

The role of Dentists in a Mass Casualty Situation – A New Zealand Perspective

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Background

Mass casualty situations can arise unexpectedly anywhere, anytime, as evidenced by recent natural disasters and terrorist activity around the globe. Although traditional emergency medical services centre around medically trained and paramedic personnel, dental practitioners have many skills and attributes that are of vital importance in responding to a mass casualty situation.

Purpose

This article highlights areas of which general dental practitioners should be aware and hopes to encourage further training and professional development to up-skill in the event of a natural disaster or terrorist event in New Zealand or Australia. In doing so, general dental practitioners may take a greater role in a multidisciplinary team in a mass casualty situation.

Materials and Methods

Web-based on-line search engines (PubMed, Medline, and Google), the Cochrane Collaboration Library and hand-searches of major journals and texts were performed.

For web-based on-line searches the following key words were used to identify relevant publications: mass casualty; dentists, disaster. An English language restriction was applied.

Conclusion

There is a growing interest in and a necessity for utilising the skills of general dental practitioners in a mass casualty situation arising either as a result of urban terrorism or a natural disaster. Further training and education of both medical and dental practitioners is needed in order to fully integrate general dental practitioners into the trauma team and to change the current attitude to admit a meaningful role for dentists in a mass casualty situation.

Conflict of Interest

The author has no conflict of interest and has not received any material or monetary gain in the preparation of this article.

Introduction

Mass casualty situations arise in the most unpredictable manner – multi-vehicle motor accidents, industrial accidents, natural disaster and terrorist attack being examples where large numbers of casualties may arise with injuries of varying degrees of severity. Traditionally, Emergency Medical Services (EMS) will be the first to respond and mainly comprise the ambulance service, local hospitals and civil defence, with further augmentation by personnel from the New Zealand Defence Force when directed. These services would be easily overwhelmed however in the event of a large scale mass casualty or disaster scenario such as the Asian or Boxing Day tsunami in December 2004, which affected hundreds of thousands of people in countries such as India, Thailand, Sri Lanka and Indonesia. Even when the best EMS resources are available, the sheer numbers of casualties can severely test the system, especially when scene security may not be established or is undergoing a continued threat. The terrorist attack on the Twin Towers in New York City on 11 September 2001 heralded a new era of urban warfare on a truly global scale. Whereas the urban conflict in Northern Ireland in the 1970's and 1980's was more or less localised to the United Kingdom, "9/11" showed that terrorism was worldwide and could strike anywhere and at anytime. The Bali Bombings in 2003 and the London bombings on 7 July 2005 bear terrible witness to this. Situations like these would place considerable strain on EMS resources in New Zealand and would be an opportunity for general dentists as health professionals to expand their capabilities in times of emergency and disaster. This article reviews current literature and highlights potential areas in which the general dental practitioner may contribute to the EMS team. By virtue of daily clinical practice and experience, the expertise of the general dentist could well be utilised.

Materials and Methods

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The Tactical Environment

Although a military term, the tactical environment is an appropriate phrase to describe the scene or situation in terms of mass casualties resulting either from a natural or a man-made disaster. A more familiar concept is one that is taught as part of basic life support when approaching an unconscious victim – namely, scene safety. As an emergency responder, appropriate management can only be rendered if one is able to perform the duties safely – falling debris, uncontrolled fires, explosions and small arms fire can be potential hazards. Emergency care may be delayed as a necessity until the situation is brought under control by EMS, police, fire fighting services or the military. An increasing concern to bear in mind is that terrorist activity may also involve biochemical agents – so-called bioterrorism - and is not merely confined to bombings and shootings 1.

Triage

Triage is derived from the French, meaning to sort out, and can be applied to various situations ranging from everyday triage of emergency department patients to large scale disasters. Triage is a way of categorising patients in the order of severity of their injuries, with the underlying principles being to accomplish the greatest good for the greatest number of casualties and to make the most efficient use of available resources².

The most common triage system used by military and paramilitary organisations is the North Atlantic Treaty Organisation (NATO) System of Triage^{3,4}. This system is used in New Zealand and prioritises patients in terms of treatment urgency. The highest priority is immediate or T1 and is given to those patients requiring urgent intervention (minutes to one hour) to save life, limb or eyesight but also where the nature of the injury is of immediate threat and the patient has a good chance of survival given the availability of resources. The second highest priority is delayed or T2, where patients require intervention but can wait for a few hours. Minimal or T3, denotes minor injuries that still require intervention, but the overall condition is not expected to deteriorate. Expectant, or T4, patients are those who are not expected to survive given the extent of their injuries in the context of the available resources. Table 1 summarises this system

of triage. Emphasis must be placed on the continued reassessment of patients so that their triage status may be updated and upgraded if necessary. For example, a patient with broken ribs may be initially categorised as T3 or minimal, but subsequently develops a life-threatening tension pneumothorax. The appropriate category for this patient would now be upgraded to T1 or immediate.

| | | |
|--|-----------|--|
| T1 | Immediate | rapid intervention to save life, limb or eyesight |
| T2 | Delayed | intervention within hours required |
| T3 | Minor | intervention required but condition unlikely to |
| T4 | Expectant | survival unlikely due to extent of illness or injury |
| Note: constant reassessment of patients is mandatory | | |

Table 1: * adapted from De Lorenzo RA, Porter R. *Tactical Emergency Care – Military and Operational Out-of-Hospital Medicine*. New Jersey: Brady, 1999; 231-247.

The T1-4 system is not to be confused however with another common system of categorisation used by ambulance services, which relates to the urgency of evacuation or transfer to hospital: immediate (P1), urgent (P2) and non-urgent (P3).

The National Disaster Life Support (NDLS) program in the US teaches a simplified triage system called MASS triage: Move, Assess, Sort and Send and is based on the motor component of the Glasgow Coma Scale and systolic blood pressure as an indicator of the severity of trauma⁵. The NDLS version of the T1-4 system is the mnemonic device IDME: Immediate, Delayed, Minimal and Expectant.

Initial Trauma Management

It is not the aim of this article to provide an exhaustive “how-to” guide for initial trauma management, but a systematic approach is necessary when dealing with initial general trauma. For most civilian trauma, the concept of the primary survey is taught and focuses on the evaluation and intervention or prevention of life-threatening conditions involving the airway, breathing, circulation, neurologic disability and exposure (ABCDE) of the patient⁶. The pertinent conditions relating to each of these areas are summarised in Table 2.

| The components and major pertinent conditions of the primary survey* | |
|--|---|
| Airway | Obstruction from secretions, fluids, tongue or foreign objects Swelling or oedema of the larynx Direct laryngeal trauma |
| Breathing | Tension pneumothorax (most life-threatening) Other pneumothoraces including simple, open, and haemothorax Flail chest Severe pulmonary contusion |
| Circulation | Hypovolaemic shock Other forms of circulatory shock or collapse Cardiac tamponade, pump failure or arrhythmias |
| Disability | Neurological injuries especially brain injury and spinal cord injury Assess degree of consciousness: Alert, Voice, Pain, Unconscious (AVPU) |
| Exposure | Hypothermia and other environmental exposures Removal of clothing for full inspection of wounds and injuries |

Table 2: * adapted from Miloro M (ed.). *Petersen's Principles of Oral and Maxillofacial Surgery*, 2nd ed. Ontario: BC Decker, 2004; Chapter 18.

The primary survey as described is based on civilian or “blunt” type trauma such as motor-vehicle accidents or falls. In situations where explosions or blast injuries may occur, such as an incendiary device or grenade detonation, the severity of injury and exactly what leads to a life-threatening situation may alter over time. This is well illustrated by a shift in focus in the primary survey by military personnel to give first priority to the control of massive haemorrhage due to ballistic or blast injury. This is followed by issues relating to airway, respiration, circulation, head injury and hypothermia (giving rise to the mnemonic MARCHH where “M” stands for massive haemorrhage control) (Table 3).

| MARCHH compared to ABCDE* | | | |
|---|-----------------------------|---|-------------------------|
| M | massive haemorrhage control | | |
| A | airway | A | airway |
| R | respiration | B | breathing |
| C | circulation | C | Circulation |
| H | head injury | D | disability (neurologic) |
| H | hypothermia | E | exposure |
| *Note the similarities with the addition of control of haemorrhage as a priority in a tactical environment. | | | |

Table 3: MARCHH compared to ABCDE. Note the similarities with the addition of control of haemorrhage as a priority in a tactical environment.

Potential Roles for the General Dentist

The challenge for general dental practitioners in the context of a mass casualty situation or disaster is two-fold. The first involves a change in mind-set in order to think outside the normal scope of dental practice. To a degree this is accomplished by a change in attitude and an ability to adapt to new and rapidly evolving situations. To a large extent these capabilities are based on previous training or experience. The second issue is more far-reaching, as it involves the profession as a whole. Guay in 2007 makes a pertinent point in that dentists tend to practice in solo or two-clinician surgeries and the vast majority of practice is outside a hospital setting⁷. Unlike medicine, the dental profession is an organisation of individual practitioners that often have little to do with multidisciplinary health activities unless hospital based. This relative professional “isolation” may be a barrier in allowing dentists to become involved in a team environment, not because of the individual practitioner but due to the lack of visibility among other health practitioners.

The military has a strong historical precedent in utilising dentists in other medical roles. It is especially well established and taught by the US military, where dental officers are trained to provide triage and basic casualty treatment as well as providing secondary airway/general anaesthesia and surgical assistant capabilities⁸.

Triage and casualty officer

By virtue of the clinical dental training (albeit focussing on the oro-facial region) recognition of obvious and potentially life-threatening injuries or conditions is well within the capabilities of the general dentist.

There will be situations however, where the signs and symptoms may be more subtle and require a greater degree of diagnostic acumen, but in this context the general dental practitioner may be the only person available with any health science knowledge at all. The appropriate screening and prioritisation of patients leads to efficient use of limited resources with the correct interventions being given at the appropriate time. It is of vital importance to continue to reassess patients that have been triaged, as patients can become critically ill over time or even expectant (T4). By assuming a role of authority or responsibility in a mass casualty situation, the dental practitioner (if this is compatible with their own personality) can also be useful in crowd control and managing potential difficulties between individuals or groups of people.

Airway management

General dentists should be familiar with airway management from a basic life support aspect using head tilt, chin lift and jaw thrust manoeuvres to open and maintain an airway, especially in the unconscious or obtunded patient. Bear in mind however, cervical spine injuries may be present and clinical suspicion should be high in certain scenarios where sudden force or impact around the head and neck region may have occurred. For those with further training, useful adjuncts such as oropharyngeal airways may be used (Figure 1).



Figure 1. Oro-pharyngeal airway devices

In extreme situations a surgical airway may be necessary when endotracheal intubation is contraindicated or unable to be performed. Cricothyroidotomy is usually preferred in an emergency setting, due to easier surgical access and the smaller chance of damaging vital structures such as vocal cords and blood vessels⁹. Figure 2 shows the anatomical landmarks for cricothyroidotomy. Familiarity with a bag-mask apparatus should also be part of any training in basic life support.

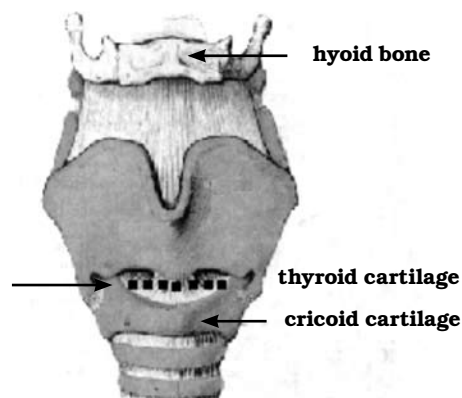


Figure 1. Oro-pharyngeal airway devices

Figure 2. Surgical incision for cricothyroidotomy. An incision is made through the skin and through the relatively avascular cricothyroid membrane between the thyroid and cricoid cartilages (arrowed).

First Aid

This is an area that is not generally covered in either medical or dental curricula, basic first aid skills such as bandaging and splinting having been replaced by more academic pursuits. These skills must be taught and demonstrated in order to maximise their potential of haemorrhage control and prevention of further injury. It would be advisable for interested civilian individuals to seek further training with the local ambulance service or Red Cross, and for military dental personnel to seek from their medic counterparts further training and skill reinforcement.

Surgical assistance

This may range from simple suturing and wound toilet to assisting a surgeon in an operating theatre environment. Dentists will be familiar with blood and basic surgical techniques of asepsis, instrument handling and the handling of tissue. However, these skills may need to be applied to different areas of the body, for example having to assist in the reduction of a lower limb fracture or an exploratory laparotomy. Surgical skills of a general nature that can be performed by general dentists would include wound toilet, removal of foreign objects such as glass or metal, wound debridement, simple suturing (including other parts of the body where access is much greater than that offered by the oral cavity) and wound dressing and post-operative aftercare. The prescribing and administration of medications is also within the scope of normal dental practice in one form or another. Dental professionals with further training especially in intravenous sedation would have an advantage and be an asset in terms of airway management and placement of intravenous lines. Ideally, large

bore intravenous access should be established in the trauma patient, but even a single small intravenous catheter is better than no intravenous access at all.

In the aftermath of the London bombings in July 2005, the Royal London Hospital received 208 casualties within a period of four hours. All senior consultants were mobilised in response to this mass casualty scenario and included oral and maxillofacial surgeons. During the next 48 hours, the oral and maxillofacial surgery service treated 22 patients with injuries ranging from facial lacerations to pan-facial fractures and burns¹⁰. The surgeons were also involved with other multidisciplinary surgery requiring specific oro-facial expertise. Although oral and maxillofacial surgeons (particularly those in the UK) tend to be dually qualified, dentally qualified oral and maxillofacial surgeons (such as those in the US) are equally adept at trauma surgery. It is conceivable that the general dental practitioner could fulfil a significant part of these surgical functions when no specialist care is available.

Forensic Odontology

This is an obvious area that is truly unique to dentistry. New Zealand is fortunate to have expertise in this area thanks to a small number of individual practitioners throughout the country. Teams of forensic dentists from New Zealand were involved with identification of remains in Bandeh Aceh, Indonesia following the Boxing Day tsunami in 2004. Successful identification of victims using dental examination and forensic records depends on the ante-mortem data available. It is imperative therefore, that general dental practitioners keep accurate and up to date dental records for their patients, including clinical notes, operative procedures and radiographs. Inconsistencies in ante-mortem dental records such as incomplete data entry, non-standardised charting systems for identification of teeth (such as FDI notation versus North American "universal" notation) and fraudulent entries add to an already difficult task identifying the remains of victims, which may be badly deteriorated, co-mingled or fragmented¹¹⁻¹³. In the circumstances of a missing or deceased person, permission cannot be directly obtained to use their dental records, therefore permission should be requested from the next of kin. When asked to supply dental records for forensic identification purposes, original records including notes, radiographs, photographs, study models and any description of abnormalities such as unusually shaped teeth, diastemas or malocclusions should be provided by the dentist¹⁴.

Points to consider

As with any role of responsibility there are always caveats and areas that should be addressed in keeping with safe clinical and professional practice. In an

ideal world, those willing to sacrifice life and limb to the aid of others during an emergency or life-saving situation should be lauded and praised. However in some countries, particularly those practising vigorous litigation, clinicians may find themselves at risk when working outside their scope of practice, even in an emergency situation. The threat of litigation is so powerful in some countries that State law has had to be modified to allow for this contingency, an example being the Illinois Public Act 49-409, which specifically allows expanded scope of dental practice in times of emergency⁹ and proposed amendments to the California State Law¹⁵.

The principle that tools are only as useful as the hands that wield them would be very appropriate in this discussion. As dental practitioners there is much that can be offered, but there is still a limit to what can and cannot be performed due to training and experience, and to a lesser degree, personality and attitude. The expectation is not for the dental practitioner to suddenly become a world-class trauma surgeon, but rather provide a level of general medical care beyond that expected of a lay person. The challenge therefore is to consolidate existing skills and perform them well and to develop and extend capabilities by further training, which does not need to be to a specialist level. Advanced life support courses run by local emergency medical services help facilitate further training and professional development and would "up-skill" the general dental practitioner to a level where they can be regarded by other allied health professionals as important and vital members of the EMS team. The Dental Council of New Zealand requires all practicing dentists to hold the New Zealand Resuscitation Council Level 4 certificate, which includes the use of an automated external defibrillator. However, more advanced trauma training is not mandatory and it is up to the individual dentist to seek further training and often at their own expense. Perhaps if District Health Boards that employ dentists would consider financial support to attend courses such as the Early Management of Severe Trauma (EMST) course run by the Royal Australasian College of Surgeons, the number of dentists that could be more fully utilised in a mass casualty scenario would increase.

Further airway management and general medic training may also be valuable to dentists serving in the New Zealand Defence Force, although currently there are no foreseeable plans to expand the duties of dentists serving in the NZ military.

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