue injury. It also provides some information when there is a religious objection to autopsy. Virtopsy has the potential to detect internal bleeding, missile paths, bone and missile fragmentation, fracture patterns, brain contusion, and gas embolism, in addition to occult fractures that are technically difficult to demonstrate during the traditional autopsy. Although a standard forensic autopsy is needed to recover evidence such as bullets or bomb fragments within the body and to collect specimens for testing, virtopsy offers a valuable tool for examination when dissection of the body is not feasible, when evidence is hard to visualize, or when a more complete assessment of injury is desired in noncriminal cases. For example, instead of a simple external examination for an obviously lethal injury in a vehicular violence death, virtopsy would permit more extensive cataloging of the injury to help automotive engineers design safer vehicles. The same technology can enhance bite mark impressions and some patterned injuries. Only a few ME/Cs have access to virtopsy at this time, and very few have the budget to purchase the expensive equipment or to build a suitable facility and staff and maintain it.

Scanning electron microscopy is not new but few ME/Cs have access to it to assist in identifying the metal conductor(s) in electrocution injuries, gunpowder residues in gunshot injuries, and other trace metals on skin or in tissues.

The anthrax bioterrorism attack that occurred in Connecticut, Maryland, New York, Virginia, and Washington, DC, highlighted the need to have biosafety capability for autopsy facilities. Currently, most autopsy facilities are 20 years old, on average, and are outdated in physical plant, technology, and biosafety capability. One-third of them lack design/airflow control of pathogens, and most function at biosafety level 2 rather than level 3.⁴³ Upgrading facilities to handle the potential biohazards associated with bioterrorism will require a massive infusion of funds that localities currently are unable or unwilling to provide. Laboratory safety in an era in which bioterrorism is a real threat remains an ongoing issue.

In-house toxicology services utilizing state-of-the-art equipment are essential for identifying drugs, intoxicants, and poisons and for detecting unsuspected homicides, suicides, and child and elder abuse. Yet only 37

⁴² See www.nlm.nih.gov/visibleproofs/galleries/technologies/virtopsy.html.

⁴³ Downs, *op. cit.*

percent of systems have in-house toxicology capabilities.⁴⁴ The cost for complete toxicology utilizing private sector laboratories for cases is high, resulting in insufficient toxicology screening and minimal testing on cases even when they are clearly indicated.

Molecular diagnosis conducted on blood and tissue samples is routine in hospital laboratories to diagnose disease. Investigations of unexplained sudden deaths, especially in young people and infants, would benefit from greater access to molecular diagnostics. Molecular diagnostic procedures are available, but most ME/C offices cannot afford to conduct these procedures and do not have the medical expertise to request them or the skills to interpret them. For example, testing for inborn errors of metabolism should be a part of any examination of the unexpected death of an infant or toddler, and testing for long QT syndrome is important in determining the cause of cardiac death in young people or in those whose family pedigree discloses other sudden unexpected deaths. Molecular testing is available for the etiology of multiple causes of sudden cardiac death, including abnormalities in ion channels in cell membranes or channelopathies, hypertrophic cardiomyopathy, long QT syndrome, Marfan syndrome, right ventricular cardiomyopathy, dilated cardiomyopathy, and Ehlers-Danlos syndrome.⁴⁵

Some testing can be carried out on a dried blood sample long after death has occurred.⁴⁶ Some molecular diseases are heritable, and it could be argued that the ME/C has a duty to identify these diseases and alert families about their presence. Many medical examiner offices archive a card with a dried blood sample on decedents, primarily to document personal identification, should the need arise, but also for future study. In the future, kin may request the archived blood cards, as the molecular diagnosis of disease improves and families seek to identify their risk. Thus, ME/Cs need education and training in and access to the specialized laboratory testing available to establish the molecular basis of disease and of sudden unexpected natural death.

⁴⁴ Ibid.

⁴⁵ S.E. Lehnart, M.J. Ackerman, D.W. Benson, R. Brugada, C.E. Clancy, J.K. Donahue, A.L. George, A.O. Grant, S.C. Groft, C.T. January, D.A. Lathrop, W.J. Lederer, J.C. Makielski, P.J. Mohler, A. Moss, J.M. Nerbonne, Y.M. Olson, D.A. Przywara, J.A. Towbin, L.H. Wang, A.R. Marks. Inherited arrhythmias: a National Heart, Lung, and Blood Institute and Office of Rare Diseases workshop consensus report about the diagnosis, phenotyping, molecular mechanisms, and therapeutic approaches for primary cardiomyopathies of gene mutations affecting ion channel function. *Circulation* 13;116(20):2325-2345.

⁴⁶ Personal communication between M.J. Ackerman and Marcella Fierro. June 16, 2008.

THE SHORTAGE OF MEDICAL EXAMINERS AND FORENSIC PATHOLOGISTS

Medical examiners are physicians who are appointed and charged with determining the cause and manner of death. In some states, medical examiners are forensic pathologists, while in other statewide systems, local, city, and county medical examiners are physicians but do not need to be forensic pathologists. They receive death investigation training and are responsible for examining bodies that do not require medicolegal autopsy and, according to system guidelines, for referring cases that need autopsy to regional offices where forensic pathologists perform the examinations and initiate further investigation as needed. Well-trained local medical examiners keep costs in line by reducing transportation costs to regional or central offices and are more accessible than pathologists in distant offices. Changes in the delivery of health care, increased patient caseloads, the inconvenience of attending scenes, the need for before and after hours examination of decedents, and the level of remuneration have made it difficult for statewide systems to recruit busy physicians to serve as community or local medical examiners. If this trend continues, systems will rely more heavily on lay medical death investigators and will need to develop training programs that assure competency.

Forensic pathology is the subspecialty of medicine devoted to the investigation and physical examination of persons who die a sudden, unexpected, suspicious, or violent death. Forensic pathology derives its name from “forensis” (public), or pertaining to the forum, and “pathos” (suffering), referring to pathos or suffering. The term ultimately evolved to encompass the study of deaths due to injury and disease and of deaths that are of interest to the legal “forum.” Forensic pathologists are physicians who have completed, at a minimum, four years of medical school and three to four years of medical specialty training in anatomical pathology or anatomical and clinical pathology, followed by an accredited fellowship year in forensic pathology. They are certified by examination and assessment of their credentials by the American Board of Pathology in, at a minimum, anatomical pathology, and by subspecialty examination, as having special competence in forensic pathology.

As of 2008, approximately 38 forensic pathology residency programs accredited by the Accreditation Council for Graduate Medical Education sponsored approximately 70 training fellowships. Some positions are unfunded, and others did not find suitable candidates. Forty-two candidates were certified in forensic pathology by the American Board of Pathology in January 2008. Pathologists must recertify by examination every 10 years to maintain their certifications, in addition to maintaining a professional license in the state in which they are practicing, by submitting a descrip-

tion of practice for pathologists that do not practice as hospital staff and by earning continuing medical education credits.⁴⁷

Forensic pathologists examine the dead to identify specific classes of injury, collect medical evidence, determine the presence or absence of natural disease, and determine the physiological cause of death. They document their findings in reports for the civil and criminal courts and provide information to family members and others who have a legitimate need to know. They may sign the death certificate describing the manner or circumstances under which death occurred (natural, accident, suicide, homicide, or undetermined). The examinations forensic pathologists carry out may be inspections or “views” of the external surfaces of a body or a medicolegal autopsy, which comprises an external and internal examination of the head, thorax, abdomen, and any other body region pertinent to the case. The nature of the death and its circumstances dictate which type of examination the forensic pathologist performs on an individual case. Pathologists who are not certified in forensic pathology perform many of the medicolegal autopsies in the United States.

Forensic pathologists practice in multiple settings. Most operate within death investigation systems and are appointed as civil servants and serve as medical examiner forensic pathologists. Some function as private practitioners, while others serve as consultants. They may operate under a fee-for-service agreement or be under contract to a city or county jurisdiction to provide medical examiner services. Others may serve as coroner’s pathologists, and perform autopsies and prepare reports for coroners, who by statute assign the cause and manner of death and sign the death certificate.

An estimated 1,300 pathologists have been certified in forensic pathology since the American Board of Pathology first offered the certification in 1959 (about 5,000 medical residents enter internal medicine programs each year). Currently, approximately 400 to 500 physicians practice forensic pathology full time. Although there are only about 70 positions available each year, recent data indicate that only 70 percent of the slots are filled. NAME recommends an autopsy caseload of no more than 250 cases per year. The estimated need is for about 1,000 forensic pathologists; about 10 percent of available positions are vacant because of manpower shortages and/or insufficient funding of pathologist positions.⁴⁸ Although many forensic pathologists earn between \$150,000 and \$180,000 annually, this range is much lower than the average income of most hospital-based pathologists starting at the entry level.

An Association of American Medical Colleges (AAMC) survey indi-

⁴⁷ American Board of Pathology at www.abpath.org/200801newsltr.htm; *ABP Examiner* 39, January 1, 2008 at www.abpath.org/200802newsltr.htm.

⁴⁸ Hanzlick, 2007, op. cit.

cates that the average medical school graduate in 2006 finished with debt in excess of \$130,571 (including premedical school borrowing), with 72 percent having a debt of at least \$100,000.⁴⁹ Interested pathology residents are less likely to elect to practice forensic pathology as a career if they are already burdened by debt load, and a program of loan forgiveness for years of service in a medical examiner system would be a major enticement to students who are considering a career in pathology. The shortage of qualified forensic pathologists required to staff aspiring medical examiner systems constitutes a major challenge not only for offices that are currently seeking staff, but for the future as well.

STANDARDS AND ACCREDITATION FOR DEATH INVESTIGATION SYSTEMS

Currently, the standard for quality in death investigation for medical examiner offices is accreditation by NAME. Accreditation attests that an office has a functional governing code, adequate staff, equipment, training, and a suitable physical facility and produces a forensically documented accurate, credible death investigation product. Of all ME/C systems nationally, only 54 are accredited by NAME. The NAME accreditation checklist is available online and describes the requirements for accreditation.⁵⁰ Accreditation is for a period of five years. NAME also offers an individualized assessment program to enable jurisdictions to identify what they need to meet accreditation standards. Impediments to developing systems that meet accreditation requirements include the following:

- Most coroner systems cannot qualify for accreditation because of problems related to size, insufficient staff and equipment, and insufficiently trained personnel, which inhibit their ability to perform a competent physical examination, make and/or exclude medical diagnoses on dead bodies, and make determinations of the cause and manner of death. The historic role of the coroner is insufficient to accurately perform the medicolegal and public health functions related to sudden, unexpected, or violent death.
- Many medical examiner systems are constrained by budget, lack of staff, lack of equipment, and insufficient facilities and cannot meet NAME standards.
- The accreditation process requires considerable staff work, including written policies and procedures.

⁴⁹ Association of American Medical Colleges at www.ama-assn.org/ama/pub/category/5349.html.

⁵⁰ NAME Autopsy Standards and Inspection Checklist at www.thename.org.

- The process requires renewal.
- There is administrative cost of the process.
- Many offices do not see any benefit to accreditation.

Federal incentives are lacking for states to perform an assessment of death investigation systems to determine status and needs, using as a benchmark and goal compliance with NAME current professional standards, guidelines, and accreditation requirements.

QUALITY CONTROL AND QUALITY ASSURANCE

Quality control and quality assurance begin with the implementation of standardized policies and procedures by qualified staff. For lay medical investigators, registration and certification by the American Board of Medicolegal Death Investigators requires standard performance procedures as outlined in the NIJ document *Death Investigation: A Guide for the Scene Investigator* and other published education and training documents.⁵¹ For forensic pathologists, basic competence is initially documented by examination and certification and subsequently by recertification by the American Board of Pathology. Written office and morgue policies and procedures with scheduled reviews and updates help ensure consistent performance over time. Professional performance parameters, such as the NIJ investigation guidelines for investigators and the NAME forensic autopsy standards, are offered as national documents that all systems should be able to follow. Professional continuing education must be available and supported, and it should be mandatory.

CONTINUING MEDICAL EDUCATION

For pathologists to maintain professional standing they must earn Continuing Medical Education (CME) credits in accordance with the number required by their state medical licensing board. Attendance at forensic educational meetings, such as the annual meetings of NAME and the American Academy of Forensic Sciences (AAFS), help keep medical staff current. Other opportunities that offer valuable CME credits are meetings that focus on pediatric forensic issues and general pathology updates. AAFS meetings are multidisciplinary and afford an opportunity for updating in forensic anthropology, forensic odontology, and other forensic disciplines. The American Society of Clinical Pathologists offers CheckSample exercises and

⁵¹ U.S. Department of Justice, Office of Justice Programs, National Institute of Justice. *Death Investigation: A Guide for the Scene Investigator*. Available at www.ojp.usdoj.gov.

quizzes on forensic subjects prepared by experts.⁵² Regular in-house training on emerging technologies in pathology and forensic science, and journal clubs covering a broad spectrum of journals, can help educate and reeducate forensic pathologists and investigators. Medical death investigators may attend the same meetings. The College of American Pathologists offers self-assessment programs in anatomical and forensic pathology, as well as a continuing education program of forensic pathology case challenges.⁵³

HOMELAND SECURITY

As part of homeland security, the National Response Plan (National Response Framework as of March 2008) identifies ME/Cs under Emergency Support Function 8 as responsible for management of the dead resulting from any hazardous event.⁵⁴ All deaths resulting from any form of terrorism are under the jurisdiction of the ME/C. MED-X, the bioterrorism surveillance program provided by the Centers for Disease Control and Prevention (CDC) for ME/Cs, utilizes syndromic surveillance of primarily out-of-hospital deaths (deaths occurring before the opportunity occurs for hospitalization and medical assessment and testing) to quickly identify deaths resulting from bioterrorism.⁵⁵

With the exception of some large city, county, and state systems, the level of preparedness of ME/C jurisdictions is generally very low. Larger medical examiner systems may be able to manage events causing several hundred simultaneous single-site recoverable bodies with minimal outside assistance. Any event with thousands of fatalities would require federal assistance. Some statewide systems have developed consortia with neighboring states to supplement staff and equipment, but smaller cities and counties will need to rely entirely on federal assets such as Disaster Mortuary Operational Response Teams and the DOD Joint Task Force Civil Support.⁵⁶ Homeland security and disaster response would be well served by universal improvement in ME/C offices to manage mass fatality events such as the multistate Hurricane Katrina tragedy and the World Trade Center attacks, while also surveilling for the links between bioterrorism

⁵² American Society of Clinical Pathologists CheckSample. Available at www.ascp.org/Education/selfStudyPublications/checkSample/default.aspx.

⁵³ See <http://cap.org/apps/cap.portal>.

⁵⁴ Homeland Security National Response Plan (known as the National Response Framework after March 2008) at www.dhs.gov.

⁵⁵ Ibid; K.B. Nolte, S.L. Lathrop, M.B. Nashelsky, J.S. Nine, M.M. Gallaher, E.T. Umland, J.L. McLemore, R.R. Reichard, R.A. Irvine, P.J. McFeeley, R.E. Zumwalt. 2007. "Med-X": A medical examiner surveillance model for bioterrorism and infectious disease mortality. *Human Pathology* 38:718-725.

⁵⁶ Disaster Mortuary Operational Response Team at www.dmort.org; Joint Task Force Civil Support at <http://jtfcs.northcom.mil>.

deaths. Multiple fatality management across jurisdictional lines, such as was needed in response to Hurricane Katrina, is nearly impossible under current conditions, given the absence of medical expertise in some systems, the absence of standards of performance, and the noninteroperability of systems and procedures. The recent infusion of funds to the states through the Department of Health and Human Services (DHHS) and the Department of Homeland Security (DHS) is of little assistance when there are no competent systems able or willing to employ those funds. Uniform statewide and interstate standards of operation, consolidation of small systems, regionalization of services, and standardization of staff training are needed to assist in the management of interstate and cross-jurisdictional events. A software program is needed that is universally usable and available, and its use should be promulgated by ME/C systems for multiple fatality management. (See also Chapter 11.)

FORENSIC PATHOLOGY RESEARCH

Currently, little research is being conducted in the areas of death investigation and forensic pathology in the United States. Individual ME/C offices mainly utilize their databases for epidemiological retrospective reviews. Individual forensic pathologists operating in any system carry heavy caseloads and often have no dedicated time, expertise, facilities, or funding for research. Research is further limited because many offices operate training programs independent of university medical schools. Occasionally, a specific case may inspire “litigation research” directed to the elucidation of a specific problem related to a case that is being litigated actively, but this does not replace broad and systematic research of a forensic issue. Few university pathology departments promote basic pathology research in forensic problems such as time of death, injury response and timing, or tissue response to poisoning. In general, research interest often is inspired by a national goal that is funded through grants. A review of the forensic literature for basic research in forensic pathology reveals that efforts are originating largely from Europe, Scandinavia, and Japan. In other countries, universities house a department of legal medicine and/or departments of forensic medicine and pathology where forensic pathologists have the time, expertise, and funding needed to perform basic forensic research.

The Accreditation Council for Graduate Medical Education (ACGME) requires forensic pathology training programs to provide fellows an opportunity for scholarly research or other scholarly activities.⁵⁷ These research projects are usually small and limited in scope because of the constraints of a one-year fellowship, legislation that does not permit most basic research

⁵⁷ Accreditation Council for Graduate Medical Education. Available at www.acgme.org/acWebsite/downloads/RRC_progReq/310forensicpath07012004.pdf.

on tissues that are available upon autopsy without the permission of next of kin, lack of funding, and lack of space. Historically, the consent issue derives from the fact that forensic autopsies are carried out for medicolegal purposes and thus do not require permission from the next of kin. But without this permission, research that utilizes tissue from medical examiner offices does not take place. The time constraints for the performance of medicolegal autopsies make finding families and obtaining consent difficult. Many projects consist of epidemiological reviews that while of interest are not basic science.

Some U.S. universities may administer some forensic pathology fellowship programs, while others may include forensic pathologists within their departments of pathology. In these instances, the forensic pathologist usually supervises a departmental autopsy service that performs hospital and forensic autopsies. A university connection usually provides the university with the opportunity to rotate pathology residents and medical students through an ME/C office for a brief period, usually several months, and provides exposure to forensic pathology as part of an overall education program for medical students or as required by ACGME for training residents in general pathology. Even in universities that have a department of forensic science, research is limited to the forensic science disciplines, and little or no research is devoted to forensic pathology or forensic medicine. In some cases, there may be collaborative, ongoing epidemiological activities, such as when forensic pathologists work with members of departments of trauma surgery to develop statistical studies or when a forensic pathologist presents data at surgical or pediatric death review conferences. Of the many impediments to academic research in forensic pathology in the United States, the most significant are the lack of understanding of forensic research challenges, the lack of a perceived need and national goals, the lack of grant funding of any kind to support research, the lack of forensic pathology researchers, and the lack of recognition for efforts directed to forensic pathology research within the university community. Grant funding drives research, but virtually no funding is available to encourage departments of pathology to make forensic pathology research a focus, and there is little tradition of collaboration between academic and forensic pathologists.

Translational research bridges the gap between basic science discoveries and their practical applications. In the case of forensic pathology/medicine, this means taking basic science research knowledge to the autopsy table.⁵⁸ Given the large numbers of autopsies performed in the

⁵⁸NIH Roadmap for Medical Research: Re-engineering the Clinical Research Enterprise—Translational Research. Available at <http://nihroadmap.nih.gov/clinicalresearch/overview-translational.asp>.

United States in medical examiner offices, there is a great need for new knowledge that will filter down to the autopsy pathologist and for opportunities for practicing forensic pathologists to identify problems that need basic research.

COMMON METHODS OF SAMPLE AND DATA COLLECTION

State statute determines the sample or collection of cases that ME/Cs investigate and examine. The minimal data collected on each case is demographic and is entered on the certificate of death by the state division of vital records and death statistics, which also maintains the data. The data are reported nationally each year to the National Center for Health Statistics. ME/C offices with databases may keep records pertaining to their particular jurisdiction and collect additional data on specific diagnoses, or classes, of death. They collect useful death data through child fatality review teams, adult fatality review teams, surveillance programs for family and intimate partner violence, and the National Violent Death Review System.⁵⁹ None of these data collection projects is federally mandated, and for small systems there is no perceived benefit. ME/C reports are available to next of kin and others as provided by statute. ME/C investigations recognize product and equipment failures leading to death and report them to appropriate agencies. Before 2005, when funding was withdrawn, CDC maintained the Medical Examiner and Coroner Information Sharing Program (MECISP) to receive reports of product-associated deaths, which allowed early recognition of problem products.⁶⁰ Originally, MECISP was established to obtain data from all deaths investigated by ME/Cs and to share such information with relevant agencies. The major goals of MECISP were to improve medicolegal death investigation and to facilitate the sharing of death investigation information.⁶¹ Many agencies depend on ME/C investigations and autopsies to complete their work, such as the Occupational Health and

⁵⁹National Violent Death Reporting System. Available at www.cdc.gov/ncipc/profiles/nvdrs/default.htm.

⁶⁰Centers for Disease Control and Injury Prevention Medical Examiner Coroner Information Sharing Project. Available at www.cdc.gov/ncphi/disse/nndss/contact.htm#mecisp.

⁶¹MECISP was established in 1986 by CDC with goals that included improving the quality of death investigation in the United States mainly by achieving uniformity and improving the quality of information obtained during the investigation of deaths by ME/Cs. The program was active and productive and very well received by medical examiners. It constituted the major interface between the public health and the ME/C systems. Approximately 10 years ago, CDC went through a period of internal reorganization and administratively began decreasing the budget for MECISP. MECISP was moved from the CDC National Center for Environmental Health to the CDC Epidemiology Program Office. The budget was eliminated in 2004, despite the efforts of NAME. R. Hanzlick. 2006. Medical examiners, coroners, and public health. *Archives of Pathology and Laboratory Medicine* 130:1247-1282.

Safety Administration, social services agencies, victim witness compensation programs, and workers compensation agencies.

Systems with in-house forensic pathologists may collect autopsy data, but often the data are collected in a format that is different from the one used for the underlying (proximate) cause of death data as listed on death certificates. The reporter may use a pathology classification system such as SNOMED (Systematized Nomenclature of Medicine) or an individually devised system that tracks diseases or injuries of personal or system-specific interest.⁶² There is no universally accepted or required system for collection or maintenance of autopsy data by medical examiners and coroners. Analysis of data may be local or regional, and it may be conducted by review teams or by national organizations or agencies with interests in specific classes of data.

Scientific interpretation and summaries of the results are included in the reports generated by each ME/C office. Reports by medical death investigators that describe the circumstances of death are descriptive and vary in quality depending on the standards of the office. Pathologists produce the autopsy reports and may or may not provide an interpretive summary of findings. Reports vary from the academic pathology report that lists each organ system and any deviations from normal to the problem-oriented autopsy report that prioritizes diagnoses from the most important leading to death followed by any contributory and then noncontributory pathology of interest. Not all pathologists follow the NAME autopsy standards. The general expectation, at least for the legal forum, is that each autopsy will have documented the findings in sufficient detail through narrative and photographs and that review by another pathologist will confirm the adequacy of the examination.

Requiring the adoption of standards for death investigations and autopsies as well as accreditation of all ME/C offices would benefit all parties, including the recipients of ME/C services. Because the credibility of unaccredited offices is rarely challenged, implementing and enforcing standards will require major incentives as well as negative consequences for nonadherence.

CONCLUSIONS AND RECOMMENDATION

ME/C systems function at varying levels of expertise, often with deficiencies in facilities, equipment, staff, education, and training. And, unfortunately, most systems are under budgeted and understaffed. As with other forensic science fields, there are no mandated national qualifications or certifications required for death investigators. Nor is medical expertise

⁶² SNOMED. Available at www.snomed.org.

always required. In addition, there is no one recognized set of performance standards or best practices for ME/C systems nor are there incentives to implement one recognized set. Also lacking are universally accepted or promulgated methods of quality control or quality assurance. It is clear that the conversion of coroner systems to medical examiner systems as recommended by many studies has essentially halted and requires federal incentives to move forward.

The Model Post-Mortem Examination Act of 1954 needs to be revisited and updated to include the elements of a progressive and responsive death investigation law. The revised code should include standards for administration, staffing, and training. Any changes to the system will require federal incentives to implement the changes in each state.

The shortage of forensic pathologists speaks to the need to provide incentives for young physicians to train in forensic pathology. Systems with authorized positions cannot fill them, because of this shortage and budget deficits. The National Forensic Sciences Improvement Act (NFSIA) must be fully funded to support the core needs of ME/C grantees for equipment and facilities, training and education, and infrastructure.

Many ME/C systems do not utilize up-to-date technologies that would help in making accurate medical diagnoses. Moreover, many are unable to make use of advances in forensic technology because of staff educational deficiencies, untrained staff, and budget stringencies. Basic and translational forensic pathology research are nearly nonexistent.

Homeland security is compromised because operating units related to forensic pathology are not standardized, and the multiplicity of systems precludes meaningful communication among units. Surveillance for bioterrorism and chemical terrorism is not universal, and database systems cannot operate across jurisdictional lines to share data or manage multiple fatality incidents.

Although steps have been taken to transform the medicolegal death investigation system, the shortage of resources and the lack of consistent educational and training requirements prevent investigators from taking full advantage of tools, such as CT scans and digital X-rays, that the health care system and other scientific disciplines offer. In addition, more rigorous efforts are needed in the areas of accreditation and adherence to standards. Currently, requirements for practitioners vary from an age and residency requirement to certification by the American Board of Pathology in forensic pathology.

Funds are needed to assess and modernize the medicolegal death investigation system, using as a benchmark the current requirements of NAME related to professional credentials, standards, and accreditation. As it now stands, ME/Cs are essentially ineligible for direct federal funding and cannot receive grants from DHHS (including the National Insti-

tutes of Health [NIH]) and the Department of Justice or DHS. The Paul Coverdell NFSIA is the only federal grant program that names ME/Cs as eligible for grants. However, ME/Cs must compete with public safety agencies for Coverdell grants; as a result, the funds available to ME/Cs have been significantly reduced. NFSIA is not funded sufficiently to provide significant improvements in ME/C systems. In addition to more direct funding, other initiatives could be pursued to improve medicolegal death investigation practices.

AAMC and other appropriate professional organizations might organize collaborative activities in education, training, and research to strengthen the relationship between the medical examiner community and its counterparts in the larger academic medical community. Medical examiner offices with training programs affiliated with medical schools should be encouraged to compete for funds. Funding should be available to support pathologists who are seeking forensic fellowships. In addition, forensic pathology fellows could apply for medical school loan forgiveness if they stay full time at a medical examiner's office for a reasonable period of time.

Additionally, the proposed National Institute of Forensic Science (NIFS) should seek funding from Congress to allow it, CDC, and DHS, jointly, to design programs of interest to medical examiners and medical examiner offices in national disaster planning, preparedness, and consequence management. Uniform statewide and interstate standards of operation would be needed to assist in the management of cross-jurisdictional and interstate events. NIFS also might consider whether to support a federal program underwriting the development of software for use by ME/C systems for the management of multisite, multistate, or multiple fatality events.

NIFS also could work with groups such as the National Conference of Commissioners on Uniform State Laws, the American Law Institute, and NAME, in collaboration with other appropriate professional groups, to update the 1954 Model Post-Mortem Examinations Act and draft legislation for a modern model death investigation code. An improved code might, for example, include the elements of a competent medical death investigation system and clarify the jurisdiction of the medical examiner with respect to organ donation. Although these ideas must be developed in greater detail before any concrete plans can be pursued, the committee makes a number of specific recommendations, which, if adopted, will help to modernize and improve the medicolegal death investigation system. These recommendations deserve the immediate attention of NIFS and Congress.

Recommendation 11:

To improve medicolegal death investigation:

- (a) Congress should authorize and appropriate incentive funds to the National Institute of Forensic Science (NIFS) for allocation to states and jurisdictions to establish medical examiner systems, with the goal of replacing and eventually eliminating existing coroner systems. Funds are needed to build regional medical examiner offices, secure necessary equipment, improve administration, and ensure the education, training, and staffing of medical examiner offices. Funding could also be used to help current medical examiner systems modernize their facilities to meet current Centers for Disease Control and Prevention-recommended autopsy safety requirements.
- (b) Congress should appropriate resources to the National Institutes of Health (NIH) and NIFS, jointly, to support research, education, and training in forensic pathology. NIH, with NIFS participation, or NIFS in collaboration with content experts, should establish a study section to establish goals, to review and evaluate proposals in these areas, and to allocate funding for collaborative research to be conducted by medical examiner offices and medical universities. In addition, funding, in the form of medical student loan forgiveness and/or fellowship support, should be made available to pathology residents who choose forensic pathology as their specialty.
- (c) NIFS, in collaboration with NIH, the National Association of Medical Examiners, the American Board of Medicolegal Death Investigators, and other appropriate professional organizations, should establish a Scientific Working Group (SWG) for forensic pathology and medicolegal death investigation. The SWG should develop and promote standards for best practices, administration, staffing, education, training, and continuing education for competent death scene investigation and postmortem examinations. Best practices should include the utilization of new technologies such as laboratory testing for the molecular basis of diseases and the implementation of specialized imaging techniques.

- (d) All medical examiner offices should be accredited pursuant to NIFS-endorsed standards within a timeframe to be established by NIFS.
- (e) All federal funding should be restricted to accredited offices that meet NIFS-endorsed standards or that demonstrate significant and measurable progress in achieving accreditation within prescribed deadlines.
- (f) All medicolegal autopsies should be performed or supervised by a board certified forensic pathologist. This requirement should take effect within a timeframe to be established by NIFS, following consultation with governing state institutions.

10

Automated Fingerprint Identification Systems

In the late 1970s and early 1980s law enforcement agencies across the Nation began adopting Automated Fingerprint Identification Systems (AFIS) to improve their efficiency and reduce the amount of time it took to identify (or not exclude) a given individual from a fingerprint or to conduct a background investigation. AFIS introduced an enormous improvement in the way local, state, and federal law enforcement agencies managed fingerprints and identified people. Before the use of AFIS, the fingerprint identification process involved numerous clerks and fingerprint examiners sifting through thousands of tediously classified and cataloged paper fingerprint cards, while dealing with delays and challenges caused by the realities of exchanging information with other agencies by mail, fax, or other means. With AFIS, fingerprint examiners use computer workstations to mark the features of a scanned fingerprint image (e.g., ridge endings, bifurcations), encode the resulting data in a machine-readable format, and then search for similar fingerprints in an associated database of known fingerprints and records. AFIS searches are fast, and they often allow examiners to search across a larger pool of candidates. Although challenging cases can be time consuming, depending on the size of the database being searched and the system's workload, AFIS often can return results to the examiner within minutes.

AFIS searches today fall into two distinct categories:

10-print searches, which typically involve comparing relatively high-quality, professionally obtained fingerprint images—for example, prints taken during an arrest or booking or as part of a background check—

with fingerprint records in an agency database, such as the FBI's Integrated Automated Fingerprint Identification System (IAFIS) or a state's criminal fingerprint database; and

Latent print searches, which are considerably more complicated than 10-print searches. In a latent print search, a fingerprint examiner attempts to identify an individual by comparing a full or partial latent fingerprint from a crime scene with the records contained in an AFIS database. Latent prints are regularly of poor quality and may be only a partial print, and often fingerprint examiners may not even know from which finger a given latent print came.

A third category (albeit one that includes elements of both categories listed above) might also be called "unidentified burned, decomposed, or fragmented prints," which may be either a complete 10-print card to be compared with known prints on file to confirm identity or partial prints recovered from the skin or dermis of damaged fingers of an unknown decedent to determine identity. This third category can include prints from single individuals recovered from a small single event or victims of a mass casualty event resulting from naturally occurring catastrophes or terrorism. In either case, AFIS systems have reduced the time required to accomplish many identifications from weeks to hours.

Today, the process of populating AFIS systems with records is managed primarily by uploading 10-print records from police bookings and background checks. Because images from these sources are generally of good quality (indeed, poor-quality 10-print records are normally redone at the time they are taken), an automated algorithm is adequate for extracting the features used to index an image for retrieval. Computer algorithms work well for performing comparisons of 10-print records (e.g., to see if the prints taken when one applies for a security clearance match the prints taken during a previous background check). However, submitting a latent print for comparison is a more customized process, requiring fingerprint examiners to mark or adjust the features manually to retrieve stored prints with the same features in analogous places. Because latent print images normally are not as clear or as complete as images from a 10-print card, the image processing algorithms used for 10-prints are not as good as the human eye in spotting features in poor images.

AFIS has been a significant improvement for the law enforcement community over the past decades, but AFIS deployments today are still far from optimal. Many law enforcement AFIS implementations are stand-alone systems or are part of relatively limited regional networks with shared databases or information-sharing agreements—the Western Identification

Box 10-1
The Western Identification Network

WIN was formed in May 1988 to facilitate the creation of a multistate AFIS implementation. A year later, the state legislatures of Alaska, California, Idaho, Oregon, Nevada, Utah, Washington, and Wyoming appropriated the necessary funding to begin work on the system.

The initial WIN AFIS was installed in Sacramento, California, with remote subsystems in Cheyenne, Wyoming; Salt Lake City, Utah; Boise, Idaho; Carson City, Nevada; and Salem and Portland, Oregon. Booking terminals also were installed in numerous locations throughout these states, and existing similar stand-alone systems in Alaska, California, and Washington were connected to WIN in 1990 to complete the initial network. At first, WIN's centralized automated database included 900,000 fingerprint records, but after connecting to Alaska, California, and Washington, the number of searchable fingerprint records increased to more than 14 million. Today, WIN members have access to more than 22 million fingerprint records from the western United States.

NOTE: For information about WIN, see www.winid.org/winid/who/documents/WINServiceStrategyJanuary2008.pdf.

Network (WIN) is one example of such a regional network (for more information on WIN, see Box 10-1).

Today, AFIS systems from different vendors most often cannot interoperate with one another. Indeed, different versions of similar systems from the same vendor sometimes cannot share fingerprint data with one another. In addition, many law enforcement agencies also access the FBI's IAFIS database¹ through an entirely separate stand-alone system—a fact that often forces fingerprint examiners into entering fingerprint data for one search multiple times (at least once for each system being searched).

There is no doubt that much good work has been done in recent years aimed at improving the interoperability of AFIS implementations and databases (see Box 10-2), but the committee believes that, given the potential benefits of more interoperable systems, the pace of these efforts to date has been too slow, and greater progress needs to be made toward achieving meaningful, nationwide AFIS interoperability.

¹ See www.fbi.gov/hq/cjisid/iafis.htm.

Box 10-2
Working Toward AFIS Interoperability

As early as 1986, the American National Standards Institute (ANSI) and the National Bureau of Standards (now known as the National Institute of Standards and Technology, or NIST) were working on ways to facilitate the exchange of fingerprint data. Their collaboration produced a standard defining minutiae data and both low- and high-resolution fingerprint images. The standard was not successful, however, because of conflicts with proprietary systems.

In 1993, ANSI and NIST teamed up again to create another fingerprint data standard, a standard later updated in 1997. It defined standards for minutiae data and low- and high-resolution fingerprint images in both binary and grayscale format, as well as methods for compressing and decompressing image data.

In the late 1990s, the International Association for Identification's AFIS Committee successfully demonstrated a method of conducting remote fingerprint searches across jurisdictions and across equipment from different vendors.^a

In 2003, the ANSI/NIST standard was updated again. It grew to include 16 record types in total, with the addition of standards for such things as palm print data and latent print data.^b The standard was recently updated once more and has subsequently been approved by ANSI's Board of Standards Review as an ANSI standard.^c

The NIST-sponsored Minutiae Interoperability Exchange Test (MINEX) program is an ongoing series of coordinated development efforts aimed at improving the performance and interoperability of fingerprint minutiae standards. In 2004, the original project undertook to determine the feasibility of using minutiae data (rather than image data) as the interchange medium for fingerprint information between different fingerprint matching systems.^d

^a The committee's final report is available at www.onin.com/iaiafifs/IAI_AFIS_071998_Report.pdf.

^b For more information on the ANSI/NIST standards, see P. Komarinski. 2005. *Automated Fingerprint Identification Systems*. Boston: Elsevier Academic Press, pp. 162-166.

^c This approved revision of the ANSI/NIST-ITL 1-2000 standard is now available as NIST Special Publication 500-271: *Data Format for the Interchange of Fingerprint, Facial, & Other Biometric Information-Part 1* (ANSI/NIST-ITL 1-2007) at <http://fingerprint.nist.gov/standard/Approved-Std-20070427.pdf>.

^d More information about the work of the MINEX series is available at <http://fingerprint.nist.gov/minexII/>.

INTEROPERABILITY CHALLENGES

Despite the work done to date to achieve broader AFIS interoperability and its potential benefits (i.e., more crimes solved, quicker and more effi-

cient searches, and better use of limited law enforcement resources), several persistent challenges to reaching this goal remain.

Technical Challenges

The technical challenges to AFIS interoperability involve both those that are encountered and addressed by the information technology community in other disciplines (such as data sharing and algorithmic performance) and those that are specific to AFIS and the sharing of fingerprint information (e.g., feature identification, reliability of latent print comparisons). In addition, systems will need to be designed with the flexibility to handle other kinds of biometric data in the future (e.g., iris and palm scans and possibly genomic data). As these latter challenges are addressed, retrieval algorithms within proprietary AFIS systems also may tend to converge, which could simplify the broader interoperability challenges.

Creating useful technical standards is never a simple undertaking, especially given a diverse array of stakeholders, proprietary systems, and ever-advancing technological capabilities (e.g., improved pattern recognition, better hardware, increased data compression). However, the successful interoperability of other distributed information networks—such as modern banking systems (e.g., ATM machines²), information sharing networks in the real estate world,³ the Centers for Disease Control and Prevention's Public Health Information Network,⁴ and even the Internet itself, each of which functions only by reliance on a number of finely crafted and agreed standards and protocols—is proof that efforts to develop and implement standards pay off in the end by allowing greater collaboration and sharing of information.

One other major area of technical challenge to achieving AFIS interoperability involves the algorithms that systems use to identify features in fingerprint images (e.g., how a system determines that a given pattern of pixels corresponds to a true ridge ending or bifurcation and how it infers what type of feature those pixels actually represent). To date, these algorithms

² Indeed, financial card transactions are facilitated by their own ISO standard (ISO 8583-1:2003). For more information, see www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=31628.

³ See, e.g., the Metropolitan Regional Information System (MRIS) at www.mris.com/about/WhoWeAre.cfm.

⁴ CDC's Public Health Information Network is a national initiative to improve the capacity of the public health community to use and exchange information electronically by promoting the use of standards and defining functional and technical requirements. The network employs a messaging system (PHINMS) to rapidly and securely share sensitive health information among CDC and other local, state, and federal organizations over the Internet—information such as HIV records, pandemic information, and information on bioterrorism. Complete information about PHIN and PHINMS is available at www.cdc.gov/phinf/.

have been largely proprietary and vendor specific (i.e., different for each type of system). In fact, experienced latent print examiners have found that different systems will retrieve different stored prints in response to a given input map of features, and they have learned system-specific ways of annotating features on a latent print in order to maximize the success of each system's (inferred) search algorithms. However, achieving broad-based AFIS interoperability will require baseline standards for these algorithms, so that fingerprint examiners can be assured of consistent feature mapping across systems. As mentioned previously, fingerprint examiners have learned by experience to provide different inputs to different vendors' systems, often purposely leaving out information—knowing that the added input will degrade the search quality:

The examiner does not necessarily encode every point he can find in the latent print. LPU [latent print unit] examiners have learned through experience with the IAFIS program which types of points are most likely to yield a correct match. LPU Unit Chief Meagher told the OIG [Office of Inspector General] that examiners are taught to avoid encoding points in areas of high curvature ridge flow, such as the extreme core of a print. Unit Chief Wieners and Supervisor Green told the OIG that IAFIS does not do well when asked to search prints in which points have been encoded in two or more clusters separated by a gap. One reason is that IAFIS gives significant weight to the ridge count between points. If the ridge count between two clusters of points in a latent is unclear, IAFIS may fail to retrieve the true source of the print. Thus, an examiner will not necessarily encode every point that can be seen in a latent fingerprint, but rather may limit his encoding to points in a defined area in which the ridge count between points is clear.⁵

The fact that today's systems often do not effectively utilize most of the available feature information and require substantial input from fingerprint examiners suggests that there is significant room for improvement. An ideal, comprehensive AFIS, for example, would be capable of automated:

- reading of latent prints;
- encoding of most features of usable quality, including those features identified as Level 1 (fingerprint classes such as whorl, arch), Level 2 (minutiae), Level 3 (pores, cuts), and ridge paths, together with a provision for including other features that could be defined by the vendor/user;

⁵ Office of the Inspector General, Oversight and Review Division, U.S. Department of Justice. 2006. *A Review of the FBI's Handling of the Brandon Mayfield Case*, p. 119.

- recognizing absent, blurred, double/multioverlap, poor-quality sections of an observed print and encoding the system to downweight, or omit entirely, during the search process;
- recognizing any orientation information;
- conducting database searches;
- providing “best matches”; and
- collecting statistical data based on the quality of the print and numbers/types of features.

Other technical challenges might include the development and use of a secure Web interface (or an analogous system) that would permit authorized latent print examiners in any jurisdiction to submit queries to IAFIS and other federated AFIS databases, as well as the development of standard procedures for maintaining AFIS databases securely, removing redundancies, ensuring that fingerprint data are entered properly, and conducting quality control and validation of searches (i.e., ensuring that queries are actually searching an entire database). Although some of the capabilities mentioned here are present in today’s commercially available systems, significant improvement still can be realized.

Support from Policymakers

Given the complexity of the AFIS interoperability challenge and the large number of players whose contributions and cooperation will be necessary to meet that challenge, it is clear that no effort aimed at nationwide interoperability will succeed without strong, high-level support from policymakers in federal and state government. Resources available to law enforcement agencies for the deployment, use, and maintenance of AFIS systems vary greatly from jurisdiction to jurisdiction, and the considerable expenses associated with purchasing, maintaining, training for, operating, and upgrading an AFIS implementation—which can easily cost millions of dollars⁶—must be well thought out and weighed against other competing costs and interests facing law enforcement.

The committee hopes that this report will help convince policymakers of the benefits to nationwide interoperability and move them to provide much-needed support to law enforcement agencies, vendors, and researchers to help them achieve this goal. Indeed, the committee believes that true AFIS interoperability can be achieved in a timely manner only if policymakers provide a strong, clear mandate and additional funding from federal and state governments—both to support the research and development

⁶ See P. Komarinski. 2005. *Automated Fingerprint Identification Systems*. Boston: Elsevier Academic Press, p. 145.

work necessary to achieve truly interoperable systems and to assist law enforcement agencies in purchasing, implementing, and managing systems and training personnel.

Vendors

As suggested above, AFIS equipment and service vendors must cooperate to ensure nationwide AFIS interoperability. However, to date—and as one could reasonably expect in a technology sector in which product differentiation and the maintenance of competitive advantages are prime concerns—vendors have had little incentive to design their systems to enable them to share information with competitors' systems. The committee believes that increased cooperation among AFIS vendors is a key to achieving meaningful interoperability. For example, one can imagine how it might prove useful if AFIS vendors could collaborate (perhaps through work facilitated by the proposed National Institute of Forensic Science [NIFS]) on developing standard (or baseline) retrieval algorithms. Such a step conceivably could make it less time consuming for fingerprint examiners to run searches on many different systems because they would not have to manually *tune* their searches to work on the systems of different vendors.

Administrative, Legal, and Policy Issues

As noted earlier, most AFIS implementations are either stand-alone systems or are part of relatively limited regional databases. To achieve truly interoperable systems, jurisdictions must work more closely together to craft acceptable agreements and policies to govern the routine sharing of fingerprint information. NIFS can facilitate the development of standard agreements along these lines, which could include issues such as the extent of system access to other jurisdictions, the management of search priorities, and the recovery of costs associated with processing the requests from outside agencies. In addition, many jurisdictions also might want assurances that they will not be held responsible for any possible misuse of fingerprint information that is provided to other law enforcement agencies.

CONCLUSIONS AND RECOMMENDATION

Great improvement is possible with respect to AFIS interoperability. Many crimes no doubt go unsolved today simply because investigating agencies cannot search across all the individual databases that might hold a suspect's fingerprints or contain a match for an unidentified latent print from a crime scene. It is possible that some perpetrators have gone free because of the limitations on fingerprint searches.

The committee believes that, in addition to the technical challenges noted above, a number of other critical obstacles to achieving nationwide AFIS interoperability exist involving issues of practical implementation. These include (1) convincing federal and state policymakers to mandate nationwide AFIS interoperability; (2) persuading AFIS equipment vendors to cooperate and collaborate with the law enforcement community and researchers to create and use baseline standards for sharing fingerprint image and minutiae data and interfaces that support all searches; (3) providing law enforcement agencies with the resources necessary to develop interoperable AFIS implementations; and (4) coordinating jurisdictional agreements and public policies that would allow law enforcement agencies to share fingerprint data more broadly.

Given the disparity in resources and information technology expertise available to local, state, and federal law enforcement agencies, the relatively slow pace of interoperability efforts to date, and the potential gains that would accrue from increased AFIS interoperability, the committee believes that a new emphasis on achieving nationwide fingerprint data interoperability is needed.

Recommendation 12:

Congress should authorize and appropriate funds for the National Institute of Forensic Science (NIFS) to launch a new broad-based effort to achieve nationwide fingerprint data interoperability. To that end, NIFS should convene a task force comprising relevant experts from the National Institute of Standards and Technology and the major law enforcement agencies (including representatives from the local, state, federal, and, perhaps, international levels) and industry, as appropriate, to develop:

- (a) standards for representing and communicating image and minutiae data among Automated Fingerprint Identification Systems. Common data standards would facilitate the sharing of fingerprint data among law enforcement agencies at the local, state, federal, and even international levels, which could result in more solved crimes, fewer wrongful identifications, and greater efficiency with respect to fingerprint searches; and
- (b) baseline standards—to be used with computer algorithms—to map, record, and recognize features in fingerprint images, and a research agenda for the continued improvement, refinement, and characterization of the accuracy of these algorithms (including quantification of error rates).

These steps toward AFIS interoperability must be accompanied by the provision of federal, state, and local funds to support jurisdictions in upgrading, operating, and ensuring the integrity and security of their systems; the retraining of current staff; and the training of new fingerprint examiners to gain the desired benefits of true interoperability. Additionally, greater scientific benefits can be realized through the availability of fingerprint data or databases for research purposes (using, of course, all the modern security and privacy protections available to scientists when working with such data). Once created, NIFS might also be tasked with the maintenance and periodic review of the new standards and procedures.

Forensic Autopsy Performance Standards



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October 8, 2012 NAME Annual Meeting, Baltimore, MD

(Sunset date August 11, 2016)

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Preface

Efforts by the National Association of Medical Examiners (NAME) to promulgate practice standards began in the 1970s. These early efforts subsequently became focused on the operational aspects of medical examiner offices, resulting in the well-known NAME Office *Accreditation Checklist*. More recently, some members suggested that the time was ripe for standards that address the professional aspects of individual death investigations. Then-president Michael Bell appointed this committee to draft such standards.

The principal objective of these standards is to provide a constructive framework that defines the fundamental services rendered by a professional forensic pathologist practicing his or her art. Many forensic pathologists will exceed these minimal performance levels and are encouraged to do so.

NAME recognized that certain standards may not be applicable where they conflict with federal, state, and local laws. Deviation from these performance standards is expected only in unusual cases when justified by considered professional judgment.

National Association of Medical Examiners
Standards Committee
August 12, 2005

Committee and Panel Membership

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Section A: Medicolegal Death Investigation

The purpose of this section is to define responsibility for medicolegal death investigation and to outline the types of cases that are to be investigated by such systems. Investigations can be conducted by inquiry with or without examination. Inquiries are typically conducted via telephone interview, personal interview, or review of records. Examination may include scene investigation, external inspection, and forensic autopsy.

Standard A1 Responsibilities

Medicolegal death investigation officers, be they appointed or elected, are charged by statute to investigate deaths deemed to be in the public interest--serving both the criminal justice, civil justice and public health systems. These officials must investigate cooperatively with, but independent from, law enforcement and prosecutors. The parallel investigation promotes neutral and objective medical assessment of the cause and manner of death.

To promote competent and objective death investigations:

- A1.1 Medicolegal death investigation officers should operate without any undue influence from law enforcement agencies and prosecutors.
- A1.2 A forensic pathologist or representative shall evaluate the circumstances surrounding all reported deaths.

Standard A2 Initial Inquiry

Medicolegal death investigators assess each death reported to the office to determine whether it falls under their jurisdiction as outlined by statutes, rules, and regulations. The categories below are those which should receive further investigations to protect the public safety and health, and determine the cause and manner of death.

The forensic pathologist or representative shall investigate all:

- A2.1 deaths due to violence.
- A2.2 known or suspected non-natural deaths.
- A2.3 unexpected or unexplained deaths when in apparent good health.
- A2.4 unexpected or unexplained deaths of infants and children.
- A2.5 deaths occurring under unusual or suspicious circumstances.
- A2.6 deaths of persons in custody.
- A2.7 deaths known or suspected to be caused by diseases constituting a threat to public health.
- A2.8 deaths of persons not under the care of a physician.

Section B: Forensic Autopsies

The purpose of this section is to establish minimum standards for the selection of cases requiring forensic autopsy, who should perform the autopsies, need for special dissection or testing, and who is responsible for interpretations and formation of opinions.

Standard B3 Selecting Deaths Requiring Forensic Autopsies

Medicolegal death investigation officers are appointed or elected to safeguard the public interest. Deaths by criminal violence, deaths of infants and children, and deaths in the custody of law enforcement agencies or governmental institutions-- can arouse public interest, raise questions, or engender mistrust of authority. Further, there are specific types of circumstances in which a forensic autopsy provides the best opportunity for competent investigation, including those needing identification of the deceased and cases involving bodies in water, charred or skeletonized bodies, intoxicants or poisonings, electrocutions, and fatal workplace injuries. Performing autopsies protects the public interest and provides the information necessary to address legal, public health, and public safety issues in each case. For categories other than those listed below, the decision to perform an autopsy involves professional discretion or is dictated by local guidelines. For the categories listed below, the public interest is so compelling that one must always assume that questions will arise that require information obtainable only by forensic autopsy.

The forensic pathologist shall perform a forensic autopsy when:

- B3.1 the death is known or suspected to have been caused by apparent criminal violence.
- B3.2 the death is unexpected and unexplained in an infant or child.
- B3.3 the death is associated with police action.
- B3.4 the death is apparently non-natural and in custody of a local, state, or federal institution.
- B3.5 the death is due to acute workplace injury.
- B3.6 the death is caused by apparent electrocution.
- B3.7 the death is by apparent intoxication by alcohol, drugs, or poison.
- B3.8 the death is caused by unwitnessed or suspected drowning.
- B3.9 the body is unidentified and the autopsy may aid in identification.
- B3.10 the body is skeletonized.
- B3.11 the body is charred.
- B3.12 the forensic pathologist deems a forensic autopsy is necessary to determine cause or manner of death, or document injuries/disease, or collect evidence.
- B3.13 the deceased is involved in a motor vehicle incident and an autopsy is necessary to document injuries and/or determine the cause of death.

Standard B4 Forensic Autopsy Performance

Performance of a forensic autopsy is the practice of medicine. Forensic autopsy performance includes the discretion to determine the need for additional dissection and laboratory tests. A forensic autopsy must be conducted by a licensed physician who is a forensic pathologist or by a physician who is a forensic pathologist-in-training (resident/fellow).* Responsibility for forensic autopsy quality must rest with the forensic pathologist, who must directly supervise support staff. Allowing non-forensic pathologists to conduct forensic autopsy procedures without direct supervision and guidance is fraught with the potential for serious errors and omissions.

Autopsies shall be performed as follows:

- B4.1 the forensic pathologist or residents in pathology perform all autopsies.
- B4.2 the forensic pathologist directly supervises all assistance rendered during postmortem examinations.
- B4.3 the forensic pathologist or residents in pathology performs all dissections of removed organs.
- B4.4 the forensic pathologist determines need for special dissections or additional testing.
- B4.5 the forensic pathologist shall not perform more than 325 autopsies in a year. Recommended maximum number of autopsies is 250 per year.

Standard B5 Interpretation and Opinions

Interpretations and opinions must be formulated only after consideration of available information and only after all necessary information has been obtained. As the person directing the investigation, the forensic pathologist must be responsible for these activities, as well as the determination of cause of death and manner of death (for the death certificate).

Autopsies shall be performed as follows:

- B5.1 the forensic pathologist reviews and interprets all laboratory results the forensic pathologist requested.
- B5.2 the forensic pathologist reviews all ancillary and consultative reports the forensic pathologist requested.
- B5.3 the forensic pathologist determines cause of death.
- B5.4 the forensic pathologist determines manner of death.

* Elsewhere in these standards, where the word "pathologist" appears, it means a physician who is a pathologist or a pathologist-in-training (resident/fellow), as defined by the ACGME.

Section C: Identification

The purpose of this section is to establish procedures for sufficient identification of the deceased, to document information needed to answer questions that may later arise, and to archive information needed for putative identification before burial of unidentified remains.

Standard C7 Standard Identification Procedures

Methods of identification are determined on an individual case basis, but can include viewing of the remains, either directly or by photograph, and comparison of dentition, fingerprints, or radiographs. A photograph of the face, labeled with the case number, documents and preserves the appearance at the time of identification. The same photograph can also be used to minimize and prevent potential errors when multiple fatality incidents occur. When more traditional methods fail in the determination of identification, a routinely-obtained DNA sample may be used to link the remains either to a known antemortem or kindred sample. In addition, a DNA specimen is particularly important for later questions of identity as well as for potential familial genetic analysis and criminalistic comparisons. Preservation of all data used to determine identification is necessary to address future questions and can provide the opportunity for a second objective determination of identification.

In support of identification of the body:

- C7.1 the forensic pathologist assesses the sufficiency of presumptive identification.
- C7.2 the forensic pathologist or representative takes identification photographs with case number in photograph.
- C7.3 the forensic pathologist or representative obtains and archives specimen for DNA on all autopsied cases.

Standard C8 Procedures Prior to Disposition of Unidentified Bodies

Prior to disposition of the unidentified remains, inventory and archiving of potentially useful objective data are required. A forensic autopsy can disclose medical conditions useful for identification. Full-body radiographs document skeletal characteristics and radio-opaque foreign bodies such as bullets, pacemakers, and artificial joints. Dental charting and radiography preserve unique dental characteristics. The documentation of a decedent's clothing and personal effects archives details that are familiar to the next-of-kin. Careful preservation and archiving provide an objective basis for future identification and thereby avoid the need for exhumation.

Prior to disposition of an unidentified body the forensic pathologist shall:

- C8.1 perform a forensic autopsy.
- C8.2 take or cause to be taken radiographs of head, neck, chest, extremities, and torso in their entirety.
- C8.3 cause the dentition to be charted and x-rayed.
- C8.4 document or cause to be documented decedent's clothing and personal effects.

Section D: External Examinations: General Procedures

The purpose of this section is to establish minimum standards for the external examination of all bodies.

Standard D9 Preliminary Procedures

These standards underscore the need for assessment of all available information prior to the forensic autopsy to (1) direct the performance of the forensic autopsy, (2) answer specific questions unique to the circumstances of the case, (3) document evidence, the initial external appearance of the body, and its clothing and property items, and (4) correlate alterations in these items with injury patterns on the body. Just as a surgeon does not operate without first preparing a history and physical examination, so must the forensic pathologist ascertain enough history and circumstances and may need to inspect the body to decide whether a forensic autopsy is indicated and to direct the forensic autopsy toward relevant case questions.

Preliminary procedures are as follows:

- D9.1 forensic pathologist reviews the circumstances of death prior to forensic autopsy.
- D9.2 forensic pathologist or representative measures and records body length.
- D9.3 forensic pathologist or representative measures and records body weight.
- D9.4 forensic pathologist examines the external aspects of the body before internal examination.
- D9.5 forensic pathologist or representative photographs, or forensic pathologist describes decedent as presented.
- D9.6 forensic pathologist documents and correlates clothing findings with injuries of the body in criminal cases.
- D9.7 forensic pathologist or representative identifies and collects trace evidence on clothing in criminal cases.
- D9.8 forensic pathologist or representative removes clothing.
- D9.9 forensic pathologist or representative photographs or lists clothing and personal effects.

Standard D10 Physical Characteristics

The external examination documents identifying features, signs of or absence of disease and trauma, and signs of death. Recording identifying features provides evidence for or against a putative identification. Recording signs of disease and trauma is a primary purpose of the forensic autopsy.

The forensic pathologist shall:

- D10.1 document apparent age.
- D10.2 establish sex.
- D10.3 describe apparent race or racial characteristics.
- D10.4 describe hair.
- D10.5 describe eyes.
- D10.6 describe abnormal body habitus.
- D10.7 document prominent scars, tattoos, skin lesions, and amputations.
- D10.8 document presence or absence of dentition.
- D10.9 inspect and describe head, neck, thorax, abdomen, extremities, and hands.
- D10.10 inspect and describe posterior body surface and genitals.
- D10.11 document evidence of medical or surgical intervention.

Standard D11 Postmortem Changes

Recording *livor mortis* helps to answer later questions about bruises and body position. Notation of postmortem artifacts is useful for interpretation of subsequent forensic autopsy findings. Each of these may be useful in estimation of the postmortem interval.

The forensic pathologist shall:

- D11.1 describe *livor mortis*.
- D11.2 describe postmortem changes.
- D11.3 describe evidence of embalming.
- D11.4 describe decompositional changes.
- D11.5 describe rigor mortis.

Section E: External Examinations: Specific Procedures

The purpose of this section is to establish minimum standards for external examination of bodies with documentation of injuries or suspected sexual assault.

Standard E12 Suspected Sexual Assault

Collection of swabs, combings, clippings, and trace evidence may be necessary to 1) determine if sexual assault occurred; 2) link multiple, apparently unrelated deaths; or 3) link the death to an assailant. DNA analysis is now the test of choice on swabs, hair, and fingernail clippings. These collections shall be performed in accordance with the requirements of the crime laboratory procedures.

The forensic pathologist or representative shall, prior to cleaning the body:

- E12.1 collect swabs of oral, vaginal, and rectal cavities.
- E12.2 collect pubic hair combings or tape lifts.
- E12.3 collect fingernail scrapings or clippings.
- E12.4 collect pubic and head hair exemplars.
- E12.5 identify and preserve foreign hairs, fibers, and biological stains.

Standard E13 Injuries: General

Documentation of injuries may be necessary to determine the nature of the object used to inflict the wounds, how the injuries were incurred, and whether the injuries were a result of an accident, homicide, or suicide. Written, diagrammatic, and photographic documentation of the injuries may be used in court. Observations and findings are documented to support or refute interpretations, to provide evidence for court, and to serve as a record.

The forensic pathologist shall:

- E13.1 describe injuries.
- E13.2 describe injury by type.
- E13.3 describe injury by location.
- E13.4 describe injury by size.
- E13.5 describe injury by shape.
- E13.6 describe injury by pattern.

Standard E14 Photographic Documentation

Photographic documentation complements written documentation of wounds and creates a permanent record of forensic autopsy details. Photographic documentation of major wounds and injury shall include a reference scale in at least one photograph of the wound or injury to allow for 1:1 reproduction.

The forensic pathologist or representative shall:

- E14.1 photograph injuries unobstructed by blood, foreign matter, or clothing.
- E14.2 photograph major injuries with a scale.

Standard E15 Firearm Injuries

Documentation of firearm wounds as listed below should include detail sufficient to provide meaningful information to users of the forensic autopsy report, and to permit another forensic pathologist to draw independent conclusions based on the documentation.

The forensic pathologist shall:

- E15.1 describe injuries.
- E15.2 measure wound size.
- E15.3 locate cutaneous wounds of the head, neck, torso, or lower extremities by measuring from either the top of head or sole of foot.
- E15.4 locate cutaneous wounds of the head, neck, torso, or lower extremities by measuring from either the anterior or posterior midline.
- E15.5 locate cutaneous wounds of the upper extremities by measuring from anatomic landmarks.
- E15.6 descriptively locate cutaneous wounds in an anatomic region.
- E15.7 describe presence or absence of soot and stippling.
- E15.8 describe presence of abrasion ring, searing, muzzle imprint, lacerations.

Standard E16 Sharp Force Injuries

Documentation of sharp force injuries as listed below should include detail sufficient to provide meaningful information to users of the forensic autopsy report, and to permit another forensic pathologist to draw independent conclusions based on the documentation.

The forensic pathologist shall:

- E16.1 describe wound.
- E16.2 measure wound size.
- E16.3 locate wound in anatomic region.
- E16.4 estimate depth of wound
- E16.5 determine organs and structures involved
- E16.6 estimate direction of stab wound tracks

Standard E17 Burn Injuries

Documentation of burn injuries as listed below should include detail sufficient to provide meaningful information to users of the forensic autopsy report, and to permit another forensic pathologist to draw independent conclusions based on the documentation.

The forensic pathologist shall:

- E17.1 describe appearance of burn.
- E17.2 describe distribution of burn.

Standard E18 Patterned Injuries

Documentation of patterned injuries as listed below should include detail sufficient to provide meaningful information to users of the forensic autopsy report, and to permit another forensic pathologist to draw independent conclusions based on the documentation. Bite marks should be swabbed to collect specimens to use for DNA comparison with putative assailants.

The forensic pathologist shall:

- E18.1 measure injury size.
- E18.2 describe location of injury.
- E18.3 describe injury pattern.
- E18.4 swab recent or fresh bite mark.

Section F: Internal Examination

The purpose of this section is to establish minimum standards for internal examinations.*

Standard F19 Thoracic and Abdominal Cavities

Because some findings are only ascertained by *in situ* inspection, the thoracic and abdominal cavities must be examined before and after the removal of organs so as to identify signs of disease, injury, and therapy.

The forensic pathologist shall:

- F19.1 examine internal organs *in situ*.
- F19.2 describe adhesions and abnormal fluids.
- F19.3 document abnormal position of medical devices.
- F19.4 describe evidence of surgery.

Standard F20 Internal Organs and Viscera

The major internal organs and viscera must be examined after their removal from the body so as to identify signs of disease, injury, and therapy.

Procedures are as follows:

- F20.1 the forensic pathologist or representative removes organs from cranial, thoracic, abdominal, and pelvic cavities.
- F20.2 the forensic pathologist or representative records measured weights of brain, heart, lungs, liver, spleen, and kidneys.
- F20.3 the forensic pathologist dissects and describes organs.

Standard F21 Head

Because some findings are only ascertained by *in situ* inspection, the scalp and cranial contents must be examined before and after the removal of the brain so as to identify signs of disease, injury, and therapy.

Procedures are as follows:

- F21.1 the forensic pathologist shall inspect and describe scalp, skull, and meninges.
- F21.2 the forensic pathologist shall document any epidural, subdural, or subarachnoid hemorrhage.
- F21.3 the forensic pathologist shall inspect the brain *in situ* prior to removal and sectioning.
- F21.4 the forensic pathologist shall document purulent material and abnormal fluids.
- F21.5 the forensic pathologist or representative removes the dura mater and the forensic pathologist inspects the skull.

Standard F22 Neck

The muscles, soft tissues, airways, and vascular structures of the anterior neck must be examined to identify signs of disease, injury, and therapy. A layer-by-layer dissection is necessary for proper evaluation of trauma to the anterior neck. Removal and *ex situ* dissection of the upper airway, pharynx, and upper esophagus is a necessary component of this evaluation. A dissection of the posterior neck is necessary when occult neck injury is suspected.

The forensic pathologist shall:

- F22.1 examine *in situ* muscles and soft tissues of the anterior neck.
- F22.2 ensure proper removal of neck organs and airways.
- F22.3 examine neck organs and airways.
- F22.4 dissect the posterior neck in cases of suspected occult neck injury.
- F22.5 perform anterior neck dissection in neck trauma cases.

Standard F23 Penetrating Injuries, Including Gunshot and Sharp Force Injuries

Documentation of penetrating injuries as listed below should include detail sufficient to provide meaningful information to users of the forensic autopsy report, and to permit another forensic pathologist to draw independent conclusions based on the documentation. The recovery and documentation of foreign bodies is important for evidentiary purposes. Internal wound pathway(s) shall be described according to organs and tissues and size of defects of these organs and tissues.

The forensic pathologist shall:

- F23.1 correlate internal injury to external injury
- F23.2 describe and document the track of wound
- F23.3 describe and document the direction of wound
- F23.4 recover foreign bodies of evidentiary value
- F23.5 describe and document recovered foreign body

Standard F24 Blunt Impact Injuries

Documentation of blunt impact injuries as listed below should include detail sufficient to provide meaningful information to users of the forensic autopsy report, and to permit another forensic pathologist to draw independent conclusions based on the documentation.

The forensic pathologist shall:

- F24.1 describe internal and external injuries with appropriate correlations.
- F24.2 describe and document injuries to skeletal system.
- F24.3 describe and document injuries to internal organs, structures, and soft tissue.

Section G: Ancillary Tests and Support Services

The purpose of this section is to establish minimum standards for the use of scientific tests, procedures, and support services. This section also addresses the need for certain equipment and access to consultants. For toxicology reports, it also specifies the report content needed by the forensic pathologist for interpretation and establishes minimum standards for handling and documenting evidence.

Standard G25 Radiography

Radiographs of infants are required to detect occult fractures which may be the only physical evidence of abuse. Radiographs detect and locate foreign bodies and projectiles. Charred remains have lost external evidence of penetrating injury and identifying features.

The forensic pathologist or representative shall:

- G25.1 X-ray all infants.
- G25.2 X-ray explosion victims.
- G25.3 X-ray gunshot victims.
- G25.4 X-ray charred remains.

Standard G26 Specimens for Laboratory Testing

Specimens must be routinely collected, labeled, and preserved to be available for needed laboratory tests, and so that results of any testing will be valid. The blood specimen source should be documented for proper interpretation of results.

The forensic pathologist or representative shall:

- G26.1 collect blood, urine, and vitreous.
- G26.2 collect, package, label, and preserve biological samples.
- G26.3 document whether blood is central, peripheral, or from cavity.

Standard G27 Histological Examination

Histological examination may reveal pathologic changes related to the cause of death.

The forensic pathologist shall:

G27.1 perform histological examination in cases having no reasonable explanation of the cause of death following gross autopsy performance, scene/circumstance evaluation, and toxicology examination, unless the remains are skeletonized or severely decomposed.

Standard G28 Forensic Pathologists' Access to Scientific Services and Equipment

The forensic pathologist requires access to special scientific services, equipment, and expertise. Radiographs, body weights, and organ weights are needed for evaluation of pathologic processes. These procedures need to be available during the forensic autopsy. Also, it is not reasonable, practical, or safe to carry bodies or organs to other locations for weighing or imaging.

The forensic pathologist shall have access to:

- G28.1 a histology laboratory.
- G28.2 a radiologist.
- G28.3 a forensic anthropologist.
- G28.4 a forensic odontologist.
- G28.5 toxicology testing.
- G28.6 on-site radiographic equipment.
- G28.7 on-site body and organ scales.
- G28.8 a clinical chemistry lab.
- G28.9 a microbiology lab.

Standard G29 Content of Toxicology Lab Report

For correct interpretation, understanding, and follow-up of toxicology reports, the forensic pathologist requires specific knowledge of the items listed below.

The forensic pathologist shall require the toxicologist or the toxicology report to provide the:

- G29.1 source of sample.
- G29.2 type of screen.
- G29.3 test results.
- G29.4 method of analysis.

Standard G30 Evidence Processing

Custodial maintenance and chain of custody are legally required elements for documenting the handling of evidence.

The forensic pathologist or representative shall:

G30.1 collect, package, label, and preserve all evidentiary items.

G30.2 document chain of custody of all evidentiary items.

Section H: Documentation and Reports

The purpose of this section includes standards for the content and format of the postmortem record.

Standard H31 Postmortem Examination Report

Postmortem inspection and forensic autopsy reports must be readable, descriptive of findings, and include interpretations and opinions to make them informative. The report typically includes two separate parts of the forensic pathologist's work product, (1) the objective forensic autopsy with its findings including toxicological tests, special tests, microscopic examination, etc., and (2) the interpretations of the forensic pathologist including cause and manner of death.

The forensic pathologist shall:

- H31.1 prepare a written narrative report for each postmortem examination.
- H31.2 include the date, place, and time of examination.
- H31.3 include the name of deceased, if known.
- H31.4 include the case number.
- H31.5 include observations of the external examination, and when performed, the internal examination.
- H31.6 include a separate section on injuries.
- H31.7 include a description of internal and external injuries.
- H31.8 include descriptions of findings in sufficient detail to support diagnoses, opinions, and conclusions.
- H31.9 include a list of the diagnoses and interpretations in forensic autopsy reports.
- H31.10 include cause of death.
- H31.11 include manner of death (where permitted or required by statute).
- H31.12 include the name and title of each forensic pathologist.
- H31.13 sign and date each postmortem examination report.

Terms and Definitions

1. Autopsy

An examination and dissection of a dead body by a physician for the purpose of determining the cause, mechanism, or manner of death, or the seat of disease, confirming the clinical diagnosis, obtaining specimens for specialized testing, retrieving physical evidence, identifying the deceased or educating medical professionals and students.

2. Cause of Death

The underlying disease or injury responsible for setting in motion a series of physiologic events culminating in death.

3. Direct Supervision

Supervision of personnel performing actions in the immediate presence of the supervisor.

4. Forensic Autopsy

An autopsy performed pursuant to statute, by or under the order of a medical examiner or coroner.

5. Forensic Pathologist

A physician who is certified in forensic pathology by the American Board of Pathology or who, prior to 2006, has completed a training program in forensic pathology that is accredited by the Accreditation Council on Graduate Medical Education or its international equivalent or has been officially “qualified for examination” in forensic pathology by the ABP.

6. Manner of Death

A simple system for classifying deaths based in large part on the presence or absence of intent to harm, and the presence or absence of violence, the purpose of which is to guide vital statistics nosologists to the correct external causation code in the International Classification of Diseases. The choices are natural, accident, homicide, suicide, undetermined, and in some registration districts for vital statistics, unclassified.

7. Medicolegal Death Investigator

An individual who is employed by a medicolegal death investigation system to conduct investigations into the circumstances of deaths in a jurisdiction.

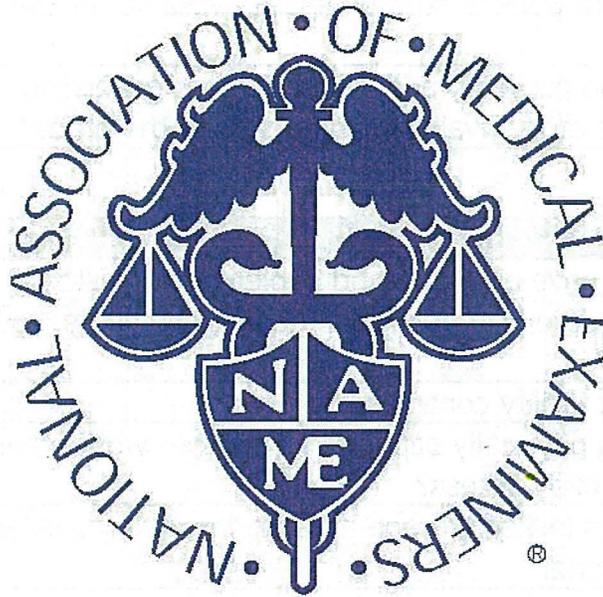
8. Forensic Pathologist's "Representative"

Any individual who carries out duties under the direction or authority of the forensic pathologist. Individuals performing these various duties may range from technicians to licensed physician medical examiners, and may be law enforcement or crime laboratory technicians.

NAME Inspection and Accreditation Checklist

Second Revision

Adopted September 2009



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A. GENERAL

A		GENERAL						
A	1	Facilities			P	Result		
	a	Does the office have sufficient space, equipment, and facilities to support the jurisdiction's volume of medicolegal death investigations?			II	Y	N/A	N
	b	Is there sufficient general storage space available for the needs of the office?			II	Y	N/A	N
	c	Are copies of the currently applicable statutes governing the operation of the office available and on file in the office?			II	Y	N/A	N

A	2	Security			P	Result		
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering facility security?			II	Y	N/A	N
	b	Is access to the facility controlled?			I	Y	N/A	N
	c	Are laboratories physically separate from other work areas, and do they have controlled access?			I	Y	N/A	N
	d	Is an after-hours locked storage area or depository available for evidentiary material?			I	Y	N/A	N

A	3	Administrative Space			P	Result		
	a	Is sufficient office space available for medical examiners, investigators, and administrative and other office staff?			II	Y	N/A	N
	b	Is each pathologist's office furnished with a desk, shelves, file cabinets, microscope, and dictation equipment?			II	Y	N/A	N
	c	Are facilities available to support individual and group employee functions including, where applicable, break/dining area, meeting/conference area, and library?			II	Y	N/A	N
	d	Is the administrative area separate from the autopsy room(s), laboratories, and body receiving area so that it is accessible to visitors who have legitimate business with the office without visual, auditory, or olfactory exposure to autopsy activity?			II	Y	N/A	N
	e	Is there a reception area that divides visitors from the rest of the facility?			I	Y	N/A	N

A 4 Safety		P	Result			
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, addressing safety that comports with federal and state regulations with regard to injury and illness prevention, repetitive motion injuries, and biohazard and chemical exposure?	II	Y	N/A	N
	b	Are employees and visitors safe from physical, chemical, electrical, and biologic hazards?	II	Y	N/A	N
	c	Are safety policies and procedures written and posted or readily accessible?	II	Y	N/A	N
	d	Is a written blood-borne pathogen control program in place?	II	Y	N/A	N
	e	Are first-aid kits, safety showers, and eye washes strategically located in the laboratories?	II	Y	N/A	N
	f	Are dedicated and marked specialized safety containers used for disposing of hazardous chemicals and biologic waste that comport with federal, state, and local regulations regarding chemical and biological waste disposal?	II	Y	N/A	N
	g	Are safety cabinets or explosion-proof rooms in use for storage of volatile solvents?	II	Y	N/A	N
	h	Are electrical outlets and equipment properly grounded and ground fault circuit interrupters utilized in areas where water may pose an added risk?	II	Y	N/A	N
	i	Are "MSDS" (Material Safety Data Sheets) readily available in areas where potentially hazardous materials are stored or in use?	II	Y	N/A	N
	j	Are building evacuation diagrams available and posted in prominent and appropriate locations throughout the facility?	I	Y	N/A	N

A 5 Maintenance		P	Result			
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering facility maintenance?	II	Y	N/A	N
	b	Are the facilities and all work areas clean, structurally sound, and well maintained?	II	Y	N/A	N
	c	Are public access areas comfortable, clean, and free from odor?	II	Y	N/A	N
	d	Are scientific equipment items that require periodic cleaning, adjustment or maintenance, such as microscopes, freezers and coolers, on a documented and appropriate maintenance schedule?	II	Y	N/A	N
	e	Are the heating/ventilation/air conditioning, plumbing, and electrical systems of the physical plant scheduled for routine inspection and preventive maintenance?	II	Y	N/A	N

	f	Are the electrical outlets and ground fault circuit interrupters tested for safety and proper functioning on at least a yearly basis?	II	Y	N/A	N
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A	6	Organ and Tissue Donations	P	Result		
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering organ and tissue donation?	II	Y	N/A	N

A	7	Mass Disaster Plan	P	Result		
	a	Does the office have a written and implemented mass disaster (multiple fatality) plan, signed within the last two years, that includes consideration of weapons of mass destruction, protective clothing and equipment, body handling decontamination and disposal, and which mandates appropriate preparatory staff training?	II	Y	N/A	N
	b	Has the plan been promulgated with the participation of jurisdictional law enforcement, fire, and rescue, emergency agencies and hospitals?	I	Y	N/A	N
	c	Has the office coordinated with surrounding jurisdictions regarding mass disaster planning?	I	Y	N/A	N
	d	Has the office participated in local or regional mass disaster exercises?	I	Y	N/A	N
	e	Is a contact list of pertinent officials, offices, phone numbers, and e-mail addresses readily available?	II	Y	N/A	N
	f	Are alternative morgue sites designated?	I	Y	N/A	N
	g	Is there a plan for chemical mass disaster?	I	Y	N/A	N
	h	Is there a plan for biological mass disaster?	I	Y	N/A	N
	i	Is there a plan for a radiation/nuclear mass disaster?	I	Y	N/A	N

A	8	Quality Assurance	P	Result		
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering quality assurance?	II	Y	N/A	N
	b	Does the quality assurance procedure include a "feedback" mechanism, so that all identified errors are brought to the attention of those persons responsible for them?	I	Y	N/A	N
	c	Is the quality assurance program a planned and regularly scheduled activity?	II	Y	N/A	N
	d	Is the quality assurance program sufficient and adequate to assure the quality of the office or system work product?	II	Y	N/A	N

	e	Is there documentation of corrective action taken for identified deficiencies?	II	Y	N/A	N
	f	Does the office actively participate on the local Child Death Review Committee (if one exists)?	I	Y	N/A	N
	g	Does the office have a procedural method of keeping track of unfinished or overdue case reports?	II	Y	N/A	N

A	9	Annual Statistical Report	P	Result		
	a	Does the office prepare an annual report tabulating total cases reported, accepted, examined, and autopsied, and the major causes of death sorted by each manner of death category?	II	Y	N/A	N
		NOTE: Mere availability of data from a computerized information management system does not satisfy this checklist item. A major rationale for the compilation of such data is the value they provide for analyzing and understanding the workload and short and long term trends that may affect an office. One Phase I for each missing report.				
	b	Does the office annually compile statistical data on deaths reported?	I	Y	N/A	N
	c	Does the office annually compile statistical data on cases accepted?	I	Y	N/A	N
	d	Does the office annually compile statistical data on manners of death?	I	Y	N/A	N
	e	Does the office annually compile statistical data on scene visits by medical examiners or medical examiner investigators?	I	Y	N/A	N
	f	Does the office annually compile statistical data on bodies transported by office or by order of the office?	I	Y	N/A	N
	g	Does the office annually compile statistical data on external examinations?	I	Y	N/A	N
	h	Does the office annually compile statistical data on complete autopsies?	I	Y	N/A	N
	i	Does the office annually compile statistical data on partial autopsies?	I	Y	N/A	N
	j	Does the office annually compile statistical data on hospital autopsies retained under ME jurisdiction?	I	Y	N/A	N
	k	Does the office annually compile statistical data on cases where toxicology is performed?	I	Y	N/A	N
	l	Does the office annually compile statistical data on bodies unidentified after examination?	I	Y	N/A	N
	m	Does the office annually compile statistical data on organ and tissue donations?	I	Y	N/A	N

	n	Does the office annually compile statistical data on unclaimed bodies?	I	Y	N/A	N
	o	Does the office annually compile statistical data on exhumations?	I	Y	N/A	N
	p	Does the office annually compile statistical data on bodies transported to the office?	I	Y	N/A	N
	q	Does the office maintain a cross index of categories of cause and manner of death for statistical data retrieval?	I	Y	N/A	N

B. INVESTIGATIONS

B		INVESTIGATIONS					P	Result		
B	1	Acceptance and Declining of Cases						Y	N/A	N
		a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering case notification, acceptance of, and declining of cases?			II	Y	N/A	N	
		b	Is there an existing law (state, federal, county, or city) covering the medical examiner's (or coroner's) geographical area of jurisdiction that requires that deaths falling under the medical examiner's jurisdiction be reported promptly to the medical examiner's office by law enforcement agencies, physicians, hospital personnel, funeral directors, or other persons who become aware of a reportable case?			I	Y	N/A	N	
		c	Does the medical examiner accept notification from any person who has become aware of a death that might fall under the jurisdiction of the office?			II	Y	N/A	N	
		d	Is at least one published telephone number for the medical examiner's office in telephone books covering the jurisdiction?			II	Y	N/A	N	
		e	Is the phone number staffed 24 hours a day by a person able to arrange a disposition at all times?			II	Y	N/A	N	
		f	Are at least 20% of the deaths occurring within the office jurisdiction reported to the office?			I	Y	N/A	N	
		g	Does the medical examiner, if it is required, arrange for a formal pronouncement of death?			I	Y	N/A	N	
		h	Does the office attempt to notify the next-of-kin as soon as possible, if notification by another agency or individual cannot be confirmed?			I	Y	N/A	N	
		i	Is the case reviewed by a medical examiner at the time jurisdiction is released, or at a minimum, within 24 hours of release?			I	Y	N/A	N	

B		2 Investigative Practices					P	Result		
B	2							Y	N/A	N
		a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering office investigations that addresses activities and responsibilities in the office and at death scenes?			II	Y	N/A	N	
		b	Is there a written and implemented office policy requiring a medical examiner or investigator to obtain the initial history of the fatal event, ascertain the essential facts and circumstances, elicit any pertinent medical history, and make a record of the names and addresses of any witnesses?			II	Y	N/A	N	

		c	Are emergency medical technicians interviewed when it is likely to be of benefit?	I	Y	N/A	N
		d	Are investigative reports routinely available to the pathologist prior to the beginning of any autopsy, external examination, or certification of death?	II	Y	N/A	N

B	3	Scene Investigations		P	Result		
		a	Is there a written and implemented policy identifying which cases require scene investigations?	II	Y	N/A	N
		b	Is it the written and implemented policy of the office to take charge of the body, the clothing on the body, and any evidence on the body which may aid in determining the identification of the deceased and the cause and manner of death?	II	Y	N/A	N
		c	Is a medical examiner or investigator available on a 24-hour basis to respond for a scene investigation?	II	Y	N/A	N
		d	Are medical examiner investigation response times recorded and monitored?	I	Y	N/A	N
		e	Does the medical examiner or investigator respond to the scene of those cases deemed necessary by the Chief Medical Examiner?	II	Y	N/A	N
		f	Are the hands protected in cases of homicides and suspicious deaths to safeguard evidence when indicated?	II	Y	N/A	N
		g	When a body has been removed from the scene or a person has been removed for treatment, are follow-up scene investigations conducted where appropriate and feasible?	I	Y	N/A	N
		h	Are office investigations autonomous and independent of law enforcement investigations?	I	Y	N/A	N
		i	Are deaths of children investigated in accordance with any applicable local or nationally recognized protocol?	II	Y	N/A	N
		j	Does the office have a procedure for the handling of money and valuable personal items?	II	Y	N/A	N
		k	Does the office have a procedure for the handling of prescription drugs?	II	Y	N/A	N
		l	Does the office have a procedure for the handling of illicit drugs?	II	Y	N/A	N
		m	Does the office have a procedure for the handling of evidence?	II	Y	N/A	N

B	4	Identification		P	Result		
		a	Does the office have a written and implemented policy or standard operating procedure covering identification procedures which is reviewed at least every two years?	II	Y	N/A	N
		b	Is there a case body numbering system in place for labeling all bodies?	II	Y	N/A	N

	c	Is the method of identification recorded?	II	Y	N/A	N
	d	Does the office have access to conduct fingerprint comparison?	II	Y	N/A	N
	e	Does the office have access to conduct dental examination?	II	Y	N/A	N
	f	Does the office have access to conduct body x-rays?	II	Y	N/A	N
	g	Does the office have access to forensic anthropology?	I	Y	N/A	N
	h	Does the office have access to forensic serology and DNA analysis?	II	Y	N/A	N
	i	Is there a method by which family or friends can make visual identification of decedents, (e.g. a viewing room, instant photography, closed circuit television, digital photography, etc)?	II	Y	N/A	N
	j	Prior to disposition of unidentified bodies, does the office perform the following tasks in order to permit potential future identification: fingerprint the body; photograph the body; examine and chart the dentition; take x-rays; store specimens for DNA?	II	Y	N/A	N

C. MORGUE OPERATIONS

C		MORGUE OPERATIONS							
C	1	Body Handling				P	Result		
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering body transportation and handling?				II	Y	N/A	N
	b	Does the body transport system reflect due respect for the decedent and the concerns of families?				II	Y	N/A	N
	c	Are the stretchers and carts used to move the body sturdy, and in good repair, and free of sharp edges?				II	Y	N/A	N
	d	Are body transport vehicles mechanically sound, clean, secure, dignified, and private?				II	Y	N/A	N
	e	Are body transport vehicles kept in good repair and have regularly scheduled and documented maintenance records?				II	Y	N/A	N
	f	Is the interior of each body transport vehicle regularly cleaned and disinfected?				II	Y	N/A	N
	g	Do body handling procedures ensure the integrity of evidence by the use of sealed body bags or by other similarly effective means?				II	Y	N/A	N
	h	Do body handling procedures include precautions against the biohazards associated with body handling?				II	Y	N/A	N
	i	Is there a system to document the acquisition, custody, integrity, and release of personal effects?				II	Y	N/A	N
	j	Is there a written and implemented procedure in place to assure the release of the correct body and personal effects to the funeral home?				II	Y	N/A	N

C	2	Body Handling Areas				P	Result		
	a	Is the body receiving area adequate in size and designed to accommodate the usual volume of incoming and outgoing bodies with safety and security?				II	Y	N/A	N
	b	Are body receiving and handling areas sequestered from public view?				II	Y	N/A	N
	c	Is access to body receiving and handling areas limited and controlled?				II	Y	N/A	N
	d	Is refrigerated storage space sufficient to accommodate the number of bodies and their handling during usual and peak loads?				II	Y	N/A	N
	e	Is the refrigerated storage space easily accessible to the autopsy room and to the body release area?				I	Y	N/A	N

	f	Is a separate or functionally isolated room or area available for the storage of decomposed and known infectious bodies that is in accordance with principles, regulations, and laws regarding universal precautions and infectious disease hazards?	I	Y	N/A	N
	g	Are temperature monitoring devices present on each refrigerator and freezer space, is there an alarm system to warn of deviations from the acceptable range, and are monitoring records kept?	I	Y	N/A	N

C	3	Autopsy Suites	P	Result		
	a	Are private and secure lockers, changing areas, and shower facilities or the equivalent available for male and female employees?	I	Y	N/A	N
	b	Can the autopsy room accommodate the usual and peak case load including the typical number of autopsies and external examinations, the normal complement of autopsy and laboratory personnel, official participants and observers from cooperating agencies?	I	Y	N/A	N
	c	Does the ventilation system control odor and fumes and prevent them from entering and leaving the autopsy and body storage areas?	I	Y	N/A	N
	d	Do the heating and cooling systems maintain a working environment conducive to effective work performance?	II	Y	N/A	N
	e	Is the lighting adequate?	II	Y	N/A	N
	f	Is a body scale located in or near the autopsy room, the body reception, or pre-autopsy preparation area?	II	Y	N/A	N
	g	Is there a written scale calibration policy with documentation (i.e., when calibrated, by whom)?	II	Y	N/A	N
	h	Are sufficient autopsy stations available for the usual case volume?	I	Y	N/A	N
	i	Is suction available at the autopsy stations?	I	Y	N/A	N
	j	Are autopsy dissecting sinks equipped with back flow protection devices?	II	Y	N/A	N
	k	Is there a stable surface for dissection at each station (either table stand or permanent structure; note e.g., merely a loose cutting board)?	I	Y	N/A	N
	l	Are floor, sink, and table drains able to handle autopsy waste and small particulate matter, with clean-out traps easily accessible?	II	Y	N/A	N
	m	Are surfaces for preparation of documents and records far enough removed from the examination areas to avoid inadvertent contamination?	I	Y	N/A	N
	n	Are surfaces in the autopsy room nonporous and easily cleaned?	I	Y	N/A	N

		o	Is dictation equipment or another means of recording postmortem findings available in the autopsy room, adjacent to the autopsy room, or in physicians' offices?	II	Y	N/A	N
		p	Are x-ray view boxes or monitors present to permit concurrent viewing during the autopsy?	I	Y	N/A	N
		q	Is/are (a) separate or functionally isolated room(s) or area(s) available for the autopsies of decomposed and known infectious bodies?	I	Y	N/A	N
		r	Are HEPA filters utilized, where appropriate, to reduce biohazard risks?	I	Y	N/A	N
		s	Are appropriate personal protective devices including face protection, chest and arm protection, gloves, shoe covers, and N95 Respirators or PAPRS available to staff so as to reduce biohazard risks?	II	Y	N/A	N
		t	Are standard precautions ("universal precautions") used when performing autopsies and handling biological specimens?	II	Y	N/A	N
		u	Are autopsy tables and dissection areas disinfected with bactericidal/virucidal solutions on a daily basis if they have been used?	II	Y	N/A	N
		v	Is appropriate storage space available and secured for decedent personal effects, evidence recovered during investigations, tissues and evidence recovered from bodies, and specimens held for additional laboratory analysis?	II	Y	N/A	N
		w	Is space available for examination of clothing, personal effects and other items or evidence discovered on or about the body with a work area or provision that prevents cross contamination of specimens and provides for effective preservation of each item's integrity?	I	Y	N/A	N
		x	Are tissue storage areas ventilated and free of formaldehyde, putrefied tissue, and other unpleasant odors?	I	Y	N/A	N
		y	Is there separate and safe storage space for reagent gases, solvents, and chemicals?	I	Y	N/A	N

C	4	Radiologic Facilities		P	Result		
		a	Does the office have access to radiographic equipment or services?	II	Y	N/A	N
		b	Is radiographic equipment installed in a convenient location in or near the autopsy room?	I	Y	N/A	N
		c	Is the radiographic equipment shielded in accord with the radiation safety standards promulgated by state and federal regulation?	II	Y	N/A	N

C 5 Radiology		P	Result			
	a	Is a written schedule of exposures (i.e., an x-ray "technique" chart) on hand, or is there an alternative system in place so as to ensure proper x-ray film exposure?	II	Y	N/A	N
	b	Are radiographs labeled with case number and right/left designation on each film?	II	Y	N/A	N
	c	Are the quality of radiographs commensurate with the purpose of the x-ray examination?	II	Y	N/A	N
	d	Are radiographs filed so as to be readily retrievable?	II	Y	N/A	N
	e	When performed in-house, are the x-ray development equipment and reagents routinely maintained according to a set schedule and is this documented?	II	Y	N/A	N
	f	Is in-house x-ray equipment periodically assessed for performance improvement, radiation protection, x-ray beam collimation, and biomedical safety, and are records of these evaluations maintained?	II	Y	N/A	N
	g	Is the x-ray film development subject to effective quality control and are x-ray films of good diagnostic quality?	II	Y	N/A	N
	h	Is there a documented program in place to assure that all personnel exposed to x-ray or other radiation sources are monitored for radiation exposure; as part of this policy, is there a mechanism in place to identify persons who are approaching, have reached, or have exceeded their exposure limits and to take appropriate actions?	II	Y	N/A	N
	i	Is x-ray equipment properly and currently licensed and maintained?	II	Y	N/A	N

C 6 Postmortem Examinations		P	Result			
	a	Does the office have a written and implemented policy or standard operating procedure covering postmortem examination procedures which is reviewed at least every two years?	II	Y	N/A	N
	b	Is there a written and implemented policy which specifies the criteria for the determination of when complete autopsies, partial autopsies, or external examinations are to be performed?	I	Y	N/A	N
	c	Are autopsies performed in greater than 95% of all cases suspected of homicide at the time of death?	II	Y	N/A	N
	d	Are autopsies performed in greater than 95% of all cases in which the manner of death is undetermined at the time an autopsy decision is made?	II	Y	N/A	N
		NOTE: Some inspector discretion allowed.				

	e	Are the circumstances of death, if known, reviewed prior to autopsy?	II	Y	N/A	N
	f	Does the medical examiner/autopsy physician personally examine all external aspects of the body in advance of dissection?	II	Y	N/A	N
	g	Is a medical examiner/autopsy physician responsible for the conduct of each postmortem examination, the diagnoses made, the opinions formed, and any subsequent opinion testimony?	II	Y	N/A	N
	h	Are all autopsy ex-situ dissections personally performed by a medical examiner/autopsy physician?	II	Y	N/A	N
	i	Is all assistance rendered by pathology assistants, autopsy technicians, dieners, or others without medical training performed in the physical presence of and under the direct supervision of a medical examiner/autopsy physician?	II	Y	N/A	N
	j	Are specimens routinely retained for toxicological and histological examination during autopsies?	II	Y	N/A	N
	k	Is there a written and implemented office policy which defines when radiographic examinations are to be performed?	I	Y	N/A	N
	l	Is there written and implemented office policy that defines when ancillary tests or procedures are to be undertaken (e.g., outlining when histological, toxicological, microbiologic, biochemical, genetic [including DNA], anthropological, and odontologic specimen collection, testing, or consultation is to be done or sought)?	I	Y	N/A	N
	m	Does the office have a written policy or standard operating procedure covering the retention and disposition of organ and tissue specimens taken at autopsy, that addresses whether, or under what circumstances, next-of-kin are to be notified of each retention?	II	Y	N/A	N
		NOTE: NAME recognizes the complexity and sensitivity of this issue, and acknowledges that either decision-to notify family members, or to avoid intrusion upon a family, is accepted and appropriate in the practice of death investigation.				
	n	Are samples routinely obtained for potential DNA analysis?	II	Y	N/A	N

C 7 Evidence and Specimen Collection			P	Result		
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering evidence collection?	II	Y	N/A	N
	b	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering tissue and body fluid specimen collection?	II	Y	N/A	N

	c	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years covering evidence and specimen disposition and destruction?	II	Y	N/A	N
	d	When collected, are autopsy tissue and fluid specimens individually collected; adequately packaged; properly labeled; appropriately preserved; and archived using a consistent and logical specimen numbering system?	II	Y	N/A	N
	e	Are specimen containers labeled with the case number and the date collected; the type of contents; the name of the deceased; the name of the medical examiner or the responsible physician; and the name of the person securing the specimen?	II	Y	N/A	N
	f	Are specimens collected for microbiological evaluation placed into appropriate transport media or sterile containers?	II	Y	N/A	N
	g	Are microbiologic specimens promptly transported to the service laboratory?	II	Y	N/A	N
	h	In cases of suspected sexual contact are control hair samples collected from the decedent by plucking a representative number of hairs from various body areas, e.g. scalp and pubic areas?	II	Y	N/A	N
	i	In cases of suspected sexual contact is the pubic area lightly combed to obtain loose and foreign hairs, and are native control hairs plucked and packaged separately?	II	Y	N/A	N
	j	In cases of suspected sexual contact are swabbings of body orifices obtained and examined for the presence of spermatozoa, the presence of seminal fluid, and DNA and/or serologic markers?	II	Y	N/A	N
	k	In cases of suspected sexual contact are bite marks processed according to procedures consistent with forensic odontologic practice (ABFO)?	II	Y	N/A	N
	l	Are DNA specimens retained indefinitely?	I	Y	N/A	N

C 8 Chain of Custody			P	Result		
	a	Are forms for chain of custody receipt in use?	II	Y	N/A	N
	b	Do chain of custody forms include the case number and/or name; description of the evidence; the persons involved in the transfer; date of transfer; and appropriate signatures?	II	Y	N/A	N
	c	Is the medical examiner able to assure the integrity of the chain of custody of evidentiary items, while under his or her control?	II	Y	N/A	N

D. HISTOLOGY

D		HISTOLOGY				
D	1	Histological Laboratory Space		P	Result	
	a	Does the office have access to histology services?	II	Y	N/A	N
	b	Is adequate space and equipment provided for tissue cutting and for histological preparation of microscopic slides, including an area for special staining methods?	II	Y	N/A	N
	c	Is each work station supplied with electricity and water and properly vented to remove solvent and fixative fumes?	II	Y	N/A	N

D	2	Histology Practices	P	Result		
	a	Are microscopic slides retained indefinitely?	II	Y	N/A	N
	b	Are paraffin blocks stored in a cool area and retained for at least ten years?	II	Y	N/A	N
	c	In addition to routine H&E staining, are special stains available for microorganisms, iron, fat, and connective tissue?	II	Y	N/A	N
	d	Are special stains returned with appropriate control slides?	II	Y	N/A	N
	e	Is a cryostat available for rapid diagnosis and for fat stains?	I	Y	N/A	N
	f	Are microscopic slides prepared, examined, and reported in all sudden infant deaths, and where feasible, in unexplained deaths, and where necessary to establish a tissue diagnosis?	II	Y	N/A	N
	g	Are formalin-fixed or paraffin-embedded tissues stored for at least one year in cases in which microscopic slides are not prepared?	I	Y	N/A	N
		NOTE: In cases involving skeletonized remains and other remains not suitable for embedding or microscopy, this checklist item would not apply.				

E. TOXICOLOGY

E		TOXICOLOGY			P	Result			
E	1	Toxicological Laboratory Space				Y	N/A	N	
		a	Does the office have access to a forensic toxicology laboratory?			II	Y	N/A	N
		b	Does the toxicology laboratory have suitable space, equipment, scientific instrumentation, reagents, and supplies to manage the caseload?			II	Y	N/A	N
		c	Is there an appropriate and safe storage system in place for chemicals and reagents, and is there provision for recognition and proper disposal of outdated and expired items?			II	Y	N/A	N
		d	Is there a properly ventilated and maintained fume hood in the laboratory or available to laboratory personnel for handling dangerous or unpleasant samples of reactions?			II	Y	N/A	N
		e	Is the toxicology laboratory used by the office accredited by an Accreditation Body who is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) and offers forensic laboratory accreditation services or a major accreditation body acceptable to NAME?			II	Y	N/A	N

E	2	Toxicology Practices			P	Result			
		a	Is the toxicology laboratory in compliance with the guidelines of the Society of Forensic Toxicologists (SOFT), or accredited by the American Board of Forensic Toxicology (ABFT), the College of American Pathologists (CAP), or a state reference laboratory?			I	Y	N/A	N
		b	Is testing routinely available for ethanol and volatiles; carbon monoxide; major drugs of abuse; major acidic drugs; and major basic drugs?			II	Y	N/A	N
		c	Does the office have access to stat carbon monoxide testing?			I	Y	N/A	N
			NOTE: Toxicology by itself should not be used as a substitute for a forensic autopsy or as a substitute for a careful search of a death scene for health and safety hazards.						
		d	Are tests performed according to written standard operating procedures?			II	Y	N/A	N
		e	Does the toxicology laboratory participate in external drug proficiency testing for drugs of abuse, and are appropriate corrective actions undertaken and recorded when the results of this testing are outside of compliance limits?			II	Y	N/A	N
		f	Is there active monitoring of the laboratory for quality assurance, and are corrective actions taken when indicated?			II	Y	N/A	N

	g	Are 90% of toxicology examinations completed within 90 calendar days of case submission?	II	Y	N/A	N
	h	Are 90% of toxicology examinations completed within 60 calendar days of case submission?	I	Y	N/A	N
	i	If the office has computerized information management system, is there an appropriate security system in place to prevent intrusion, unauthorized release of information, or unauthorized addition, deletion, or alteration of data?	II	Y	N/A	N
	j	Is there a system to monitor and track overdue toxicology reports?	II	Y	N/A	N

E	3	Toxicologists	P	Result		
	a	Does the Chief Toxicologist have formal training and experience in forensic toxicology?	II	Y	N/A	N
	b	Does the Chief Toxicologist hold a relevant doctoral degree from an accredited institution?	I	Y	N/A	N
	c	Is the Chief Toxicologist certified by the American Board of Forensic Toxicology (ABFT) or certified in toxicological chemistry by the American Board of Clinical Chemistry (ABCC) or the international equivalent?	I	Y	N/A	N

E	4	Toxicology Specimens	P	Result		
	a	Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, for the collection of toxicology specimens?	II	Y	N/A	N
	b	Is peripheral blood rather than central blood used for toxicological testing whenever possible?	I	Y	N/A	N
	c	Is the site of collection (peripheral, central [heart/great vessels], dural sinus, chest cavity, subdural hematoma, etc.) of blood used for toxicology recorded?	II	Y	N/A	N
	d	Are specimens for toxicology promptly delivered to the toxicology laboratory or stored in a secure refrigerator or freezer until delivery is effected?	II	Y	N/A	N
	e	When toxicology is requested, is the toxicologist made aware of the circumstances surrounding the death and any medications which may have been taken by the decedent?	II	Y	N/A	N
	f	Are toxicological specimens retained for at least two months in routine cases and 1 year in homicide cases after receipt of report by the medical examiner?	II	Y	N/A	N
	g	In cases of delayed death in hospitalized victims, does the office attempt to obtain the earliest available specimen from the hospital when appropriate?	II	Y	N/A	N

	h	In deaths associated with the possible inhalation of toxic gases, are airway and lung specimens collected and stored in containers suitable for headspace analysis?	I	Y	N/A	N
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F. REPORTS AND RECORD KEEPING

F		REPORTS AND RECORD KEEPING				
F	1	Reports and Record Keeping	P	Result		
		a Does the office have a written and implemented policy or standard operating procedure, signed within the last two years, covering reports and record keeping?	II	Y	N/A	N
		b Is the record storage space secure, with controlled access, to ensure the integrity of the reports?	I	Y	N/A	N
		c Are records kept in an orderly fashion for easy retrieval of data?	II	Y	N/A	N
		d Are the original case reports retained under the care, custody, and control of the office?	II	Y	N/A	N
		e Are the original reports kept under the custody of the office?	II	Y	N/A	N
		f Does each report prepared under the authority of the office include the name of the deceased, if known, and the case accession number?	II	Y	N/A	N
		g Are there forms for initial notification of death; scene investigation; requests for autopsy reports; chain of custody; and authorization for release of reports and records if required by law?	II	Y	N/A	N
		h Does the office have a written and implemented policy indicating professional staff responsibilities for completing unfinished or overdue cases in a set period of time which is reviewed at least every two years?	II	Y	N/A	N
		i Are the run sheets of emergency medical technicians, emergency room records, and hospital charts available to the medical examiner in accepted cases?	I	Y	N/A	N
		j In criminal cases and violent deaths, does the medical examiner have access to and obtain as needed the investigative findings of the police, fire department, and other investigative agencies?	II	Y	N/A	N
		k Is a history of past medical illness and current treatment verified with the attending physician or by review of the decedent's medical and emergency treatment records in applicable cases?	II	Y	N/A	N
		l Are all paper components of the death investigation in a given case filed in the same place, including investigative reports, scene reports, body examinations, supplemental laboratory reports and consultations, and follow-up information?	I	Y	N/A	N
		m Are completed records located in a central record storage area?	II	Y	N/A	N
		n If long term archival records are stored in a location off premises, are they secure and retrievable?	II	Y	N/A	N
		o Is there sufficient record storage space available for a minimum of five years of current reports and records?	II	Y	N/A	N

	p	Do written and implemented guidelines detail the archiving and destruction times for all records?	I	Y	N/A	N
	q	Does the office have a written and implemented policy or standard method for filing, to include how, where, and which records are stored?	I	Y	N/A	N
	r	Does the office have a computerized information management system?	I	Y	N/A	N
	s	Where the office records are computerized, are they adequately backed up to prevent loss in case of computer malfunction or failure?	II	Y	N/A	N

F	2	Release of Information	P	Result		
	a	Are copies of official reports available to those individuals having a legitimate right to them?	II	Y	N/A	N
	b	Is there a written and implemented procedure regarding distribution of records and information?	I	Y	N/A	N
	c	Are copies of the applicable law, regulations, guidelines and, legal opinions available in regard to the release of records and information?	II	Y	N/A	N
	d	Does the office have a written and implemented policy regarding media contact?	I	Y	N/A	N
	e	Does the office have a primary person designed to release or to oversee the release of public information?	II	Y	N/A	N

F	3	Investigative Reports	P	Result		
	a	Are records of the initial case investigative contact available on every death reported to the office, whether or not jurisdiction is accepted?	II	Y	N/A	N
	b	Is there a routine reporting form to be filled out by death investigators for case acquisition?	II	Y	N/A	N
	c	Does the office maintain a log of each official case investigation performed by office investigators?	II	Y	N/A	N
	d	Is a written scene investigation report prepared by the office for every scene visited?	II	Y	N/A	N
	e	Do investigation reports include, as applicable, the history obtained from investigators and witnesses; past medical history; circumstantial history; scene observations; pertinent body findings and notations regarding photographs taken and evidence recovered?	II	Y	N/A	N

	f	Are diagrams or photographs or digital images prepared to clarify essential spatial relationships between the body, its environment, and any significant investigative facts such as blood, evidence, weapons/instruments, etc., where appropriate?	I	Y	N/A	N
	g	Are significant circumstantial and physical observations noted and recorded regarding the time of death, (including the presence, location and degree of rigor; the location, fixation, and color of postmortem livor; and, when indicated, the temperature of body and environmental temperature and climatic conditions)?	I	Y	N/A	N

F	4	Reports of Postmortem Examinations	P	Result		
	a	Is a written narrative autopsy report prepared in every autopsied case?	II	Y	N/A	N
	b	Are written notes taken for each autopsy that, along with review of photographs and other records, could be used as a basis for report generation if dictated tapes become lost or damaged?	I	Y	N/A	N
	c	Does the autopsy report include a description of external and internal findings, external and internal evidence of injury, review of organ systems, listing of diagnoses or summary of case findings, and opinions regarding the cause and manner of death?	II	Y	N/A	N
	d	Is there written documentation of a physical examination of the decedent's unclothed body prepared for every decedent whose body is examined?	II	Y	N/A	N
	e	Are clothing and personal effects examined and inventoried in all cases brought into the office for postmortem examination?	II	Y	N/A	N
	f	Are records kept identifying autopsy participants and observers who are from other agencies or entities?	I	Y	N/A	N
	g	Is a written list/catalog of histology sections taken, designating the organ or anatomic site from which the section was obtained, made for each autopsy that includes histology?	I	Y	N/A	N
	h	Are diagnoses or conclusions arrived at by microscopic examination (histology) included in the final autopsy report's list of diagnoses or summary of case findings or opinion section?	II	Y	N/A	N
	i	Is the cause and manner of death listed in the autopsy report consistent with that stated on the death certificate?	II	Y	N/A	N
		NOTE: In coroner jurisdictions, is there a system by which the cause and manner of death placed on the death certificate are made available to the autopsy surgeon?				
	j	Does the forensic pathologist sign the autopsy report after it has been transcribed, proofread, and corrected?	II	Y	N/A	N

	k	Are 90% of reports of all postmortem examinations completed within 90 calendar days from the time of autopsy in homicide cases?	II	Y	N/A	N
	l	Are 90% of reports of all postmortem examinations completed within 60 calendar days from the time of autopsy in all cases (homicides excluded)?	I	Y	N/A	N

F	5	Death Certificates	P	Result		
	a	Does the office, in certifying the cause and manner of death, conform with the format of the death certificate prescribed by the local authorities?	II	Y	N/A	N
	b	Is standardized terminology of recognized disease nomenclature such as ICD 9/10 used in the filling out of death certificates?	I	Y	N/A	N
	c	(Medical Examiner Jurisdictions) Is the death certificate prepared and signed by the autopsy physician, the Chief Medical Examiner, or his or her (the medical examiner's) designee?	II	Y	N/A	N
	d	(Coroner Jurisdictions) Is there a system in place so that the death certificate's conclusions and wording reflect the findings and reasoning of the autopsy surgeon?	II	Y	N/A	N
	e	Are death certificates filed in a timely manner in keeping with the legal requirements of the jurisdiction or jurisdictions covered by the office?	II	Y	N/A	N
	f	When a death certification has been deferred or left pending, is there a mechanism in place that ensures that requisite information, tests, or data is sought, and that the certification is then completed in a reasonable time?	II	Y	N/A	N
	g	Does the office keep a current and up-to-date list of pending cases that includes unsigned and incomplete death certificates?	II	Y	N/A	N
	h	Are copies of death certificates of all cases in the case files or somehow retrievable?	II	Y	N/A	N

F	6	Photographic Records and Practices	P	Result		
	a	Is there a designated staff member responsible for the inventory, care, and maintenance of the photographic equipment and supplies?	I	Y	N/A	N
	b	Is an identifying label included in each photograph such that the label does not obscure the identifying features of the decedent; or alternatively, does at least one photograph per set of photographs in a given case include a label to permit post process labeling of film?	II	Y	N/A	N

	c	Are photographs taken prior to examination or processing of trace evidence, foreign material, blood patterns, and other items important for determining the cause and manner of death or necessary for medicolegal interpretation or presentation?	II	Y	N/A	N
	d	Are orientation photographs (photographs of the same area from a distance or with a frame of reference) taken when close-up photographs are taken?	I	Y	N/A	N
	e	Is at least one measurement scale included in close-up photographs, with evidence photographs, and in those cases when no frame of reference is present in the field of view?	II	Y	N/A	N
	f	Is an American Board of Forensic Odontology (ABFO) scale included in all bite mark photographs?	I	Y	N/A	N
	g	Are all photographs and any negatives labeled and filed in a retrievable manner?	II	Y	N/A	N
	h	Does the office document pertinent external and internal findings photographically?	II	Y	N/A	N
	i	Is at least one identification photograph taken of all bodies brought to the office?	II	Y	N/A	N
	j	Is there photographic documentation of pertinent findings in suspected homicides?	II	Y	N/A	N
	k	In cases of homicide or suspected homicide, if digital photographic imaging is used, is a backup system employed such as supplementary film photography, or is collateral photography performed by law enforcement personnel or by another agency or is the success of digital photographs verified at the time of autopsy so as to foreclose the unavailability of appropriate photographic documentation?	I	Y	N/A	N
	l	Are digital photographs backed up daily, in a location separate from the original, so that a computer failure would not result in permanent loss?	II	Y	N/A	N
	m	Are electronic photograph files copied and stored in at least two locations to prevent loss from a computer malfunction?	I	Y	N/A	N

G. PERSONNEL AND STAFFING

G		PERSONNEL AND STAFFING			P		Result	
G	1	Personnel						
		a	Does the office have a written and implemented policy, signed within the last two years, covering personnel issues?	II	Y	N/A	N	
		b	Has a copy of the personnel policies been distributed to all personnel?	II	Y	N/A	N	
		c	Are all new personnel provided information on the written policies of the office during orientation?	II	Y	N/A	N	
		d	Are there written and implemented procedures for discipline and removal of staff for cause?	II	Y	N/A	N	
		e	Are all potentially exposed or at-risk office staff offered vaccination for Hepatitis B, and is such vaccination or refusal to be vaccinated documented?	II	Y	N/A	N	
		f	Is yearly tuberculosis testing offered to at-risk office staff, and is such testing or refusal to be tested documented?	II	Y	N/A	N	
		g	Are office staff with a history of positive skin tests offered yearly follow-up evaluation?	II	Y	N/A	N	

G		2 Professional Staff - Medical Examiners			P		Result	
		a	Is the Chief Medical Examiner or the Coroner's autopsy surgeon a pathologist granted, by the American Board of Pathology, a certificate of qualification for the practice of Forensic Pathology, and does he or she have at least two years of forensic pathology work experience beyond forensic pathology residency/fellowship training?	II	Y	N/A	N	
		b	Is the Chief Medical Examiner licensed to practice medicine or osteopathy by the appropriate state or jurisdictional authority granting such licenses where the office is located?	II	Y	N/A	N	
		c	Is the Chief Medical Examiner employed full time, and are the office duties his or her primary professional obligation?	II	Y	N/A	N	
		d	When the Chief Medical Examiner is not available, is a deputy Chief Medical Examiner or an associate medical examiner who possesses qualifications similar to those of the Chief Medical Examiner available in an alternate capacity?	I	Y	N/A	N	
			NOTE: In small offices staffed by one or a few physicians, the practicalities of coverage should be considered. At times when regular physician coverage is, of necessity, unavailable, is there a policy or practice specifying reasonable alternative autopsy decision-making responsibility?					

	e	When the Chief Medical Examiner is not available, is there a deputy Chief Medical Examiner or an associate medical examiner who is licensed to practice medicine or osteopathy by the appropriate state or jurisdictional authority granting such licenses where the office is located?	II	Y	N/A	N
	f	Are all associate/deputy medical examiners or physicians responsible for autopsies pathologists who have completed a training program in anatomic pathology accredited by the Accreditation Council for Graduate Medical Education (ACGME) or equivalent?	II	Y	N/A	N
	g	Are all associate/deputy medical examiners or physicians responsible for postmortem examinations and autopsies licensed to practice medicine or osteopathy by the appropriate state or jurisdictional authority granting such licenses where the office is located?	II	Y	N/A	N
	h	Are all associate/deputy medical examiners or physicians ultimately responsible for autopsies pathologists who are board certified in anatomic pathology by the American Board of Pathology and who have completed at least one year of supervised training under the supervision of a forensic pathologist certified by the American Board of Pathology, or are they themselves so certified?	I	Y	N/A	N
		NOTE: One Phase I for each unqualified physician.				
	i	Is the medical staff of sufficient size that no autopsy physician is required to perform more than 325 autopsies/year? (See note after 3A.8)	II	Y	N/A	N
	j	Is the medical staff of sufficient size that no autopsy physician is required to perform more than 250 autopsies/year?	I	Y	N/A	N
		NOTE 1: In considering compliance with items G1i and G1j, it should be recognized that within a working team, duties and activities are often divided in such a way that one or more team members might perform in excess of the permitted number of autopsies. This is not a per se deficiency unless the autopsy load and the size of the pathology workforce would make it inevitable that the limit would be exceeded.				
		NOTE 2: For the purpose of calculating autopsies per pathologist in G1i and G1j, fellows may be counted as one-half a pathologist position, but residents in training should not be included in the fractional denominator.				

		<p>NOTE 3: For the purpose of calculating autopsy load in items G1i and G1j, the workload from external examinations should also be considered. Three to five formal (dictated or written) external examinations (depending on their complexity) should be considered to be equivalent to one complete autopsy. For example, a workload of 200 complete autopsies and 150 external examinations would be equivalent to 250 autopsies. Further consideration should be given to autopsy coverage that entails travel to a separate facility. The inspector should adjust the calculation to reflect the time required. For example, two hours of travel time should be considered equivalent to one autopsy.</p>				
		<p>NOTE 4: For the purpose of calculating the autopsies per pathologist in G1i and G1j, the administrative and leadership duties of the department chief should be considered. In large and complex offices, the chief may spend almost all of his or her time in non-autopsy activities; in such instances, that position should be eliminated from the fractional denominator. By contrast in a small office or in an office organized so that administrative duties are not a substantial burden, it may be appropriate to make only a modest reduction of the fractional denominator.</p>				
		<p>NOTE 5: For the purpose of calculating the autopsies per pathologist in G1i and G1j, other significant responsibilities should be taken into consideration. For example, pathologists with significant collateral responsibilities in academic, surgical pathology, laboratory work, research, consulting, or other assignments should be reflected by an appropriate readjustment of the fractional denominator.</p>				
		k Are all medical staff licensed to practice medicine in all jurisdictions covered by the office?	II	Y	N/A	N

G	3	Medical Investigators	P	Result		
		a Are there written and implemented qualifications established for medical investigators?	II	Y	N/A	N
		b Have medical investigators received specific training in the policies and procedures of the office?	II	Y	N/A	N
		c Is the office's chief investigator or is at least one principal investigator a Registered Diplomate of the American Board of Medicolegal Death Investigators?	I	Y	N/A	N
		d Are a majority of the medical investigators who have worked in the office for over 5 years Registered Diplomates or Board Certified Fellows of the American Board of Medical Death Investigators?	I	Y	N/A	N

G	4	Other Personnel (Technical)	P	Result		
		a Does the office have written and implemented policies for the qualifications and training necessary for all technical staff (e.g., histotechnologists, radiology technicians, etc.)?	I	Y	N/A	N
		b Is there sufficient technical staff coverage to handle the routine daily caseload for autopsy assistance?	II	Y	N/A	N
		c Is there sufficient technical staff coverage to handle the routine daily caseload for histology?	I	Y	N/A	N
		d Is there sufficient technical staff coverage to handle the routine daily caseload for forensic photography?	I	Y	N/A	N
		e Is there sufficient technical staff coverage to handle the routine daily caseload for x-ray?	II	Y	N/A	N
		f Is there sufficient technical staff coverage to handle the routine daily caseload for toxicology?	I	Y	N/A	N
		g Is there sufficient technical staff coverage to handle the routine daily caseload for investigations 24/7?	II	Y	N/A	N

G	5	Other Personnel (Non-Technical)	P	Result		
		a Is there sufficient non-technical staff coverage to handle the routine daily caseload for administration?	II	Y	N/A	N
		b Is there sufficient non-technical staff coverage to handle the routine daily caseload for visitor reception?	II	Y	N/A	N
		c Is there sufficient non-technical staff coverage to handle the routine daily caseload for medical transcription?	II	Y	N/A	N
		d Is there sufficient non-technical staff coverage to handle the routine daily caseload for records keeping?	II	Y	N/A	N
		e Is there sufficient non-technical staff coverage to handle the routine daily caseload for data analysis?	I	Y	N/A	N
		f Is there sufficient non-technical staff coverage to handle the routine daily caseload for body handling and transportation?	II	Y	N/A	N
		g Is there sufficient non-technical staff coverage to handle the routine daily caseload for maintenance and cleaning?	II	Y	N/A	N

G	6	Professional Credentials and Privileges	P	Result		
		a Is licensure of the medical staff verified at the time of initial employment?	II	Y	N/A	N
		b Is continued current licensure of the medical staff verified annually?	I	Y	N/A	N

	c	Does the Chief Medical Examiner evaluate the performance of each member of the professional staff at least once each year if such evaluations are permissible under local statutes or labor contracts?	I	Y	N/A	N
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G	7	Staff Training and Continuing Education	P	Result		
	a	Is each licensed professional employee required to, and given time to, participate in continuing education?	II	Y	N/A	N
	b	Is sufficient funding provided to each licensed professional employee for office approved and professionally required continuing education?	I	Y	N/A	N
	c	Is there continuing education available for all medical investigators?	I	Y	N/A	N
	d	Are operators of radiologic equipment properly trained?	II	Y	N/A	N
	e	Are all staff members, medical and nonmedical, who perform duties in a training capacity continually supervised and monitored by a qualified practitioner?	II	Y	N/A	N
	f	Is there a mechanism whereby the signed reports of trainees in forensic pathology are reviewed and approved in writing by a faculty pathologist?	II	Y	N/A	N
	g	Are the reports of trainees in forensic pathology who are not licensed to practice medicine in the state where they are training cosigned by a faculty pathologist?	II	Y	N/A	N
	h	If the office has training program for forensic pathologists, is the program accredited by the American Council for Graduate Medical Education (ACGME)?	II	Y	N/A	N

G	8	Performance Evaluation and Monitoring	P	Result		
	a	Do in-house laboratories participate in external proficiency tests?	II	Y	N/A	N
	b	Does the medical staff participate in external check samples and/or proficiency surveys?	I	Y	N/A	N
	c	Are staff sign-out conferences regularly scheduled for discussion and disposition of pending and problem cases?	I	Y	N/A	N
		NOTE: At an inspector's discretion in small offices, scheduled formal discussions may be replaced by evidence of readily available informal consultation among staff or with outside consultants.				
	d	Is there a system in place for annual review of autopsy performance and quality of associated reports?	II	Y	N/A	N

H. SUPPORT SERVICES AND CONSULTANTS

H		SUPPORT SERVICES AND CONSULTANTS			P		Result	
H	1	Support Services						
	a	Does the office have written and implemented policies or standard operating procedures, signed within the last two years, covering each of the below support services including toxicology, radiology, histology, forensic sciences, and Criminalistics?			I	Y	N/A	N
		NOTE: One Phase I deficiency for each missing policy.						

H	2	Criminalistics/Forensic Science Examinations			P	Result		
	a	Are laboratory services available to perform fingerprinting; serologic and/or DNA testing; ballistics; and trace evidence examination?			II	Y	N/A	N
	b	Is the crime laboratory accredited by an Accreditation body who is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual recognition Arrangement (MRA) and offers forensic laboratory accreditation services or a major accreditation body acceptable to NAME?			I	Y	N/A	N

H	3	Microbiology			P	Result		
	a	Does the office have microbiology laboratory services available?			II	Y	N/A	N
	b	Is the microbiology laboratory accredited by the College of American Pathologists (CAP) or equivalent?			II	Y	N/A	N

H	4	Clinical Chemistry			P	Result		
	a	Are routine diagnostic clinical chemistry tests available for analysis of postmortem specimens?			II	Y	N/A	N
	b	Is the clinical chemistry testing performed by a laboratory accredited by the College of the American Pathologists (CAP) or does it have equivalent certification?			II	Y	N/A	N

H	5	Consultations			P	Result		
	a	Does the office arrange for the availability of expert consultants in neuropathology; forensic dentistry/odontology; forensic anthropology; and radiology?			II	Y	N/A	N
	b	Are the consultative services responsive complete, reliable, reputable, and credible in court?			I	Y	N/A	N

H	6	Consultants	P	Result		
		a Is the office affiliated with a forensic anthropologist board certified by the American Board of Forensic Anthropology (ABFA)?	I	Y	N/A	N
		b Is the office affiliated with a forensic odontologist board certified by the American Board of Forensic Odontology (ABFO)?	I	Y	N/A	N
		c Are other consultants (e.g., neuropathologists, pediatric pathologists, radiologists, etc.) formally trained in their respective specialties?	I	Y	N/A	N
		d Does the office have ready access to legal advice and consultation in matters relating to the interpretation and implementation of its governing statute or statutes and on other (civil) legal matters?	I	Y	N/A	N
		e Does the office maintain a file documenting the legal advice and consultation that has been received?	I	Y	N/A	N

H	7	Consultation and Laboratory Reports	P	Result		
		a Are the reports of consultations and laboratory tests pertinent to determining cause and manner of death (ballistics, trace evidence, etc.) incorporated into the official records of the case whenever such tests are performed and when such inclusion is permitted by the consultant's policies and state or local regulations or statutes?	I	Y	N/A	N
		b Are request forms available for supplemental laboratory and consultative services?	I	Y	N/A	N
		c Are consultations and laboratory tests tracked and monitored by the office for chain of custody; status of completion; expected return time; billing information; and return of residual specimens, as applicable?	I	Y	N/A	N



**Regional Medicolegal Autopsy and Death Investigation Centers
-Construction, Staffing, and Costs-**

A Report and Recommendations

**Prepared by the System Infrastructure Committee of the
Scientific Working Group on Medicolegal Death Investigation (SWGMDI)**

Executive Summary

Given the shortage of forensic pathologists and adequately equipped and staffed forensic autopsy facilities in the United States, a regional system of medicolegal autopsy and death investigation facilities might be an effective and efficient way of serving the needs for quality services in underserved areas of the United States. To this end, the National Research Council's (NRC) Report, "*Strengthening Forensic Science in the United States: A Path Forward*" recommended that funds be provided to build regional offices in areas of need. This report presents information that would be helpful in establishing and maintaining regional facilities: formulas for predicting facility size, construction costs, personnel needs, and ongoing costs based on a population-based model; minimum population catchment areas; and maximum feasible distances for transporting deceased bodies to regional facilities. The recommendations may be useful to jurisdictions that are considering the construction of regional medicolegal death investigation/autopsy centers in the United States. In short, this report focuses on details about construction, staffing, and ongoing operational costs, *not* on where such facilities should be located. The locations where regional centers are needed will be the subject of other Scientific Working Group on Medicolegal Death Investigation (SWGMDI) studies and reports.

Regional Medicolegal Autopsy and Death Investigation Centers -Construction, Staffing, and Costs-

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Prepared by the System Infrastructure Committee of the
Scientific Working Group on Medicolegal Death Investigation (SWGMDI)

INTRODUCTION

Recommendation 11a of the National Research Council (NRC) Report, “*Strengthening Forensic Science in the United States: A Path Forward*” is that funds be provided to build regional medical examiner offices (1). As a follow up to that recommendation, the Scientific Working Group on Medicolegal Death Investigation (SWGMDI) identified the perceived need for regional centers in the United States and indicated in that report that much more study is needed to determine where such centers should be located (2). Subsequently, the SWGMDI Board directed its System Infrastructure Committee to identify infrastructure needs for establishing regional facilities, including personnel and support service needs. The Committee was also charged with developing a per capita formula for personnel needs in any medicolegal death investigation system. Although the locations where regional centers are truly needed will be the subject of another SWGMDI report, this report presents formulas for predicting facility size, construction costs, and personnel needs and costs based on a population-based model. A recommended minimum population catchment is also provided, as is a minimum per capita annual cost to operate the constructed facility.

METHODS

The SWGMDI System Infrastructure Committee reviewed available recommendations, inspection and accreditation reports and data, and surveys concerning staffing and infrastructure for medicolegal death investigation systems, including the following:

- Historical staffing pattern recommendations previously published by the National Association of Medical Examiners (NAME) (3).
- NAME Inspection and Accreditation system data from 2012 regarding office-specific population based catchment areas, facility square footage, autopsy room square footage, autopsy rate per 1,000 population, and annual budget per capita.
- Data previously collected by NAME in 2001 similar in scope to the NAME Inspection and Accreditation data of 2012.
- A survey specifically conducted for this report of medical examiner/coroner offices that have been constructed within the past 15 years, including square footage construction costs and the cost of equipment contained in the physical plant that was included in initial construction costs.
- Accreditation processes and standards of the International Association of Coroners and Medical Examiners and Inspection and Accreditation Checklist of the National Association of Medical Examiners (4, 5).

The Committee also considered input from SWGMDI Board Members who work in medical examiner/coroner offices to obtain their experience and perspective on staffing and infrastructure needs to effectively run a medicolegal autopsy facility.

Because a recent SWGMDI survey found that most responders did not perceive a need for other crime lab services to be included in regional autopsy centers (2), this report focuses on regional medicolegal autopsy centers that would support autopsy performance, investigative and support staff, and histology services.

FINDINGS

Population catchment area

Review of NAME Inspection and Accreditation data and previously collected facility data shows that Medical Examiner/Coroner (ME/C) offices operating at an acceptable level of autopsy performance annually perform approximately one autopsy per 1,000 persons. NAME inspection data show an average autopsy rate for all offices of all types of 0.5 per 1,000, and facility surveys found 0.7 per 1,000 persons. An autopsy rate of 1 per 1,000 population might be considered as a best case scenario formula for ensuring that medicolegal autopsies are performed in numbers that meet public health, public safety, justice system, medical quality assurance, and other needs. Thus, the SWGMDI regards an estimated autopsy rate of 1 per 1,000 population as one that can provide optimal benefit for all users and a target around which to plan. The NAME Accreditation criteria require that no forensic pathologist be required to perform more than 250 autopsies per year (5). Combining these data and criteria suggests that one forensic pathologist should be available for every 250,000 persons in a given jurisdiction. To provide adequate backup and coverage for off days for the office's jurisdiction and consultation, as needed, with a professional colleague, the Infrastructure Committee finds that each regional medicolegal autopsy facility should have a minimum of two forensic pathologists. Thus, to ensure efficient use of forensic pathologists, the Committee recommends a *minimum population catchment area of 500,000 population*, recognizing that smaller population catchment areas may be needed in some places when all factors such as death rate, travel distances, travel times, and other factors are considered.

Geographic catchment area

Because body transport from the location of death to a jurisdiction's autopsy facility imposes costs on both the death investigation system and on families who may be charged for transport by funeral service providers, minimizing the distances that bodies must be transported helps to reduce costs. A recent survey of state medical examiner offices found that the maximum distance for transporting bodies ranged from 50 to 1,200 miles with an average (excluding the 1,200 outlier) of 211 miles (6). A very recent on-line survey of medical examiners and coroners conducted specifically for this report showed that body transport costs averaged \$170 per case when a flat rate was paid, and \$128 plus \$1.47 per mile when a basic rate plus per mile fee was utilized (7). In many jurisdictions, one-way transport of a body may require up to 3 to 4 hours. Thus, costs for mileage and personnel time can be significant, and delays in the timeliness of autopsies resulting from lengthy transportation times can have an adverse impact on autopsy interpretations. Further, if medicolegal death investigators were to work in a regional center and need to travel to death scenes to conduct their investigations, travel distances would need to be

reasonable so that scene investigations were not discouraged. To address these considerations, the Infrastructure Committee recommends that transport distances exceed 100 miles in no more than 10% of cases. For example, in catchment areas containing a central, more densely populated area, it may be acceptable to have a larger catchment area maximum transport distance if the number of cases from outlying areas is relatively small and infrequent.

Staffing

The NAME’s original Inspection and Accreditation Standards recommended that staffing be based on the number of autopsies performed annually, which in turn is based on population (3). For an office performing 1,000 autopsies per year, which would typically cover a population base of about 1 million persons, NAME recommended the following staffing:

Chief Medical Examiner	1
Staff forensic pathologist	5
Autopsy assistant	7
(Includes 2 photographers)	
Histologist	1
Chief Investigator	1
Investigator	8
Reception/Administrative/Clerical	9
Security and Attendant.....	6
Custodial	2
 Total	 40

One of the authors of this report (RH) works in the Fulton County (GA) Medical Examiner’s (FCME) office that serves a population base of approximately 1 million, and the office’s staffing pattern is almost identical to the recommendation above with slightly fewer employees (n=36). There are no significant shortages in personnel, caseloads meet NAME Inspection and Accreditation requirements, and the office complies with the NAME’s Forensic Autopsy Performance Standards and the National Institute of Justice’s Guidelines for the Death Scene Investigator (5, 8). The investigators work from the office, staff it 24/7/365, and respond to death scenes as needed. Autopsies are conducted 7 days a week, and there is always at least one security person or morgue attendant on the premises. One histologist can adequately manage the case load using a policy that tissues are processed to blocks in all autopsy cases and to glass slides when microscopy is needed. Staffing patterns in other accredited medical examiner and coroner offices are similar. Thus, the Infrastructure Committee recommends a *staffing pattern for regional offices similar to that in the older NAME accreditation standards, with approximately 35-40 employees per million persons*. Additional staff would be required if other lab services were provided by a regional office, such as toxicological analyses, fingerprinting, DNA profiling, trace evidence examination, drug identification, digital evidence analysis, arson evidence analysis, and firearms and ballistics investigations.

Some of the positions listed above would probably increase linearly as the population served increases (along with autopsies) such as forensic pathologist positions, while others might not

(such as Chief ME or Chief Investigator). Such facts should be kept in mind when staffing levels are planned.

Funding

NAME surveys conducted in 2001 found the following annual per capita funding levels for county and state medical examiner systems (9, 10):

Type of System	Average annual funding per capita	Range of annual funding per capita
County medical examiner systems	\$2.16	\$0.62 to \$5.54
State medical examiner systems	\$1.41	\$0.34 to \$3.20

The survey, however, included medical examiner offices that were well funded and others that had marginal or insufficient funding. Furthermore, some of the surveyed offices provided only basic death investigation services, while others had laboratories and provided a greater scope of services. In 2012, the average annual funding level was \$3.79 per capita for 31 NAME-accredited offices that reported adequate or more than adequate facilities and staffing. Nineteen of these offices were county-based, and the remainder were regional or state offices.

Returning to the FCME office example, its 2012 budget was \$3,784,793 or \$3.78 per capita, which is well within the range shown above and almost identical to the average funding level reported in 2012. Fulton County’s personnel costs including salaries, benefits, insurance, and pensions accounted for 80% of the office’s total annual budget, a situation not unusual among government funded ME/C offices. Thus, a funding level of \$3.78 per capita enables this office to provide basic death investigation and pathology services, histology services, body transport services, and other operational services that meet NAME Accreditation and other professional guidelines and standards.

Based on the above analysis, the Infrastructure Committee recommends minimum annual funding of \$3.75 per capita for the operation of regional medicolegal autopsy and death investigation centers that would include investigative, autopsy, histological, body transport, and basic radiographic services. The per capita funding level would need to be adjusted upward if more comprehensive services were included.

Facilities

Facility and Autopsy Room Square footage

In 2001, data from 140 ME Offices, which covered 151,500,890 of the US population, showed that the average total facility and autopsy room square footage per thousand population were 12.7 (range: 0.2 to 140; median: 10) and 2.7 (range: 0.1 to 18.4; median: 2.1), respectively. These older data suggest that a regional facility serving a population of 500,000 should have a total area of about 6,350 square feet and about 1,350 square feet of autopsy room area.

In 2012, the average area for the total facility and autopsy areas were 19.5 square feet and 2.7 square feet per 1,000 population, respectively, for 31 NAME-accredited offices that reported adequate or more than adequate facility space. Thus, current data on average show greater total facility sizes but identical amounts of autopsy room space. These newer averages suggest that a

regional facility serving a population of 500,000 should have a total area of about 9,750 square feet and about 1,350 square feet of autopsy room area. It would be wise to build in additional space that might eventually accommodate installation of newer imaging equipment such as CT and MRI scanners. Plans should include enough space to accommodate future need, realizing that many public office spaces are built to last for a 25 to 30 year period.

Facilities should also be of adequate size to ensure that space exists to perform needed functions and that accreditation capability is not put at risk because of inadequate facility size.

Autopsy Tables and Body Storage

Review of 2001 data from 154 ME offices, which covered 161,408,392 of the US Population, showed that the average number of autopsy stations and bodies that could be stored was 5 (range: 0.5 to 60; median: 4) and 42 (range: 1 to 250; median: 28) per million population, respectively. These averages suggest that a regional facility serving a population of 500,000 should have 2-3 autopsy stations and storage space for approximately 20 bodies.

Construction Costs

An online survey of NAME members provided the following construction costs per square foot for 10 medical examiner facilities built since 1997: median: \$371; mean: \$345; range: \$110 - \$474.¹ The three facilities with the highest costs per square foot include more equipment and services, such as additional forensic laboratories and CT-scanners with specialized rooms for the scanners, than the basic medicolegal death investigation facility. The average construction cost for the seven more basic facilities was \$340 per square foot. Construction costs will vary regionally depending on the local economy and other factors such as building codes that have to do with appearances of buildings and special considerations related to the environment, such as earthquake and high wind risks. Further, the cost of land may need to be considered as a separate budget item over and above basic construction costs for the physical facility and its contents.

RECOMMENDATIONS

Based upon the above considerations and other information, a summary of recommendations has been developed for regional medicolegal autopsy centers that could be designed to house basic medicolegal death investigation and autopsy services including histology.

- 1) The minimum population catchment areas should be targeted at 500,000 unless the geography or square mileage of the area makes a 500,000 population catchment area impractical, in which case smaller population catchment areas should be considered.
- 2) Centers should be located in areas, when feasible, so that body transport distances do not exceed 100 miles in more than 10% of cases.
- 3) For a center serving 500,000 population: Minimum square footage of the facility should be 9,750 square feet with a minimum autopsy room area of 1,350 square feet and having at least 3 autopsy tables and body storage capacity of at least 20.

¹ The centers that provided information on construction costs and the year in which they were constructed are Fulton County, GA (1999); Cuyahoga County, OH (1999); Collier County, FL (1998); Macomb County, MI (2008); Anoka County, MN (2008); Orlando, FL (2009); Albuquerque, NM (2010); Baltimore, MD (2010); University of North Dakota, Grand Forks, ND (2011); and West Tennessee, Memphis, TN (2012).

- 4) Ideally, all newly constructed facilities should have at least two buildings, when feasible, with separate HVAC and air handling equipment, one building for office space and the other for performance of autopsies, body storage, and histology services. One building can suffice if air handling and other design features ensure mitigation of possible biosafety hazards.
- 5) If there are two buildings, the main building should have office space for forensic pathologists, investigators, administrative, reception, and clerical staff; conference space for quality assurance activities and meetings with clients/users; a suitable private room for meeting with families; and a records storage area.
- 6) If there are two buildings, the autopsy building should have space for the autopsy room, body storage, x-ray performance and development, photographers, forensic autopsy assistants, the histology lab, tissue procurement area, and evidence processing and storage. Space should be built suitable for installing a CT and/or MRI scanner as these become more available and affordable. Tissue procurement organizations should be consulted when planning any tissue procurement area.
- 7) Autopsy areas should have ceiling to floor air flow, negative pressure, a minimum air exchange rate of 12 per hour, and at least one ventilated hood.
- 8) Specimen storage cabinets should be ventilated to the outside.
- 9) Design plans should be calculated on an estimated construction cost of about \$350 per square foot, including the equipment installed. For a minimum size regional center serving 500,000 population, estimated construction costs should be about \$3,412,000.
- 10) Generic formulas should be used to assist in planning. The formulas to assess *minimum* requirements are shown in the table on the next page.

Parameter	Formula
Facility space	19.5 sq. ft. per 1,000 population
Autopsy room space	2.7 sq. ft. per 1,000 population
Body storage capacity	0.042 bodies per 1,000 population
Number of autopsy stations	0.005 per 1,000 population
Number of expected autopsies	1 per 1,000 population
Number of forensic pathologists	6 per 1,000 expected autopsies (includes one Chief)
Number of investigators	9 per 1,000 autopsies (includes one Chief)
Number of autopsy assistants	7 per 1,000 autopsies (includes photographers)
Number of histologists	1 per 1,000 autopsies
Number of security and attendant personnel	6 per 1,000 autopsies
Number of reception/administrative/clerical/custodial personnel	11 per 1,000 autopsies
Total number of employees	38 per 1,000 autopsies
Annual budget	\$3.75 per capita
Personnel costs	80% of annual budget
Operation costs	20% of annual budget
Minimum construction cost	\$350 per sq. ft.

Regardless of size, construction and planning must be of a nature that the following are also given due consideration:

- Requirements for biosafety must be met
- Facility security
- Case information and management data system with security and back-up
- Emergency power availability
- Showers and locker room with changing areas
- Biohazard and medical waste disposal policies and procedures
- Laundry facilities or services
- Storage areas and inventory system for consumable supplies
- Disaster plan with a business continuity plan to ensure continuation of services if the facility must be closed or is non-operational

COMMENTS

Although a separate SWGMDI report addresses possible locations of regional centers, two comments from that report are worth repeating here. First, where appropriate, consideration should be given to a regional center serving contiguous populations in adjacent states. Second, there are some existing medicolegal autopsy centers that currently do not function as regional centers but could formally function in such a way without building a new facility. The SWGMDI has assembled a comprehensive list of medicolegal autopsy centers in the United States, and further work is needed to identify potential opportunities for evolution of some of them into regional centers (2, 11).

If the federal government were to provide construction grants to states needing new regional facilities at an estimated cost of \$3,412,500 per center, and if the previous SWGMDI study identifying a perceived need of 46 regional centers in the United States is anywhere near the real need, an estimated minimum total of \$156,975,000 would be required to construct the needed facilities throughout the United States. That estimate is based on the assumption that all regional centers would be of minimum size and would each serve a population of approximately 500,000. The total cost estimate is also based on construction of 46 centers that are perceived as being needed, but some of which may not be needed or practical. Further study is needed to identify where regional centers are truly needed and what their size would need to be in each location in order to better estimate construction costs for individual facilities.

To date, the SWGMDI has reported on the perceived need for regional centers and has made no recommendations about where such centers should actually be located. The principles outlined in this document are generic planning guides and are independent of where regional centers would be located. The SWGMDI fully understands that the generic guides may need to be modified to fit a specific locale, such as establishing a smaller or larger population catchment area or a smaller or larger geographic area to be served. It is for such reasons that further state-specific study will be needed. The SWGMDI has an ongoing project to better identify areas that may be underserved in terms of quality medicolegal autopsy and death investigation centers.

Within the death investigation community itself, there may be some resistance to the development of regional centers for reasons including, but not limited to, a fear of reduced income, increased workload, or loss of local influence and control. Another problem is that some systems that are marginally operating may incorrectly view themselves as being in no need of improvement. For example, a system may be “getting by” by performing many external exams, or not doing examinations at all in some cases when, in fact, they should probably be doing complete autopsies in more cases or examining more bodies. These are issues that will need study at the state and local levels to assess compliance with professional standards, the actual quality and scope of work in the contexts of real need and best case scenarios, and other issues such as those mentioned above.

The concept of regional centers is applicable whether the existing system is medical examiner or coroner. In either case, quality uniform investigations need to occur locally by trained and qualified people, and quality medicolegal autopsy services need to be available.

When the time comes to specifically identify places that may benefit from regional centers, numerous factors need to be considered. These factors include the possibility of decentralizing, consolidating, cooperating across state lines, turning existing non-regional facilities into regional ones, and other factors as outlined in this report.

APPENDIX 1: A Sample Facility

The Fulton County Medical Examiner (FCME) serves a population of slightly more than 1 million, and each year processes about 2,400 death reports, performs about 1,000 autopsies, and conducts about 900 on-scene investigations.

The FCME facility was built in 1999 at a cost of \$200 per square foot, including equipment. The facility consists of three separate buildings:

- One building houses office space for all administrative, clerical, investigative and medical staff, and several conference rooms.
- A second building includes the primary autopsy room (8 stations), a histology lab, an x-ray room, evidence storage and processing areas, a photography office, offices for forensic autopsy assistants, a laundry room, two large body cooler areas, the body receiving and release area, and a tissue procurement area.
- A third building has 2 autopsy stations, a body cooler area, a small anthropology workspace, and storage space for skeletonized remains. This building is used for decomposed, skeletonized, or other cases in which isolation is preferred.

Each building has its own HVAC system, and the buildings are connected by covered outside walkways. Autopsy areas have OSHA compliant ceiling to floor air flow, a minimum of 12 air exchanges per hour, and negative pressure relative to adjacent areas.

Construction was primarily with concrete block, decorative brick external façade, sheetrock walls, grid ceilings with drop-in tiles, epoxy resin floors in autopsy and related areas, and impermeable synthetic coverings on the walls of autopsy areas. Ample free parking is available for employees and visitors. The grounds are secured by fencing, controlled access gates, and video surveillance. The only laboratory is for histology services. All specimens for forensic analyses are sent to the state crime lab or to hospital or private laboratories.

Assuming a 4% annual inflation rate since construction, the estimated cost of building a similar facility today would be \$11.8 million or \$357 per square foot.

In 2012, the FCME office was fully accredited, operated in compliance with NAME and other professional guidelines and standards, and operated at \$3.78 per capita annual budget.

For a hypothetical catchment area of 500,000 population, an analogous annual budget would amount to \$1.9 million.

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