Statewide standards and Achievement of National Standards for Death Investigation.

1. **Consideration of Entire System, not just autopsy performance.** The entire death investigation system involves death notification, response, investigation and appropriate adjudication, including referral, transport and performance of an autopsy in some cases. The system must also focus on quality improvement, identification and reporting of risks and hazards, changing patterns of deaths, such as prescription drug or violent deaths, reporting to appropriate State agencies, such as Child Fatality, suicide prevention and others. In every aspect, evidence must be preserved appropriately as indicated and cooperation with law enforcement, judicial parties or other investigative units. Many deaths require feedback to first responders, health providers or health systems. Importantly, the system must serve citizens and families in quality, empathy, promptness and excellence in service. Improvements of the system and knowledge base must continually occur. If the entire system is not considered, cases will be missed, even homicides may be buried without questions and opportunities for health, safety, workplace and community improvement will be lost.

2. **Importance of Accreditation and Certification**: Performance of medicolegal death investigation and forensic autopsies should be accomplished by individuals trained and certified by the appropriate professional agency and the autopsies should be conducted within accredited facilities, meeting current professional standards and expectations.

   Facilities: The facilities performing medicolegal autopsies should achieve and maintain accreditation from the National Association of Medical Examiners (NAME), the standard accrediting agency for these facilities and operations. The facilities should meet construction and operational standards of this agency for the integrity and quality of medicolegal death investigation.

   Current status:
   Bismarck: Facility constructed in 2005 meets most infrastructure and facility requirements for accreditation. Caseload precluded accreditation with staffing present in time period 2008 – 2013. Currently not accredited.

   Grand Forks: Constructed to meet all accreditation standards present in 2011. Currently in application process for accreditation by NAME and CAP (College of American Pathologists).

   Individuals: Individuals should be certified by the appropriate certification agency, maintain these credentials and follow practice guidelines of these agencies. These standards are:

   A) Autopsy performance, decisions for investigation and case adjudication: Autopsies should be performed by individuals certified or board-eligible (for recent trainees – it takes from one to five years to complete requirements and pass examinations) for certification by the American Board of Pathology (ABP) in Forensic Pathology.
      - Forensic Pathology is a sub-specialty of Pathology. Certification in Forensic Pathology is possible ONLY after successful certification in Anatomic Pathology (AP) or Anatomic and Clinical Pathology (AP/CP). Most hospital pathologists are AP/CP certified. Some may have additional certification, such as Hematology, Cytopathology (or any of 12 other subspecialties). Currently, there are no hospital based pathologists in ND with FP certification.

B) Investigation: Investigators should be certified by the American Board of Medico-legal Death Investigators (ABMDI).

Current Status:

- Pathologists: The four pathologists who primarily perform forensic autopsies are all board certified by the ABP in Forensic Pathology. (Massello, Bismarck; Sens, Koponen, Meyers: UND) UND has a requirement that new graduates must pass all certification requirements within 3 years of hire. There are some forensic autopsies still performed by pathologists who are not board certified in Forensic Pathology but this is decreasing. Hospital autopsies can be performed by pathologists certified in Anatomic Pathology but not Forensic Pathology. Forensic pathologists can perform hospital autopsies and because of autopsy expertise, can serve a unique consult / referral practice for hospitals.
- Investigators: There are 5 ABDMI investigators in ND. Two are in the Office of the State Forensic Examiner in Bismarck, one in Grand Forks Coroner's Office and two in Cass County Coroner's Office. Three additional investigators in in process of certification in Grand Forks.

3. **State / Agency responsibilities for Service**: Service expectations are critical in areas such as access and responsiveness; fairness and equalization across state, timeliness of service delivery, reports and other performance expectations. Some of these will require legislative input and appropriations, however most are rule or procedure based within the agency responsible.

4. **State / County expectations** for review and utilization, prevention and identification of risks, trends and hazards, appropriate planning and implementation, advancement of knowledge. There is a wealth of information from death investigation outside of the information needed for adjudication of a particular case. Forensic investigations regularly contribute to Child Fatality Review Board in the State. Potential significant contributions are possible with Suicide studies, Trauma and Injury, First responder and transport issues, work-place and public hazards, trends in crime, drug abuse and a host of other facets of investigation. For the state and county investment in death investigation, this information must be shared with appropriate state and county agencies. A potential example of this is the study now initiated with increasing prescription drug deaths within North Dakota. This will have impact in many areas – from health care to judicial and law enforcement concerns.

Goals:

1) **Plan and support for achieving and maintaining Accreditation of all autopsy facilities.**
2) **Direction of Medicolegal death investigation and performance of autopsies by Board Certified Forensic Pathologists**
3) **Increase access and numbers of ABDMI Investigators, particularly in Western and Central state.**
4) **Increase opportunities for utilization of death investigation data in public health, environmental health, crime and judicial information and others as appropriate.**

Current and unmet needs, obstacles and practices

1) **Variation in county practices; pool of trained investigators for assistance, increased consultation with forensic pathology practices**. There is variation in county practices, resources and access to expertise in death investigation in North Dakota. This occurs in both larger and more rural counties. The population density, large rural areas and geography of North Dakota will mandate more facile and coordinated access to forensic pathologists and systems for every county. Regionally, training of ABMDI investigators, able to respond to problematic investigations may be a part of the solution as well as increased utilization and training of first responders and law enforcement. Another critical aspect of death investigation is the timely reporting of deaths for review by forensic offices so that the correct investigation is started immediately. This will further support for law enforcement, first responders and families.

2) **Facilities:** Facility issues are difficult and expensive. Balance is always needed between size of facility, population served, travel times and difficulty to facility and optimizing facility effectiveness. In general, larger facilities are more cost effective and can more readily provide a broad base of services. However, transport expense and time, difficulty with remote investigations and considerable delays, concerns and expense for families as well as local authorities charged with death and crime investigation.

   Nationally, a minimum population of 500,000 is considered the smallest for optimal basic forensic medicolegal death investigation; 1 million is cited by many studies as a minimum. However, standards also call for transport times of less than 2 hours. North Dakota is reasonably served by two centers, with the possibility of a third center in the Western part of the state if this is linked in to other centers for support and the structure of the facilities allows for additional caseload, such as hospital referrals, private cases, cases from neighboring states.

   - **Comparison with national recommendations**. Recently, baseline information for facilities, autopsy space, body storage space and expected number of autopsies is available for national comparison. As shown below, these are guidelines for facility space, autopsy space and body storage for a forensic facility. There is some variation in the capacity needed for body storage. Generally, more rural areas or communities where identification of bodies and claiming bodies by families is not a significant issue, a lower number is needed. In larger cities with homeless individuals or areas along the Southern border of US, higher body storage capacity is generally needed. These figures assume minimal transportation time and expenses.

Figure 1: National Forensic Facility Capacity Guidelines

Parameter	National (per 1000 people)		Test population
Population			1,000,000
Area			compact
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
# Autopsies	1		1000

The guideline of 1 autopsy / 1000 population is generally accepted as a standard for assuring the

appropriate forensic response and investigation in medicolegal death investigation practices. This may be higher in areas like the "oil patch" where a more normal community profile (children, elders, families) may not be present as well as increased danger in work environments, crime and influx of people / workers, transportation and health care challenges.

Table 2: Comparison of Recommended Capacity and Current Capacity in Grand Forks and Bismarck

	National Recommendation Current Bismarck Service Area	Recommendation if Entire State was Served	Current Bismarck Capacity (July, 2014)
Population Served	352,175	699,628	352,175
Facility Space	6,867 sq. feet	13,643 sq. feet	5,400 sq. feet
Autopsy Space	845 sq. feet	1,679 sq. feet	800 sq. feet
Body Storage Space	15	29	8
# Autopsies	352	700	~ 250 – 275 (estimate)

For area currently served, Bismarck is operating very lean, with likely an increase in body storage for consideration and likely continued increase in autopsy performance as referral patterns expand. No capacity for mass disaster support or advanced imaging. Autopsies have been steadily increasing annually since initiation of the office in 1996. Many services (histology, DNA, toxicology, administrative support) are outsourced to other companies / agencies or central NDDH support. Body storage has been an issue for the office in the past, requiring counties to hold bodies on occasion.

A similar comparison for Grand Forks facility is given. Since Grand Forks operates as a regional center, it accepts cases from hospitals and counties in MN and SD, improving efficiency and reducing operating overhead and costs. Three figures are provided. The first is based on figures for solely ND operations. The second figure is for the current caseload referral to Grand Forks and the "base" figure would be if every case in a geographically logical distribution was referred to Grand Forks (maximum potential

Table 3: Comparison of Recommended Capacity and Current Capacity in Grand Forks and Bismarck

	National Recommendation Grand Forks ND Only	Recommendation for Current Grand Forks Practice	Maximum Capacity Grand Forks Practice	Current Grand Forks Capacity
Population Served	347,453	451,997	608,370	451,997 (347,452 ND)
Facility Space	6,775 sq. feet	8,814 sq. feet	11,863 sq. feet	7,400 sq. feet
Autopsy Space	834 sq. feet	1,085 sq. feet	1,460 sq. feet	~1,800 sq. feet
Body Storage Space	15	19	26	12 (+15)
# Autopsies	347	452	608	~ 400 - 450

Grand Forks facility was designed with a smaller total sq. footage since faculty and some support staff are at University, not the facility. The autopsy area was increased to accommodate more students for education.

Rack facility at Grand Forks will accommodate an expansion of body storage in case of moderate sized mass disaster.

capacity).

- **Imaging and radiology**

The use of modern imaging, such as Lodox, CT and MRI scanning is the standard in most developed nations (Australia, Europe, United Kingdom, South Africa), and is increasing in use in larger centers in the USA. Most of the initial work was done by the Armed Forces Medical Examiner, where 100% of battlefield deaths in Middle East, as well as a significant number of other military deaths were autopsied and CT scanning done at the Dover facility. Incredible knowledge resulted from improved care on battlefield, detection of explosive devises in bodies and assessment of armor and protective devices.

In the non-military setting, this is used in forensic offices similar to hospital CT scans. There are findings optimally demonstrated by CT which supplement those at autopsy. Imaging may also be useful in populations opposed to autopsy. There are a variety of imaging available, as briefly outlined.

Modality	Technique summary	Advantages	Disadvantage	Initial Cost (variable and decreasing)	Specialized Technical Assistance	On-going cost
LoDox	Conventional radiograph of entire body in 13 seconds	Detection of fractures, retained metal, superior documentation	Minimal soft tissue exam No current 3D	250,000 - ~ 450,000	No – training in few hours.	10 – 20 K
CT	Identical to hospital CT	3D reconstruction Moderate time Some injuries documented better at CT Reproducible, can be reviewed	Moderate time Requires shielding Requires PACS for data storage and manipulation (another 200K)	750,000 - 1M +	Helpful or dedicated people trained	500,00 - 100,000 +
MRI	Identical to Hospital	Best soft tissue injury May be important in child injury	Slow Special rooms / shielding needed Requires PACS for storage of data	1 – 2 M +	Absolute need; high level of skill (and funding)	200,000 + usually considered minimum

Most imaging is not practical for ND; however, acquisition and use of LoDox technology would have clear advantages. This should be coupled with arrangements with hospitals to provide CT scanning (and MRI if requested) on selected child abuse cases, facial injury and homicides where court demonstration is likely or when injuries (such as facial fractures, vertebral injuries) are difficult to demonstrate at autopsy or where national recommendations (child abuse) call for these studies. This is partially implemented in Grand Forks and being discussed with hospitals and radiologists in the State.

- **Mass disaster response and planning:** Forensic offices must be involved in mass disaster planning, particularly disasters potentially affecting the region. Consideration on both a county and state level should include this non-inclusive list:
    - What is the capacity and expansion capacity at each facility
    - In mass disasters, should pathologists / staff go to the region affected or should all bodies be transported? In general, the more local the care in a mass disaster, the better coordination and results. The worst scenario would be splitting between the disaster scene and multiple morgues and autopsy facilities.
    - Are there regional sites which could be used as temporary morgues and autopsy facilities? Are equipment and personnel in current forensic facilities cross trained and compatible (Grand Forks deliberately obtained equipment compatible with Bismarck for this reason).

- **Possible third location in Western ND**. This is a difficult question and would increase costs and staffing. If considered, all facilities should have a cost-structure and incentives to expand work beyond geographic borders and accept hospital and private referrals.

- **Biohazard / high risk facility**. Many newly constructed facilities have at least one room capable of a Biohazard III case. This should be given consideration in ND for inclusion in at least one of the facilities. Current air flow in Bismarck is a Biohazard II. One room in Grand Forks can handle a more infectious case but is NOT officially Biohazard III (Informally known as a level 2.5; better than most air-flow and isolation laboratories but not at full Biohazard III). With the potential for bioterrorism, planning and construction of a Biohazard level II room within a new facility might be considered.

- **Toxicology, DNA and special testing**: These are readily available commercially and expensive to set up for post-mortem testing to meet current Accreditation requirements. Grand Forks has elected to utilize post-mortem toxicology commercial testing. This is cost effective and frees the Crime Laboratory for the main mission of crime analysis. Switching these services to commercial entities should be reviewed for cost effectiveness and operational efficiencies for the entire system.

- **Flexible model for improved efficiency and optimizing service**. Significant operational expenses in the Grand Forks office is possible by contracting with hospitals, out-of-state counties and private requests for autopsy services. This reduces overhead, increases case variety and expertise and addresses a huge need within the community and hospitals. The UND Accounts are still fully under state regulation and rules, however, the additional income is directly applied to expense reduction. Other offices (out-of-state) may even use a "private" model, where a more commercial business model is utilized.

  Other efficiencies can be realized by partnering with current State entities, such as the administrative support, microbiology support provided to Bismarck by the Department of Health and the support / shared positions present at the Grand Forks facility with UND.

- **Development, research and training**: Training issues are significant and will continue in importance, similar to any rural state. First responders and law enforcement will ALWAYS be a key component in the statewide system. Advancement of the science and delivery in rural states, recognition of trends, such as the prescription drug deaths and autopsy rates, should be a part of a well-functioning system. This requires investment of time and support for these activities.

3) **Transportation issue**: Transportation is the single most inequitable aspect of forensic services within the large geographic expanse of North Dakota. Transportation is significant, and the further counties are, the more it is an issue. To compound the body transportation issues, travel by investigators and law enforcement becomes difficult for smaller, remote counties yet the presence of law enforcement may be critical to optimal case management.
   National averages for transportation (SWGMDI, 2012)
   - Flat rate (used in small counties for one way body transport ~ 25 miles): $170.00 / trip
   - Mileage based (generally longer distances or cross counties): $128.00 + 1.47 / mile

4) **Support and consultation; Quality Assurance Programs**. A variety of forensic and medical consultants are needed for a forensic pathology and death investigation system. These include forensic odontology, anthropology, criminalistics, toxicologists (PhD, ABFT Certified), neuropathologists, cardiac and pediatric pathologists.

   In addition, a robust quality assurance and review among forensic pathologists and death investigators is required for optimal office operation, support and achieving national accreditation which requires this type of review activities.

5) **Funding recommendations and ranges (National).** The minimum per capita OPERATING support is 3.75 / per capita / per year. This does not include long transportation expenses nor any additional support services such as advanced imaging, DNA, molecular testing or complex toxicology. Many systems are considerably more per capita. North Dakota will be complicated by the need for local resources for investigation, long transports for several regions and low population base for efficiencies. This figure DOES NOT include land, building and major capital expenses. Building and capital expenses average 350 – 400 / square foot construction due to complex laboratory requirements.