

FATALITY MANAGEMENT IN MASS CASUALTY INCIDENTS

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Summary

Medical involvement in mass casualty incidents requires proper planning and preparedness. In disaster situations, legal aspects concerning the dead add to the general problem of a lack of time, place and resources to maintain routine working conditions, and demand authority and competence. The aspects of planning the recovery of the dead, transportation and morgue facilities, establishment of cause of death, identification, and the final disposition of the dead are discussed. The implementation of forensic mass fatality teams is felt to be the right answer for a better planning and coordination.

Key words: Disaster medicine; Fatality management; Forensic medicine

Introduction

Mass casualty incident management fits into the general framework of acute disaster management, and has to deal with a sudden rise in the needs for an effective medical, social, and psychological intervention, exceeding the normal capacities of the local facilities [1,2]. The Military have been aware of this problem for a long time and managed, with reasonable success, to cope with it in the training of their medical and paramedical troops, as well as in strategic and tactical planning [3–6]. Civil medicine acknowledged the problem of mass casualty incidents later, when it was confronted with the implicit risks of modern warfare, mass traffic, growing industry and technology. It soon became clear that improvisation was not the right answer, and that planning, preparedness and training were essential [7–9]. In this context the dead are often overlooked, possibly because of the predominant influence of clinicians in medical disaster management planning. Although mass casualty incidents often go together with high fatality, it is often forgotten how great an impact the dead have on the survivors, the rescue teams, the media, and the community as a whole [10–12]. In addition, mass casualty incidents will, as in all cases of unnatural death, inevitably give rise to legal investigations concerning the identity of the deceased, their cause of

death, and the responsibility for the disaster [13–15]. These specific issues add to the other problems common to all medical intervention in disaster situations, which is characterized by a lack of time, place and resources to keep at the routine working procedures. Planning must cover the following major items: victim recovery, evacuation and morgue facilities, identification, establishment of the cause of death, and the final disposition of the dead.

Victim Recovery

On his arrival at the scene, the senior emergency care officer will overlook the situation and evaluate the possible risks for the rescue teams. Next, he will go from victim to victim, evaluating them quickly according to their needs for treatment and their chances of survival, applying only basic life support [16,17]. In contrast with the routine emergency care, early medical intervention in mass casualty situations cannot afford to perform time consuming examinations or any heroic treatment [8,17,18]. This inevitably leads to the consequences that even in the hospital no distinction can be made between cerebral and biological death and that some potentially salvageable victims will be declared dead, deprived as they are from the intensive care they would have received under normal situations. The ethical dimensions of these decisions involved in triage demand authority as well as the competence and the experience that only well-trained doctors can give [7,17–19].

Each body, body-part or personal belongings recovered should be tagged with a unique recovery number [20]. If bodies are scattered over a substantial area, a grid with alfa-numerical coordinates should be used to enable the record-keeping of their location [15,16,21]. In addition, their position relative to other victims or personal belongings should be noted on the tag label in order to help identification. If there is no danger of a further disintegration (e.g. by fire, collapsing buildings, water current) the bodies should not be moved from the scene prior to the arrival of the forensic expert in charge [10,22,23], but they should be handled with dignity, covering them with blankets. However, if a danger of acute further disintegration exists, the dead should be removed to a safe *fatality collection point*, well secured from public view (e.g. in the 1987 Zeebrugge ferry disaster, they were brought to the nearby naval base platform (Capt. M. Claus, pers. comm.) and not to the triage station.

Transportation and Morgue Facilities

The focal point for caring for the dead and the legal investigation as to the identification and the establishment of the cause of death, is the temporary morgue [15,24]. As soon as it is installed and properly secured, the dead have to be cleared from the scene or the fatality collection point in an organized way. Whenever possible, funeral cars, ambulances or closed vans

should be used. For identification's sake an uncontrolled scattering of the deceased over several morgues and funeraria, regardless of how well equipped they might be, should be avoided.

The temporary morgue site must have adequate space to receive and store the bodies, if possible in well ventilated and cold places. If the latter is a problem, plans must have been made to claim refrigerated vans from a nearby company or from other organizations. As primary hospitals are in danger of becoming overwhelmed by walking wounded, severely injured and relatives of the victims, it is appropriate to install the temporary morgue away from this hospital [7,25]. There must be adequate lighting and sufficient electrical outlets, running water and appropriate furniture to enable *assembly line* postmortem examinations and autopsies [21,24]. Access must be guarded though easy for transportation teams, and at least two independent telephone lines should be operational (one for communication with the command post and one for outside communications). As they arrive at the morgue, the bodies and bodyparts are given a sequential morgue number (M-number) next to the recovery number and they are placed in orderly rows according to that number. A minimum space of 6 x 2 ft. (185 x 60 cm) should be provided for each body, with 2 ft. (60 cm) distance between bodies in a row and 5 ft. (150 cm) between rows [24]. Facilities for administrative activities, resting and having a meal, and a waiting room for relatives who have come to identify the bodies should be provided.

Identification and Establishment of Cause of Death

Identification can be divided into two phases [13,15]. First there is a *technical* phase of collecting postmortem data on the deceased and their belongings. In a second phase, called the *tactical* identification, these data have to be matched to antemortem records. It is clear that the latter are far easier to achieve in incidents with known victims (e.g. airplane crash, hotel fire, etc.) than in those with unknown victims (e.g. warehouse fire, train accident, etc.). Identification, however, does not start at the morgue, but at the site of the incident [20]. The use of tag labels, recording the exact location of the bodies and their position relative to other victims, is of great value both for the identification and the reconstruction of the accident [22,23]. All personal belongings on or near the victims should be recovered, tagged and brought to the morgue. There, identification procedures should take place systematically, even if a body can already be identified at the beginning of the assembly line. Standardized protocols will be needed to avoid duplicate investigation, misunderstanding and false data acquisition (an example of such a protocol is given in Appendix A).

At first, the bodies are described as they outwardly appear, recording all significant features, mud, clothing and belongings. The same happens for all loose body-parts or belongings. Care should be taken not to give any non-descriptive interpretation to these belongings, as most of the people only

know their appearance and do not know if e.g. a ring is gold or copper, or if its stone is a diamond, a brilliant, or mere rock-crystal. At this time fingerprints should be taken. It should be mentioned however that their use is rather limited by the fact that in most countries not everyone has a fingerprint record. Photographs should be taken of the clothed body and all relevant external items, taking care that these photographs are identifiable by including the recovery number and M-number in the picture. Next, the bodies have to be removed to a postmortem examination area in a roll-on roll-off way, where they can be unclothed and examined by a forensic pathologist assisted by legal officers. It should be mentioned here that, although modern trained police officers and funeral directors can be of help in the identification, the delicate procedures of examining a human body, even if it is dead, are a medical act and should only be performed by a doctor [12,23]. All relevant marks and signs on the body should be marked on the protocol, including Tanner scores [26], state of virginity and breast circumference in females, circumcision in males, tattoos, and all scars and signs of surgical treatment. Photographs are taken from all relevant features. If the clothes or any other object are essential for a further investigation or as evidence in court, they should be dried before packing, as wet materials become mouldy, change colour and disintegrate rapidly, especially in plastic bags. At this time, blood and urine samples or muscle biopsies should be collected for alcohol dosage, blood grouping, and toxicological analysis [27]. In fire accidents additional airtight blood samples should be taken for the concentration of carboxyhemoglobin and cyanide [22,27]. As odontological findings often contribute most to the identification, attention should be given to get complete dental records [21,23,28—30]. Their use too, however, largely depends on an accurate routine dental record-keeping [27]. More recently, Röntgen pictures of the skull have been valuable for identification purposes, using the superimposition of premortem photographs [31,32]. As computerized three-dimensional imaging techniques become more sophisticated, techniques of artificial facial reconstruction might become important. The contribution of autopsies to the identification often is limited [12,21]. Therefore, autopsies should be performed only if dictated by the law or the legal authority in charge, or if there is doubt as to the cause of death. If done, they should be complete and carried out properly, including closure and external restitution of the bodies.

Final Disposition

Irrespective of the objective reasons to handle the identification procedures in a calm and expert atmosphere, it is only natural that the deceased should be given back to their relatives for disposal as soon as possible. Whenever a body has been identified, it should be released from the morgue after examination, and moved to a place the family has designated. Initially unidentifiable bodies can be embalmed and stored awaiting further

investigation. Definitely unidentifiable bodies should be buried in separate graves after full examination, keeping record of their location. However, no embalming or other thanato-cosmetic procedures can be allowed before the body has gone through a complete technical identification procedure, as they alter the original features of the body and complicate post mortem examinations [15]. The dead do not in general pose a public health threat, and there is no need for a hasty disposition using mass graves or, for forensic aspects even worse, cremation. In this context, the use of surgical masks by litterbearers, morgue personnel and identifying relatives should be abandoned also, since this only leads to further mystification, discomfort, and hyperventilation. For those not used to contact with dead bodies, the use of such masks only strengthens the old belief in the contagiousness of the deceased and death [11,12].

Before release of a dead body from the morgue, a thorough check should be run as to the completeness of the postmortem record, the identity of the deceased, and the cause of death. The funeral director's address and the final destination of the body should be noted on the protocol. As data collection in disaster situations often is completed only after the disposal of the dead, and a need for further investigation might rise, no cremation authorization should be given.

Conclusions and Recommendations

From what is mentioned it is clear that fatality management in mass casualty incidents requires preparedness and planning, in order to facilitate identification of the deceased, establishment of the cause of death, and accident reconstruction. Only a multidisciplinary team of well-trained and experienced forensic doctors, odontologists, and technicians can effectively manage such a task. Ready to move *mass fatality teams*, stationed at strategic locations throughout the country and well-known to the legal and other authorities involved in disaster management, may be the logical solution. In countries where coroner duties are the responsibility of the legal system, these teams could well be established in and work from the district coroners' offices. This would allow them to come into action very rapidly [20]. In countries like Belgium, such an automatic intervention is not possible since every medical doctor, regardless of his area of specialization, can theoretically be appointed to a forensic task by the magistrate in charge. Irrespective of the fact that most of the magistrates normally work together with specially trained forensic doctors and university departments of forensic medicine, preparedness for mass fatality situations in those countries still is hampered, since both the composition and the degree of involvement of the forensic team depend on an appreciation of the need for such a team by the magistrate in charge. This way of acting should be reconsidered for the exceptional situations that mass casualty incidents are. Disaster forensic teams should be established at all major universities of the country, ready to

move at a moments notice 24 h-a-day. Their working area should be well described and known to the legal officers and the magistrates on duty in that area. These should be informed of the phone number and the address of the team-leader on duty, and together with the authorities involved in disaster management a policy should be worked out, stipulating the situations in which these forensic teams should *automatically* be called in.

To be efficient, mass fatality forensic teams should work out their intervention schemes in close cooperation with the departments of pathology of the hospitals in their area and especially with the civil defence and Red Cross organizations, as the latter are very likely to be involved in the recovery of the dead and the installation of the temporary morgue. Coordination with the emergency departments of the hospitals in the area is essential too. In addition, even the basic training of rescue and emergency personnel should include teaching on how to handle the dead, emphasizing the need for complete and standardized record-keeping of the recovery of victims and personal belongings. Finally, it should be stressed that the post-mortem procedures must take place in a systematic and organized fashion, under the medical authority of a forensic pathologist.

Appendix

POSTMORTEM REPORT	
DISASTER ID:	OPENED: .. / .. / ..
R n°:	M n°:
IDENTIFICATION:	
.....	
.....	
A. INVENTORY	
TAG n°	DESCRIPTION
CLOTHES:	
PAPERS:	
JEWELRY:	
OTHER:	
PHOTOGRAPHS: Y / N	
FINGERPRINTS: Y / N	
name:	
signature:	

B. MEDICAL

STATUS: intact / flesh covered / burned SEX: M / F / ??
 decomposed / semi-skeletal

AGE: (exact / estimated) RACE: / ??

HEIGHT: (exact / estimated)

WEIGHT:

EXTERNAL: Tanner scores: G . / P . / B .

hair: eyes:

scars:

tatoes:

.....

rigor 0 I II livores 0 I II temp

remarks:

.....

.....

AUTOPSY: Y / N thorax: heart:

 trachea:

 lungs:

 remarks:

 abdomen: stomach:

 liver:

 spleen:

 kidneys:

 bladder:

 remarks:

 head: skull:

 brain:

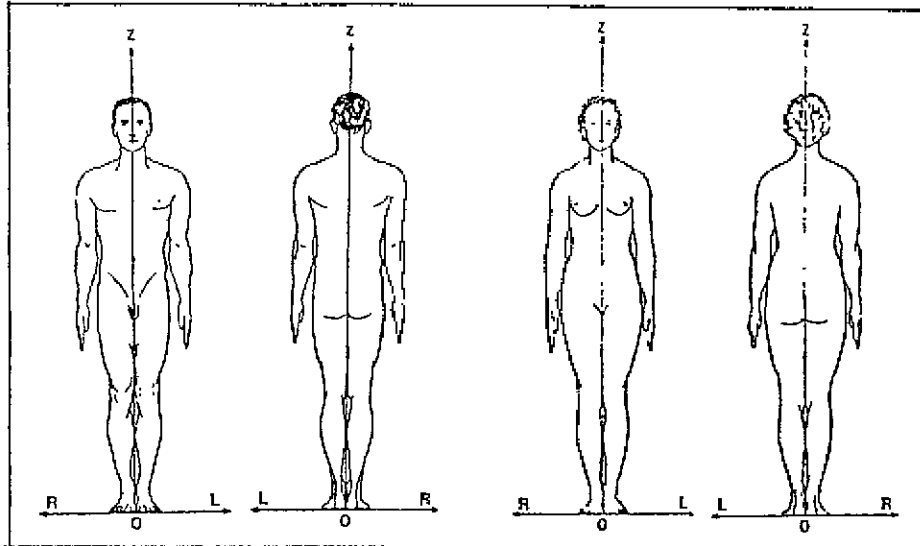
 remarks:

SAMPLES: none / blood / urine / muscle / organs /

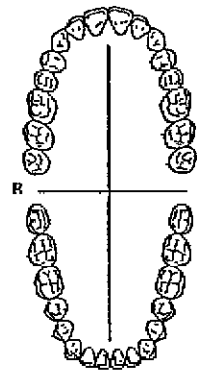
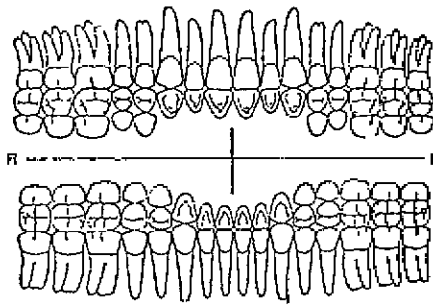
 destination: alc/ bg / co / tox / path /

DIAGNOSIS:

name: signature:



C. DENTAL RECORD



code: X (missing) C (caries) E (erosion) B (broken) R (root)
 Fx (filled x=.(?)/a(amalgam)/s(silicate)/o(other))
 Crx (crown x=.(?)/g(gold)/po(porcelain)/pl(plastic)/o(other))
 Bx/y (bridge from x to y) D (ersatz denture) <-> (diastasis)
 @ (torsion) U (unerupted)

remarks

.....

.....

.....

name: signature:

D. FINAL DISPOSITION

run check before release:	<input type="checkbox"/> R n°	<input type="checkbox"/> medical
	<input type="checkbox"/> M n°	<input type="checkbox"/> autopsy
	<input type="checkbox"/> identity	<input type="checkbox"/> dental record
	<input type="checkbox"/> inventory	<input type="checkbox"/> enclosures

DEATH CERTIFICATE ISSUED BY :
 date: place:

LEGAL AUTHORIZATION ISSUED BY :
 date: place:
 not.n°:.....

DESTINATION: funeral director's address:

 way of transport: road / rail / sea / air
 final destination:

E. ENCLOSURES

n°	description
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