

TECHNICAL NOTE

ODONTOLOGY

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The Odontology Victim Identification Skill Assessment System*·†

ABSTRACT: Mass fatality identification efforts involving forensic odontology can involve hundreds of dental volunteers. A literature review was conducted and forensic odontologists and dental educators consulted to identify lessons learned from past mass fatality identification efforts. As a result, the authors propose a skill assessment system, the Odontology Victim Identification Skill Assessment System (OVID-SAS), which details qualifications required to participate on the Antemortem, Postmortem, Ante/Postmortem Comparison, Field, and Shift Leader/Initial Response Teams. For each qualification, specific skills have been identified along with suggested educational pedagogy and skill assessment methods. Courses and assessments can be developed by dental schools, professional associations, or forensic organizations to teach and test for the skills required for dental volunteers to participate on each team. By implementing a system, such as OVID-SAS, forensic odontologists responsible for organizing and managing a forensic odontology mass fatality identification effort will be able to optimally utilize individuals presenting with proven skills.

KEYWORDS: forensic science, forensic odontology, victim identification, skill assessment, forensic dentistry, curriculum, competencies, competency assessment

It is impossible to predict if, when, and where the next act of terrorism or natural disaster will occur. Every American, including emergency workers and first responders, has the right to expect that if they are a victim of a terrorist attack or natural disaster, every effort would be made for a quick and accurate identification. Families have the right to expect that their family member's remains will be treated with dignity, and that the forensic procedures followed will ensure maintenance of the chain of evidence while addressing the human need to bring closure to their loved one's loss as soon as possible. Thus, all municipalities must be prepared to deal with a mass fatality identification effort.

The events of September 11, 2001 and Hurricane Katrina brought to American soil the horror of terrorism and natural mass disasters. These acts were of a proportion few imagined was possible. Hundreds of individuals from all across the United States provided time and expertise to address the forensic identification needs. The World Trade Center (WTC) forensic dental effort alone enlisted approximately 350 dentists and dental auxiliaries.

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*Presented at the 60th Annual Meeting of the American Academy of Forensic Sciences, February 18-23, 2008, in Washington, DC.

†In-kind support has been provided by the University of Medicine and Dentistry of New Jersey—New Jersey Dental School.

Received 20 Oct. 2008; and in revised form 11 Feb. 2009; accepted 21 April 2009.

This large number of participants was required as the WTC identification effort actively took place over 10 months and formally ceased after 4 years. There were over 2506 antemortem records, 1016 postmortem records, and 2752 victims. All antemortem record processing, postmortem examinations, computer entries and comparisons, and victim identifications were performed by at least two dentists. Every activity was overseen by a shift commander who was a permanent member of the New York City—Office of Chief Medical Examiner (NYC-OCME) consultant staff. Final victim identifications were also verified by at least two dentists with at least one dentist being a permanent member of the NYC-OCME forensic odontology consultant staff.

As the NYC-OCME does not employ full time forensic odontologists, the effort involved NYC-OCME personnel along with the U.S. Department of Health and Human Services, Disaster Mortuary Operations Response Teams (DMORT) and 272 dental volunteers (excluding DMORT personnel) from the New York City area. While DMORT team members were paid for their efforts, DMORT personnel left their practices for two straight weeks to assist in the identification efforts. Dental volunteers from the New York City area volunteered their time without any compensation and thus were limited in their time commitment to the effort. Even NYC-OCME dental personnel all had active practices, thus limiting time available to this effort after the first several weeks of the event. Given the magnitude of the disaster, there was no choice but to use this large number of dental personnel or else there would have been significant delays in making identifications.

New Jersey Disaster Victim Identification Team (NJ-DVIT) members played a pivotal role in these efforts. After the WTC disaster on September 11, 2001 and the American Airlines Flight 587 crash in Queens, New York (which was processed concurrently

with the WTC towers), forensic odontologists in New Jersey began a round of discussions with the New Jersey Medical Examiner's Office and the newly formed New Jersey State Department of Homeland Security. The need for an effective mass fatality victim identification team in New Jersey is critical for homeland security, particularly because of our proximity to New York City. In addition, New Jersey is the home for major telecommunications companies, utility companies, petrochemical refineries, pharmaceutical manufacturers, and nuclear reactors. New Jersey has one of the country's largest and busiest harbors as well as one of the country's busiest airports. Being one of the most heavily and densely populated states in the nation, New Jersey is particularly vulnerable to terrorist attacks and industrial accidents.

One of the critical topics included the appropriate role, response, and qualifications of NJ-DVIT members to mass disasters in the State of New Jersey. The team was recognized in the late 1980s by the New Jersey State Police and the New Jersey State Medical Examiner's Office. Membership was open to New Jersey Dental Association members who expressed an interest in forensic odontology. The team was all volunteers. While training was provided annually, there was no determination of whether members had achieved specific skill levels. New Jersey currently has only four dentists who are diplomats of the American Board of Forensic Odontology. This highlighted the need to ensure competency of dentists and dental personnel who are members of the NJ-DVIT team.

After September 11, 2001, a survey of dentists was administered by the Journal of the American Dental Association. Sixty-two percent of the respondents indicated that they never had forensic odontology training and 75% indicated an interest in receiving such training (1). While there has been a call for providing forensic odontology training in predoctoral dental school curricula, most students are graduating without attaining these skills (2–7). Competencies identified by both U.S. dental schools and the Canadian Faculties of Dentistry as being essential for the new graduate are completely silent in the area of forensic odontology (8–14). As dental students do not gain these competencies while in school, and studies suggest that practitioners with special forensic training and experience are better able to perform tasks needed in identification, a partnership to further forensic odontology skill development was formed between the University of Medicine and Dentistry of New Jersey—New Jersey Dental School (UMDNJ-NJDS) and the NJ-DVIT (15,16).

Methods

The leadership of NJ-DVIT, faculty members from UMDNJ-NJDS with expertise in developing competencies and competency assessments, and forensic odontologists from New York City who were actively involved with guiding and managing the World Trade Center forensic odontology activities assembled to discuss lessons learned from the mass fatality identification efforts. Of particular note was that no national standardized skill assessment system was in place at the time. Thus, team leaders had no way to assess volunteer skills other than reviewing courses taken. In conducting this review, leaders were only able to review documentation confirming attendance at these courses, not confirming a participant's knowledge level or ability to carry out a specific skill.

A review of the literature was conducted. While there have been suggestions as to the content of forensic curricula, no proposals have been developed to suggest a skill assessment system, which would enable team captains to quickly and fully understand the

skill level of a community dental practitioner or dental auxiliary presenting during a mass fatality identification effort (2–7). The group therefore concluded that if a skill assessment system could be developed, individuals charged with directing and managing the odontology section of a large-scale identification effort could do so more effectively and efficiently.

The necessary teams required to successfully implement the odontology aspect of a mass fatality identification effort were identified. Competencies or skills required for individuals to successfully operate as a team member were detailed along with possible assessment mechanisms, which could be employed to test an individual's ability to accurately perform each skill and gain qualification. The designed skill assessment system was initially presented during a poster session at the 2008 American Academy of Forensic Sciences meeting in Washington, DC. Feedback from this meeting was used to refine the system.

Results

Table 1 details the Odontology Victim Identification Skill Assessment System (OVID-SAS). The system calls for five educational qualifications. A dentist or dental auxiliary could gain educational qualification by completing courses, which cover the skills identified and taking examinations which document their ability to perform each of the identified skills. The table documents the necessary skills required for each educational qualification, teaching pedagogy which could be employed in courses covering these skills, and possible testing mechanisms, which could be administered to ensure that course participants can perform the necessary skills.

By establishing five educational qualifications, dentists can participate in mass fatality victim identification efforts as members of one or more teams based upon their proven skill level. These qualifications include the following:

- Antemortem Team Qualification,
- Postmortem Team Qualification,
- Comparison Team Qualification,
- Field Team Qualification, and
- Initial Response Team and Shift Leader Qualification.

The first four qualifications correspond to one of the four teams normally organized in a mass fatality identification effort. The fifth qualification, the Initial Response Team and Shift Leader Qualification, is geared toward experienced forensic odontologists who are interested in taking on a leadership role in mass fatality forensic dental identification efforts, though participation on a Initial Response Team or Shift Leader may be limited to those individuals who have been authorized by local, state, or federal authorities to serve in such leadership roles.

Individuals directing the identification effort would immediately know the skill level of dental personnel who have achieved various educational qualifications, thus minimizing time required to credential team participants in a mass fatality identification effort. Field Team Qualification and Initial Response and Shift Leader Qualification would be the last two qualifications completed.

To make possible training for individuals wishing to achieve such qualifications, dentists and dental auxiliaries would be able to complete courses developed by dental schools, medical examiners, existing victim identification teams, or established nationally recognized forensic organizations such as the American Society of Forensic Odontology (ASFO) or the American Board of Forensic Odontology (ABFO). To facilitate training for individuals wishing

TABLE 1— *Odontology victim identification skill assessment system (OVID-SAS).*

Educational Qualification	Necessary Skills	Educational Pedagogy	Assessment Methodology
Antemortem team	<p>Know legal basis for obtaining original patient records</p> <p>Obtain from dentists and other health care providers, original patient records, including radiographs</p> <p>Obtain dental, medical, and other identification information from victim's families</p> <p>Maintain chain-of-evidence for antemortem records</p> <p>Maintain antemortem record system according to established protocols</p> <p>Operate forensic identification software</p> <p>Chart antemortem dental record from antemortem records obtained from treating dentists</p> <p>Operate as a team with other team members</p>	<p>Lecture/Web-based/distance learning</p> <p>didactic presentations</p> <p>Charting exercises</p> <p>Computer exercises</p>	<p>Written examination</p> <p>Simulated conversation with victim's family and antemortem dentist</p> <p>Antemortem chartings</p> <p>Use of forensic identification software</p>
Postmortem team	<p>Engage in proper use of protective gear and adhere to infection control protocols</p> <p>Search postmortem remains for dental evidence</p> <p>Resect the maxilla and mandible while maintaining the ability for victims to be viewed</p> <p>Complete a postmortem dental record charting</p> <p>Photograph remains following best forensic photographic practices</p> <p>Obtain radiographs from victim remains</p> <p>Operate forensic identification software</p> <p>Maintain chain-of-evidence for postmortem records</p> <p>Maintain postmortem record system according to established protocols</p> <p>Operate as a team with other team members</p>	<p>Lecture/Web-based/distance learning</p> <p>didactic presentations</p> <p>Use of protective gear exercises</p> <p>Cadaver laboratory exercises including resections, capturing radiographs, taking photographs</p> <p>Charting exercises</p> <p>Computer exercises</p>	<p>Written examination</p> <p>Postmortem examination in cadaver laboratory</p> <p>practical exam</p> <p>Postmortem chartings</p> <p>Radiography and photography practical exam</p> <p>Use of forensic identification software</p>
Ante/Postmortem comparison team	<p>Operate forensic identification software</p> <p>Use forensic identification software to identify possible ante/postmortem matches</p> <p>Compare and match ante- to postmortem records to verify victim identification</p> <p>Understand algorithms used by software to identify possible matches</p> <p>Maintain chain-of-evidence in reviewing ante- and postmortem records</p> <p>Operate as a team with other team members</p>	<p>Lecture/Web-based/distance learning</p> <p>didactic presentations</p> <p>Comparison exercises</p> <p>Computer exercises</p>	<p>Written examination</p> <p>Use of forensic identification software</p> <p>Mass disaster simulation to verify ability to correctly perform comparisons and make positive identifications</p>
Field team	<p>Understand and apply crime scene protocols, including chain-of-evidence</p> <p>Search remains for dental evidence</p> <p>Engage in proper use of protective gear and adherence to infection control protocols</p> <p>Understand and apply best practices in evidence collection</p>	<p>Lecture/Web-based/distance learning</p> <p>didactic presentations</p> <p>Use of protective gear exercises</p>	<p>Written examination</p> <p>Practical examination demonstrating proper use of protective gear</p>
Initial response team and shift leader Limited to individuals identified by official federal, state, or local authorities	<p>Assess the situation and determine course of action</p> <p>Activate team members</p> <p>Determine necessary supplies and equipment</p> <p>Manage the establishment of the antemortem record system</p> <p>Manage the establishment of the postmortem record system</p> <p>Manage the establishment of a comparison/positive ID record system</p> <p>Establish policies and procedures manual for dental victim identification</p> <p>Manage the establishment of the antemortem and postmortem record system</p> <p>Identify forensic identification software system to be employed</p> <p>Manage establishment of the computer network with identified software</p> <p>Establish policies and procedures for victim identification verification</p> <p>Establish policies and procedures for supervision of other team members and ensure a smooth transition between shifts</p>	<p>Lecture/Web-based/distance learning</p> <p>didactic presentations</p> <p>Use of protective gear exercises</p> <p>Web-based NEMS courses</p>	<p>Portfolio analysis</p> <p>Review of credentials and experience by official legal authority</p> <p>Board certification (optional)</p> <p>NEMS certifications</p>

to achieve such qualifications, both live and asynchronous Internet-based courses could be developed. Internet-based courses would enable dentists and dental auxiliaries to rapidly and easily participate in some of the training in the event of a major catastrophic emergency requiring an unprecedented response.

Educational qualifications would be based upon the dental professional passing skill assessment examinations developed and administered by the same possible organizations. Assessment mechanisms would include written examinations to confirm foundation knowledge as well as hands-on simulation examinations such as resecting the maxillary and mandibular arches in a cadaver laboratory, taking photographs and radiographs in a cadaver laboratory, completing antemortem and postmortem chartings, entering chart

information into forensic identification software (including the scanning of radiographs), and making victim identifications with the aid of victim identification software.

Discussion

Key among the lessons learned was the need to quickly identify the knowledge level of individuals interested in participating in mass fatality victim identification efforts. Equally, if not more important, was the ability to quickly ascertain a volunteer's actual ability to apply this knowledge. In other words, team captains needed to be able to quickly determine how well a volunteer was able to adhere to proper protocols, accurately assemble a forensic

antemortem charting, complete a jaw resection to complete a post-mortem examination, operate forensic dental identification software, perform comparison searches, and accurately identify an ante/post-mortem match. The identification of these skills was required so that volunteers could be appropriately assigned to the antemortem, postmortem, or comparison teams.

As NJ-DVIT is a specific team formed to operate in New Jersey, it is somewhat unlikely that such an organization would be activated as a team in other jurisdictions, particularly outside of the New York City and Philadelphia metropolitan areas. Thus, team leaders outside of New Jersey would be unaware of the skill level of individual NJ-DVIT team members. Similarly, NJ-DVIT team leaders would be unaware of the skill level of dental personnel coming from other jurisdictions. Without a nation-wide skill assessment system, forensic odontology team leaders would need to ascertain the skill level of anyone who is not a member of their own team. Thus, implementing OVID-SAS nationally, as a “best-practice” in mass fatality dental identification efforts, would greatly facilitate any forensic odontology response to a mass fatality event.

Even if OVID-SAS is not implemented nationally, this limitation also does not prevent dentists and dental auxiliaries living or working in other jurisdictions from participating in educational or assessment programs developed as part of an OVID-SAS implementation in New Jersey. While a national standard would be optimum, given that mass fatality identification efforts on the scale of WTC ID effort could again require involvement from dental professionals from all over the country, it would still be up to each jurisdiction and identification team to implement OVID-SAS and up to each jurisdiction to decide if the courses and assessments developed are acceptable.

It should be noted that the proposed skill assessment system does not equate to board certification. Board certification by ABFO requires proficiency and documented experience in victim identification, bite mark analysis, as well as expert testimony. The proposed framework would only indicate that a dental professional has completed educational programs and has successfully completed skill assessments in victim identification.

This article reported a skill assessment system for forensic odontologists, which was developed as a result of lessons learned from recent mass fatality efforts. While it is hoped that the United States of America will never have another mass fatality event, the country does need to be prepared to respond should one occur. As dental professionals responding to mass fatality events will again come from different parts of the United States, a national skill qualification system, such as the one being proposed, would be helpful.

National implementation of OVID-SAS with standardized training and skill assessment would make future responses more efficient and effective.

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