

Dental Participants in Mass Disasters— A Retrospective Study with Future Implications

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ABSTRACT: Mass casualty incidents continue to require the services of forensic dentists to determine the identity of victims. Across North America and Europe, teams of forensic dentists train, using mock disaster exercises, to prepare for such duties. It is vital that these mock exercises simulate the features of real disaster situations as far as possible. In order to inform those responsible for the design and implementation of mock exercises, a study was undertaken to determine the features of actual disasters that dental personnel had attended. Using a questionnaire, data were solicited from 38 odontologists. The average number of disasters attended by the respondents was eight, with an average casualty number of 94. Aircraft crashes were the most frequent cause of disasters that were attended by the odontologists. The authors conclude that future mock disaster exercises should replicate features of aircraft crashes as closely as possible by using commingled, fragmented, and burned remains. In addition, mock disasters should require the identification of a realistic number of individuals to ensure authenticity and the maximum logistical preparedness of participants.

KEYWORDS: forensic science, forensic dentistry, identification, disasters, logistical preparedness

The role of forensic dentistry in mass disaster (more than three fatalities) victim identification is well-established (1–3). Efforts to train participants for such work have concentrated on the use of mock disaster exercises that have been shown to be effective (1). Despite this, many concerns exist over the preparedness of the dental response teams (2). Several Federal (e.g., D-MORT) and private (e.g., Kenyons International) response groups have aimed to increase teams' readiness by identifying individuals willing to participate and training them for the varied roles of disaster team members (3).

It is crucial that those being trained are able to respond and participate should they be called upon, and that there is a wide range of age groups represented within the cohort of forensic dentists to ensure an ongoing fulfilment of the response need over time (1). The U.S. National Transportation Safety Board (NTSB) and the U.K. Civil Aviation Authority are anticipating an increase in the number of major aircraft incidents over the next ten years as a reflection of the increased air traffic volume (4). For example, the NTSB predicts that there will be 1 billion passenger enplanements

by U.S. citizens by 2010, representing a 53% increase from 2000 (5). It must also be remembered that while aircraft disasters are frequently the focus of publications on the topic, natural and other man-made disasters also require the services of odontologists. One of the purposes of this article is to determine the demographic distribution of forensic dentists currently engaged in the provision of identification services in mass casualty incidents.

It is a requirement of any mock disaster exercise that it prepares the participants, as much as possible, for the situation they are likely to encounter when their services are required (1). Exercises that fail to recognize this will not provide adequate preparation and may fail to meet the stated objectives. It is the second purpose of this article to determine what features mock exercises should replicate by analyzing the types of disasters that dentists have attended previously. In this way, the groups charged with the deployment of such teams will be able to design authentic exercises that will truly reflect the nature of the work likely to be encountered.

Methods and Materials

A questionnaire was designed as part of a larger study to examine the psychological and emotional impact of disaster work on dental personnel (2). The questionnaire was e-mailed to individuals known by the authors to be previous participants in mass casualty incidents. Sixty-five individuals were sent the questionnaire. This was a representative sample of the individuals working in the discipline, and included dentists from both civilian and armed forces backgrounds. Data collected from the questionnaire included (a) age, (b) sex, (c) number of disasters attended, (d) cause of the most recent disaster, (e) number of fatalities of the most recent disaster, (f) disaster attended having the most fatalities, and (g) cause of disaster having the most fatalities. The questionnaires were coded and anonymous to the investigators. Data were collected and entered into a statistical package (Statistics Program for the Social Sciences, SPSS) for basic statistical treatment.

Results

Thirty-eight questionnaires (58%) were completed correctly and returned. Eighty-nine percent of the respondents were male. Age was divided into groups and the distribution of these groups is shown in Fig. 1. The average number of mass disasters attended was 8.4 (± 9.5). The average number of fatalities per incident was 94.08 (± 88.35). This figure does not include the 913 victims from the Jones' Town massacre that can be regarded as an outlier and thus excluded. The distribution of disaster causes is shown in Figs. 2 (most fatalities) and 3 (most recently attended).

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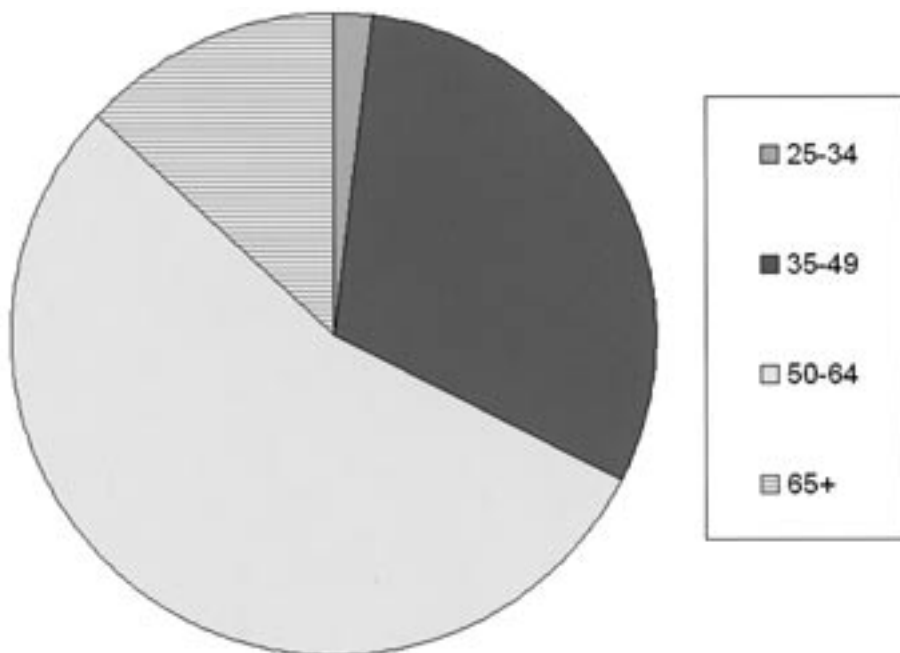


FIG. 1—Distribution of ages of the forensic dentists attending mass casualty incidents (n = 38).

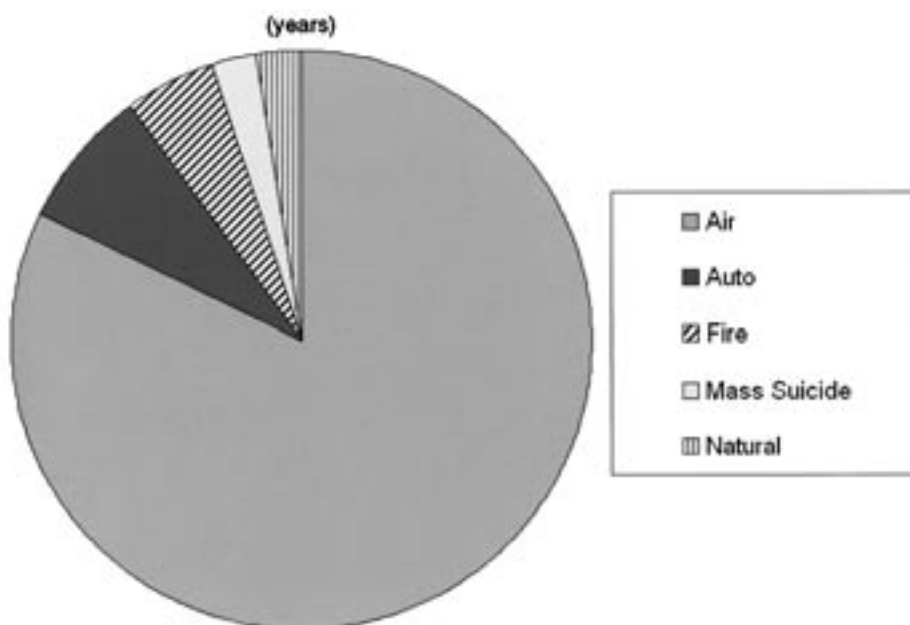


FIG. 2—Cause of mass disasters with the largest number of fatalities attended by forensic dentists (n = 38).

Discussion

The majority (54%) of individuals questioned in this survey were in the 50 to 64 age group; 13% were 65 or older. If this is representative of the dental personnel involved in disaster identifications, then there is a real need to recruit and train younger odontologists to continue the work of their older colleagues. It is accepted by many that actual disasters are inappropriate for training novices (6–8). However, groups staging mock disasters must ensure that the attending dentists span a broad range of ages. The fact that most odontologists who respond to mass disasters are older may be a reflection of the time available for young dentists

who are beginning their careers. Arguably, this is exacerbated by the scarcity of approved training programs in forensic dentistry and the lack of a dental speciality in the discipline (9,10).

It is clear from the data collected that air crashes are the most common cause of disasters requiring the attention of a dental identification team. This has important consequences for the designers of mock exercises. It is important that the features and circumstances of an aircraft crash are replicated, as much as possible, if the objective is to train individuals for the most likely event. One of the confounding aspects of air crashes is that the human remains will often be in very poor condition, and may be burned and commingled with other victims (3,11–13). This

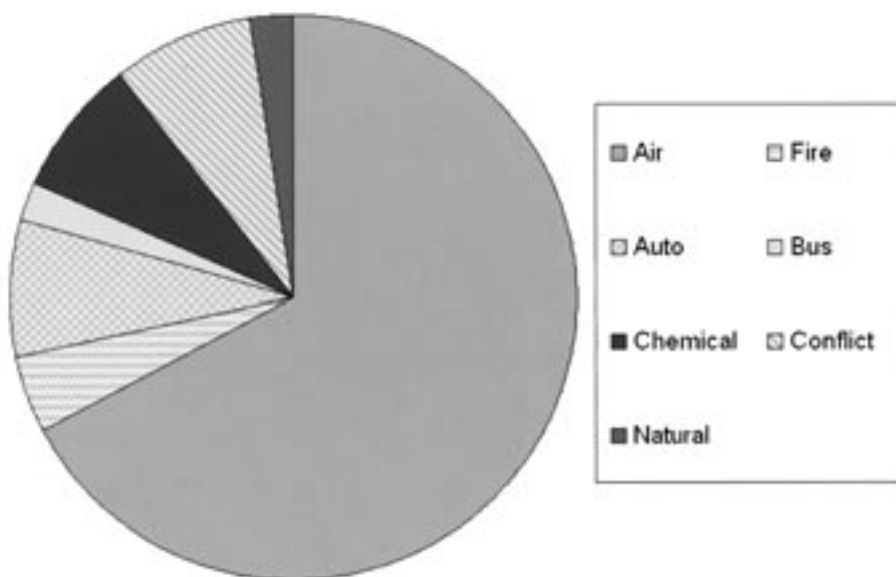


FIG. 3—Cause of mass disasters most recently attended by forensic dentists (n = 38).



FIG. 4—An example of the commingling and fragmentation of remains likely to be experienced by forensic dentists attending an airline crash. Such complexities should be incorporated into mock exercises.

should be replicated in the postmortem specimens and records that are used for the training exercise. For example, radiographs of the type shown in Fig. 4 are more representative than a complete mouth series. It is this quality of evidence that dental teams are likely to encounter in the real scenario, and therefore it should be simulated in the mock disaster.

Special techniques are required when dealing with severely burned remains and improper handling can result in the loss of cru-

cial identification evidence. Delattre reviews the techniques for dealing with such remains, including the stabilization of fragile, burned dental tissues (11). It would be helpful to replicate the handling of such remains in a mock scenario—possibly using animal tissue—to ensure that the postmortem team is familiar with the particular challenges this evidence presents.

The international nature of air travel today means that it is likely that forensic dentists will need to be aware of the charting and

recording systems used in a variety of countries, and such complexities should be introduced into the mock disaster. Authentic copies of dental records from international sources will assist the antemortem team in learning the nuances of different notations. By using the air crash as a model for mock disasters, team organizers can logistically prepare their members more effectively for the disaster challenge. The number of cases to be identified will be a crucial component of this (13).

We have determined that the average number of fatalities in incidents attended by this cohort of forensic odontologists was 94. But, typically, training exercises involve the identification of far fewer individuals. This may not be valid if the aim is to prepare the team members effectively. While time and resource considerations must be taken into account, the authors believe that the number of mock victims requiring identification is one of the most pivotal areas of training and should be emphasized in each exercise (1). Through more realistic scenarios, the exercise participants must appreciate the complexities and challenges brought about by the sheer number of bodies (13).

Conclusions

While many causes for mass casualty incidents have been noted, it appears prudent to use the aircraft crash as a model for disaster training. It must also be recognized that the data for this study are collected from a sample of odontologists based upon their willingness to complete the questionnaire. This may not, therefore, be representative of the overall discipline. However, the data that was compiled suggest that mock disaster exercises should incorporate the following aspects to ensure that participants are fully prepared:

- a realistic number of casualties represented,
- postmortem remains representative of disaster type, including burned, fragmented, and commingled remains for the postmortem team, and
- A variety of antemortem record types should be used, including those in foreign languages and employing alternate tooth notation systems.

The identification of disaster victims by their dental features is likely to remain a dominant technique despite the increased use of DNA (13). It is essential both for the success of the identification process and for those working within it, that team members are prepared for the challenges as much as possible. We have described the common features of disasters that were attended by forensic dentists and how they could be replicated or simulated in a mock training program. Further research is required to determine the ef-

fectiveness of such authentic mock scenarios both in terms of increased preparedness and logistical practicality.

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