Involvement of health care providers in chemical, biological, radiological and other hazardous material incidents

Don Hodkinson provides an overview of hazardous material response and outlines special considerations for health care workers in these emergency situations

Abstract

This paper aims to address the issues faced by health care providers when confronted by a chemical, biological, radiological (CBR) incident, or other hazardous material (HAZMAT) incident. A CBR incident, in reality, is nothing other than a specific type of hazardous material event. However it is not without its own unique challenges. The field of CBR incident response is an extremely complex one consisting of many problems, both obvious and subtle. It is a field of expertise that is infrequently needed and therefore rarely tested to verify accuracy and efficacy. It is for this very reason that the inherent problems posed by this complex issue are able to elude those with insufficient training, poor comprehension of relevant issues and most importantly, any actual practical experience operating in these hostile environments. It is paramount that all personnel involved in CBR/HAZMAT incident response be fully conversant with each other's roles and responsibilities, if potentially costly and dangerous mishaps are to be avoided.

Introduction

Hazardous materials are substances or materials, in any quantity or form, which pose an unreasonable risk to the health and safety of people and property. There are a number of types of hazardous materials such as explosives, compressed gasses, flammables, oxidisers, corrosive material and radioactive material. This article will primarily focus on:

a. **Chemical** – these may range from simple everyday industrial chemicals such as chlorine, ammonia, sulphuric acid and hydrochloric acid, through to chemical weapons such as nerve agents, blister agents, blood poisoning (cell toxicants) agents, and lung damaging (choking) agents (Topfer 1998).

b. **Biological** – these can be bacteria (causing anthrax, plague), virus (ebola, marburg, smallpox), rickettsia (causing Q fever, typhus), toxins (botulinum, Staphylococcus enterotoxin B) and cytotoxins (ricin, tricothecene mycotoxins) (Topfer 1998; Sidell, Patrick & Dashiell 1998).

c. **Radiological** – there are essentially two types of radiation. Non-ionising radiation, which has enough energy to move atoms in a molecule around but not change them chemically; and ionising radiation, which has enough energy to actually break chemical bonds leading to DNA changes. Of these two, ionising radiation is of particular concern, consisting of alpha particles, beta particles, gamma rays and x-rays (USA – EPA).

It is imperative that health care providers responding to chemical, biological, radiological and other hazardous material incidents are fully conversant with their responsibilities and actions in these environments. The role of the health care provider must be clear and well defined. Goals and expectations must be achievable, especially given the limitations placed on them by both the environment they are working in and the personal protective equipment (PPE) they are required to wear. Appropriate and workable policies and procedures must be in place. Suitably trained and practiced health care providers must be available to participate in these events if and when they arise.

The threat

Despite the "Convention on the Prohibition of the Development, Production, Stockpiling and use of Chemical Weapons and on their Destruction" (Chemical Weapons Convention for short) of 1997, the 1972 Biological Weapons Convention (Australia is a signatory to both), and the various nuclear disarmament treaties, incidents occurring from the use of weapons of 'mass destruction' continue to remain a threat.

In Japan between 1994 and 1995, the *Aum Supreme Truth Cult* used chemical weapons on a number of occasions, resulting in the deaths of dozens of people and seriously injuring hundreds of others.

Evidence points to this Sect developing and testing the efficacy of these chemicals on a property in Western Australia some years earlier. Evidence also suggests that the Sect was heavily involved in developing both biological and nuclear weapons (Kaplan & Marshall 1996).

More recently, following the terrorist attacks on the World Trade Centre and the Pentagon in 2001, biological agents (specifically Bacillus anthracis) were used. This biological agent along with other imitation products has been disseminated on a number of occasions around the world, including within several Australian States. It is widely believed that there are still several countries that continue to develop and stockpile both biological and chemical weapons. Much discussion has also taken place, as recently as January 2005, regarding the so-called 'dirty nuclear bomb', its development and potential use by terrorist organisations.

Apart from the use of these weapons of 'mass destruction' by terrorist organisations and some individual countries, one should not forget about the occurrence of industrial accidents, which may release these chemicals, their precursors, or other hazardous materials into the environment. Accidents have occurred at chemical, biological, nuclear and other industrial facilities on a number of occasions including Sverdlovsk, former Soviet Union 1979 (Alibek 1999); Three Mile Island, USA 1979; Bhopal, India 1984; Chernobyl, Ukraine 1986; Coode Island, Melbourne 1991; Esso Longford, Melbourne 1998 and the recent rail accidents in Neyshabur, Iran and Ryongchon, North Korea. Unfortunately, incidents such as these still continue to occur.

The events of September 11 2001 and the terrorist activities following have raised the profile of CBR and drawn attention to the increased risk of CBR and other related hazardous material incidents. With this in mind, authorities Australia-wide have reacted to ensure that their response to these events, should they occur in their regions, are well prepared for. However, in undertaking this preparedness it is imperative that relevant authorities consider a wide variety of scenarios. They should conduct objective practical trials to prove the worth and efficacy of their response programs and act diligently to address identified shortfalls.

Detection and monitoring

The most important aspect of any good response team is being able to recognise or detect that a hazardous agent has been released into the atmosphere. Detection can be performed by any number of methods ranging from simply smelling odours through to the use of highly technical, hazard specific equipment. Obviously smelling odours is not a safe or acceptable method for the detection of toxicants in an environment. It is mandatory to use appropriate detection equipment in any suspected toxic environment (Raza 1998). Suitably trained and qualified personnel must undertake this task.

Detection and monitoring is conducted to establish the nature and concentration of the toxicant present, the results of which, along with other considerations dictates:

- the types and level of PPE required;
- allows permissible exposure limits to be set; and
- assists in determining the safe working boundaries.

Biological and radiological materials are not so easily detected or monitored. It is imperative that hazardous material exposure be kept in mind as a differential diagnosis in any 'mass casualty' incident where many people present with a similar clinical picture, provides a first indicator that a hazardous incident has occurred. The best way to achieve this is to ensure that health care providers take a thorough and concise history from all casualties. This history may reveal such things as similar time of onset of symptoms between casualties, same route to work, same office building or work-site (Jagminus & Erdman 2001).

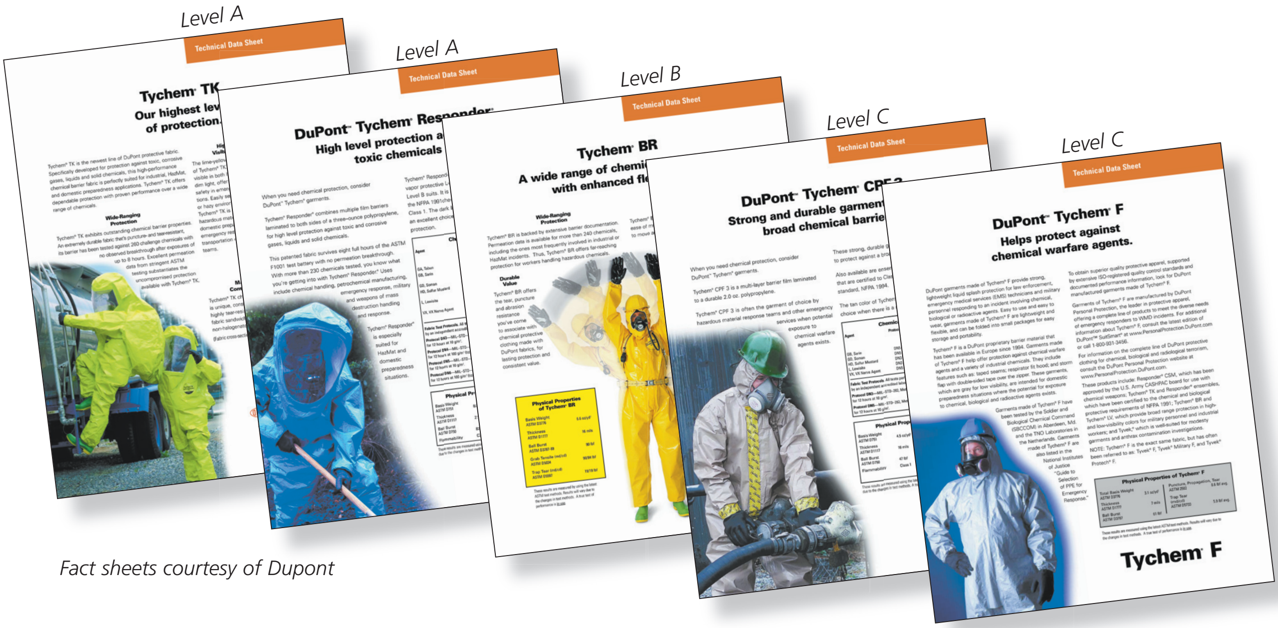
Personal protective equipment (PPE)

Personal protective equipment refers to the equipment used to protect personnel from a hazardous substance. This equipment includes respiratory equipment, various types of suits, garments, gowns, gloves, boots and over-boots. The type of PPE required depends on the type of incident, be it chemical, biological or radiological. It also depends on the method of dispersal of this substance (droplet, aerosol, vapour), the mode of entry into the body (inhalation, dermal absorption or ingestion), and the concentration of the hazardous agent in the atmosphere, which may lead to immediate danger to life and health (IDLH) environments.

There are numerous methods used to describe the levels and types of PPE ensembles. These definitions vary between countries, organisations, military and civilian institutions. The United States Occupational Safety and Health Administration (OSHA) and US, EPA regulations classify PPE as follows:

Level A – consists of Self Contained Breathing Apparatus (SCBA) or Supplied Air Respirator (SAR) with escape cylinder in combination with a fully encapsulating chemical protective suit capable of maintaining a positive air pressure. It includes both outer and inner chemical resistant gloves, chemical resistant steel-capped boots and two-way radio communications. This level affords the highest level of protection for skin, eyes and the respiratory system.

Level B – consists of either SCBA or SAR respiratory system, with hooded chemical resistant clothing, inner and outer chemical resistant gloves, chemical



Fact sheets courtesy of Dupont

resistant steel-capped boots and other items as deemed necessary. This does not include a positive pressure suit. This ensemble is worn when the type and concentration of the hazardous substance has been identified and has been determined that the hazard requires a high level of respiratory protection, but a lesser level of skin protection. This level of protection is generally suitable for personnel working in the Warm Zone, performing patient care and decontamination.

Level C – The dermal protection is the same as that worn in Level B, however respiratory protection is less. A full or half-face Powered Air-Purifying Respirator (PAPR) or Air-Purifying Respirator (APR) is worn. This level should be used when the hazardous substance has been identified, the concentrations measured and a determination made that this type of respirator is deemed appropriate to remove the contaminants. Level C is much easier to work in as it negates the use of the SCBA. Furthermore, the heat load is less, leading to lower incidents of heat stress.

Potential limitations of PPE

Health care providers must be aware that they have a number of limitations placed on them while working in the Warm Zone wearing PPE. These limitations severely impact on the medical care they are able to provide. They must work without compromising their own safety. There are examples of health care providers (and other rescue personnel) becoming casualties through either errors in judgement, poor training, poor discipline, heroics or just plain foolhardy actions. To this end, health care providers and rescue personnel must ensure they are wearing the appropriate PPE prior to entering a hazardous site, and the seal of both their respirator and protective clothing is never breached for any reason, until fully decontaminated.

Detection/monitoring for contamination at Hotline using AP2C monitor

There are a number of constraints placed on an individual when wearing PPE (Arnold & Lavonas 2001). These include:

Decreases dexterity and tactile senses – motor skills in general are restricted, with fine motor skills near impossible to perform accurately (i.e. inserting an intravenous cannula, taking a pulse or blood pressure).

Increased weight and decreased mobility – moving around in general is more difficult when dressed in full PPE, appreciably more so if SCBA is also worn.

Detection/monitoring personnel for contamination at decontamination line, using chemical agent monitor (CAM) and AP2C monitor. Chemical decontaminant in the background

Impairs vision – visual fields are significantly decreased. Simple tasks such as looking for chest expansion or moving around obstacles is more difficult.

Impairs hearing – hoods that cover head and ears lead to difficulty in hearing, which is exacerbated when fully encapsulated suits are worn. The noise associated with SCBA air supplies or even when breathing through simple High Efficiency Particulate Air (HEPA) filters detracts from other audible sounds (i.e. listening for patient breathing with the ear only is compromised and using stethoscopes is impossible).

Places a greater burden of heat stress on the wearer – the materials that PPE are made from are either permeable (double thickness charcoal impregnated suits), or impermeable (made from impervious materials which for obvious reasons do not breath readily) thus increasing the heat stress experienced by the wearer. Other issues like workload with large numbers of casualties, the stress of working in the hazardous environment, and inability to replace fluids as frequently as usual add to and complicate the issue of heat stress.

Psychological stress (especially encapsulated suits) – may lead to claustrophobia on behalf of the wearer, unless properly trained and practiced in wearing the equipment. Claustrophobia may be a personal trait, which no amount of training can mitigate. This will not be recognised until too late if prior training and experience in wearing these suits has not occurred. Simple everyday jobs become much more difficult with more complex jobs near impossible to perform. Furthermore, casualties may experience a degree of psychological stress seeing people moving around wearing these suits.

Limited oxygen availability – Self Contained Breathing Apparatus (SCBA) contains a specific quantity of air, the exact amount depending upon the type of system being used. A typical SCBA has a working duration of between 20–50 minutes depending on the capacity and number of cylinders being used, the type of work performed and the fitness of the wearer. Personnel operating in SCBA must also be aware that they need to have sufficient air remaining in their tanks to allow them enough time to pass through the decontamination process. This process will vary depending on the contaminant, concentration, number of people involved and decontamination procedures. It is imperative that there are personnel designated to monitor each person wearing SCBA.

Communicating with others – full-face respirators and fully encapsulating suits hinder communication appreciably. Tasks such as obtaining patient history and eliciting patient complaints can be significantly compromised.

Potential hazards associated with PPE

Wearing PPE does not come without its own unique hazards (Arnold & Lavonas 2001; Dubey 1998). These include:

Penetration – a process where the chemical flows through openings, seams, holes or voids in the protective suit. Positive pressure suits reduce the risk of penetration.

Permeation – implies that the hazardous gases or liquids diffuse through, on a molecular level, the pores of the material (protective barriers). Permeation depends on the properties of the garment and the concentration of the chemical. Permeation is measured in "breakthrough time" (BTT).

Permeable PPE ensemble with M40 Air Purifying Respirator

Note: heavy-duty butyl rubber gloves, and continuous air sampling pump/absorption tube.

Detection/monitoring for contamination at "Hot line", using Chemical Agent Monitor (CAM)

Incorrect use – all PPE must fit correctly and wearer confidence must be obtained prior to the use of this equipment in any hazardous environment. Masks should be tested using quantitative fit testing (i.e. M41 Protection Assessment Test Instrument), as opposed to qualitative fit testing (i.e. Isoamyl Acetate or CS gas). It should be noted that mask fit factors will deteriorate significantly with as little as a day old beard stubble (Ivarsson, Nilsson & Santesson 1992). Non-powered Air Purifying Respirators provide little protection to personnel who have full beards. Positive pressure respirators provide the best level of protection to workers in hazardous chemical environments, but not without their associated limitations.

Degradation – over a period of time contact and concentration of hazardous chemical degradation can occur, which modifies the structural characteristics of the PPE, thus allowing penetration and permeation to occur.

Contamination – individuals, when removing their PPE may inadvertently contaminate their underlying skin from contaminant remaining on the outside of their suits (cross contamination) if not thoroughly decontaminated prior to their removal or if the removal process is not correctly performed.

The site boundaries

There are a number of ways chemical hazard boundaries are described. These are:

- Black and White areas;
- Dirty and Clean sides—with the hotline being the dividing line;
- Exclusion, Contamination reduction and Support zones; and
- Hot, Warm and Cold zones.

In this article I concentrate on the later – Hot Zone, Warm Zone and Cold Zone.

The precise ways decontamination sites are established are vast and varied with each individual organisation choosing a specific layout that meets its specific requirements. The intricacies related to the exact layout of decontamination sites are not discussed in this article. This is usually not the responsibility of the health care provider, but rather—in most instances, that of the fire department.

The guiding principle and cardinal rule of operating in hazardous environments must not be disputed and that is: *"expose the absolute minimum number of personnel to the minimum quantity of hazardous agent, for the absolute minimum period of time"* (Dubey 1998).

The hazardous materials (HAZMAT) plan describes a three-tier system of setting out boundaries adjacent to the incident site (Sidell, Patrick & Dashiell 1998).

Hot Zone – this area extends for about 100 metres upwind/uphill of the incident and 1,000 metres downwind/downhill of the incident (distances quoted are variable, and dependant upon many criteria). Only rescue and explosive ordnance demolition (EOD) personnel should enter this zone. Medical personnel should *never* enter this zone. Training or directing medical personnel to enter this area is inappropriate, as toxic/hazardous environments are not the place to be attempting to provide any level of medical care. It is crucial that casualties be evacuated by appropriately trained rescue personnel from the Hot Zone back to the Warm Zone, where medical care can be provided in a more suitable and safer environment. By doing this, the risk of further exposure to the casualty and chance of injury to both the rescuer and health care provider is greatly reduced.

All equipment and vehicles are considered contaminated once in this zone. Entry to and exit from this area is through specific entry/exit points which are strictly monitored. All personnel entering this area wear full PPE appropriate to the incident or hazard. Level A ensemble should be initially instigated and may be modified once the results of detection and monitoring are known.

Warm Zone – this area extends upwind from the Hot Zone for a distance of 5–20 metres depending on numbers of personnel working in the area and the number of expected casualties. Rescue, decontamination team members and medical first response/triage personnel staff this area. All personnel wear full PPE appropriate to the hazard—usually Level B or C ensemble. Entry and exit is via designated entry control points.

Initial triage of casualties takes place in this area. Casualties are sent to either the **immediate care area** for life/limb threatening injuries, the **delayed care area** for stable but non-ambulatory conditions, and the **ambulatory care area** for ambulatory patients. The issue of contamination and the fact that health care providers are wearing PPE significantly impedes the level of medical care they are able to provide in this zone. This level of care may be considered as being relatively rudimentary. Usually treatment consists of nothing more than that which is absolutely necessary to enable the casualty to survive through the decontamination process and out into the Cold Zone i.e. immediate life saving measures appropriate to the cause of the injury/contamination such as simple first aid procedures, antidote treatment for poisoning by nerve agents—autoinjectors, nitrates for cyanide poisoning, airway control via atropinisation/suction, and oxygen therapy/ventilation.

During the decontamination process all dressings and medical materials must be changed for non-contaminated materials, prior to the casualty entering the Cold Zone. No contaminated dressings, materials or clothing is to enter the Cold Zone. Furthermore, it must be realised that all equipment, including medical equipment i.e. cardiac monitors/defibrillators, resuscitators, and trauma kits which is taken into the Warm Zone is considered contaminated and therefore must be decontaminated prior to being removed from the zone. If this cannot be accomplished, then it will need to be destroyed appropriately.

Cold Zone – this is upwind/uphill from the Warm Zone. Casualties enter from the Warm Zone via appropriately designated and marked entry points having first been fully decontaminated. Cold triage is set up in this area. Here casualties are further triaged and sent for appropriate treatment. Patient treatment areas can also be set up in this area or casualties can be transported to higher levels of care as deemed necessary. All personnel working in this area have PPE at the ready in case of a sudden wind shift in their direction.

Experience has shown that a great number of casualties will leave the immediate vicinity of the incident before response teams arrive and set up zones, as was the case following the Tokyo subway nerve agent incident (Arnold & Lavonas 2001). It is sound practice that extra decontamination, crowd control and triage teams be available to respond to nearby hospitals (Sidell, Patrick & Dashiell 1998).

Decontamination

Ideally, the first step in decontamination involves determining the exact causal agent—is it chemical, biological, radiological or other hazardous substance? In reality, this process may take a considerable period of time therefore the relatively simple decontamination methods such as physical removal may initially prove satisfactory. However, once the causal contaminate has been identified, more complex methods such as chemical decontamination can be instigated.

Decontamination is a specialist field; one outside the boundaries of this article, therefore the specific principles and practices of decontamination will not be discussed in any great detail. Generally decontamination involves either:

a) Physical removal of the hazardous agent via means such as dilution and washing with water/soap, evaporation, adsorption, and scraping. These physical methods are not without their restrictions and precautions. Some chemicals hydrolyse quite slowly in water (e.g. drops of sulphur mustard) while the hydrolysis products of other chemicals, such as lewisite or V-nerve agents may remain as toxic as the original chemicals (Decontamination article OPCW 1997). This in part explains why it is important that all wastewater be collected, decontaminated and disposed of appropriately.

b) Chemical decontamination occurs due to a chemical reaction that neutralises the hazardous agent. Chemical decontamination is considered more effective and reliable than physical removal of the agent, however it is technically more difficult as specific compounds are required to neutralise specific toxic agents (Raza 1998). Only specially trained personnel should undertake chemical decontamination.

Decontamination must be performed judiciously, in a manner which ensures that all contaminant is removed/neutralised from both the casualty's clothing and responder's PPE, as this prevents the likelihood of any contaminant being transferred to the clean underlying bare skin during the removal of these garments prior to entering the Cold Zone.

Casualty decontamination deserves brief discussion. Generally speaking, ambulatory casualties are decontaminated in the same manner as any other individuals being removed from the contamination site. Stretcher patients on the other hand present a different situation. Decontaminating stretcher patients takes more time, personnel, and resources (Sidell, Patrick & Dashiell 1998). The process is more complicated, involves more steps and requires a logical flow pattern. It is therefore important, given that a significant number of casualties will most probably present as non-ambulatory, that this skill be well practiced and rehearsed prior to the event if it is to be performed competently.

Decontamination tasks are not usually the role of the health care provider, but rather, the fire fighter or other suitably trained personnel. However, health care providers may find themselves assisting casualties through the process.

Medical considerations

Health care providers should be prepared to deal with a wide spectrum of casualties, including victims with thermal burns, multiple trauma, acute myocardial ischaemia or infarction, acute bronchospasm, heat induced illness, dermatoses, musculoskeletal complaints, soft tissue injuries, embedded foreign bodies and lacerations. This is an incomplete list but it demonstrates the spectrum of injuries or illness that may arise during a chemical, biological, radiological or hazardous material incident. The challenge associated with the release of an agent resulting from these events is not so much in treating the effects of the single agent, but more so with the overlay of the agent onto the normal spectrum of injuries or illness. This may produce some challenging diagnostic and treatment problems that include:

- Casualty suffering heat exhaustion with hypovolaemia and tachycardia, who requires atropine for treatment of nerve agent vapour exposure;
- The apnoeic cyanide casualty who requires immediate antidote therapy, but who has not yet made it through to the Warm Zone;
- Multiple trauma victim with an embedded foreign body from munition fragmentation, who was responding to a known liquid contaminated environment of sulphur mustard, but has not yet developed symptoms of exposure;
- The burn victim who requires vigorous fluid resuscitation, but has received an overwhelming vapour exposure to phosgene, with incipient pulmonary oedema.

With appropriate planning, training, co-ordination and preparation circumstances such as those described can be handled in an organised, efficient manner.

Triage – *provide the greatest good to the greatest number of victims, given limited health care resources.* Health care providers acquire significant expertise in sorting conventional medical/surgical casualties. This expertise is gained through training and then routinely practiced during the course of their normal daily work when prioritising casualties/patients. It is further practiced when dealing with victims of accidents or natural disasters – road traffic accidents, fires, floods and earthquakes. However, these same personnel may have very little expertise in triaging casualties resulting from chemical, biological, radiological or other hazardous material incidents.

To effectively determine which casualties must receive immediate care and which can wait without compromising their condition, a triage officer must be familiar with the clinical presentation and the natural progression of illness and injuries. Knowing the signs and symptoms of CBR/HAZMAT agent exposure will permit the appropriate decisions to be made concerning the urgency of treatment. There may be a requirement for rendering lifesaving treatment during triage. By necessity, this will be limited to a few minutes of time at the most and address only the airway, breathing and circulation = ABC's in primary survey of advanced trauma life support.

A common observation made in the aftermath of hazardous material accident response is that the health care providers have in most instances been inadequately trained to deal with the types of hazardous material exposures that occurred. Continuing medical education should be provided on a periodic basis to address CBR/HAZMAT toxicity, signs and symptoms of exposure, triage of mixed conventional and CBR/HAZMAT casualties, initial diagnosis and treatment and protective measures (Science Applications International Corporation 1998).

Conclusion

As the name implies and by their very nature chemical, biological, radiological and other hazardous material incidents are serious events, events that will most probably result in casualties, many of who may die. It is therefore imperative that rescue and other response personnel take all reasonable precautions to ensure they do not become casualties. The guiding principal and cardinal rule of operating in a hazardous environment: *'expose the absolute minimum number of personnel, to the minimum quantity of hazardous agent, for the absolute minimum period of time'* (Dubey 1998) must be strictly adhered to.

It must be understood and accepted that health care providers have no role in the Hot Zone, for this hazardous environment is not the place to be attempting to provide any level of medical care. It is crucial that casualties be evacuated by appropriately trained rescuer personnel from the Hot Zone back to the Warm Zone. Here medical care is better able to be provided in a more suitable and safer environment. This reduces both the risk of further exposure to the casualty and the chance of injury to either the rescuer or health care provider.

The primary role of the health care provider in a CBR/HAZMAT scene consists of:

a) Operating in the Warm Zone where they will provide through rapid triage to determine priorities for treatment, decontamination and evacuation so that casualties pass through the process in a suitable time frame. This enables them to reach definitive—higher level medical care at the earliest opportunity. Due to the complexities of working in Level B or Level C PPE, performing anything other than the most basic life support measures in the Warm Zone can prove quite difficult and pose exceptional challenges.

b) Operating in the Cold Zone where they will provide casualties, once decontaminated, with immediate on scene higher-level pre-hospital medical care and arrange transport to the most suitable receiving hospital/facility.

Training health care providers to operate in CBR/HAZMAT environments is an extremely important issue; one that may seem relatively straight forward. However, in reality this is quite complex. This article provides a broad overview of preparation and approach to such incidents however the specific medical management of casualties suffering from any of the numerous conditions resulting from exposure to a CBR/HAZMAT incident has not been encapsulated. This is an entirely separate issue. Health care providers must be well trained and competent in the individual clinical management of a variety of casualties including casualties suffering trauma caused through conventional means, casualties suffering from CBR/HAZMAT related conditions, casualties suffering from psychological conditions, casualties suffering from physiological (heat etc.) conditions or casualties suffering from a combination of any of these four.

Organisations responsible for providing the health care personnel who are expected to enter these environments are ultimately responsible for ensuring these personnel receive comprehensive training relevant to their role and actions within the CBR/HAZMAT environment. Furthermore, they have a duty to ensure that re-accreditation training is forthcoming, to guarantee currency and competency. Just as 'flight crews/paramedics require frequent re-certification of their skills, so too does the CBR/HAZMAT health care responder for these environments are unique environments, both hostile and unforgiving.

If it is considered pertinent to train health care providers in the techniques required for entering and operating in contaminated CBR/HAZMAT environments then a prudent suggestion would be that a select number of medical personnel be trained in hazardous environment response, and for these individuals to become an integral part of the local authority HAZMAT response team. As part of this team these personnel would train, 'cross-train' and re-accredit in accordance with local policy and safety requirements. Furthermore, whenever the HAZMAT team is summonsed to an incident, these health care providers would also respond as an essential part of this cohesive unit.

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A health perspective in a counter-terrorist environment

This information was provided by the Australian Government Department of Health and Ageing, April 2005

Introduction

Australia has a robust, world-class health care system. However, the number of people injured and in need of urgent medical treatment from a terrorist attack could stretch the capacity of any health system in the world. The Australian and State/Territory Governments, have committed millions of dollars and substantial resources to ensure effective plans are in place and that health agencies are prepared to respond to the health consequences of a terrorist incident.

Australia has taken an all-hazards approach in planning a health response to a terrorist attack or naturally occurring disaster. The hosting of the Sydney 2000 Olympic Games strengthened Australia's health response planning compared to many other countries in the region. Following the Games, a much greater focus to counter-terrorism planning came after the events of September 11, 2001, and that emphasis is continuing in the present day. Since 2003 the Australian Government has provided more than $170 million on specific health counter-terrorism measures.

Response responsibility

In the federal system, the constitutional responsibility for the front-line emergency response to terrorism rests with individual State and Territory Governments. States and Territories run the hospital systems and are responsible for treatment of injured citizens. All State and Territory health authorities in Australia have health disaster plans in place to co-ordinate health facilities in their jurisdictions in response to mass casualty situations. These plans are well established and rehearsed and are co-ordinated with other emergency services within the jurisdiction.

The Australian Government recognises that nationally we must also have a capacity to respond, provide national leadership and assist States and Territories should a terrorist attack happen in Australia. Individual jurisdictions are supported by a close collaborative network of health departments across the nation and in the Australian Government. The Australian Government has specialist capabilities, with the Federal Health Department and the Department of Defence, which can be made available to States and Territories should an incident occur. Australia's health network ensures that if the consequences of a bioterrorist event are beyond the capacity of an individual jurisdiction, a rapid national multi-agency response is possible. The Australian Health Disaster Management Policy Committee (AHDMPC) is pivotal in providing a national health response.

Australian Health Ministers' Advisory Council

The Australian Health Ministers' Advisory Council established the AHDMPC in February 2003. The AHDMPC's membership includes the Australian Chief Medical Officer, senior officials from each State and Territory health jurisdiction and experts in public health, mental health, surgery and emergency and disaster management. The Australian Defence Force, Emergency Management Australia and a senior health officer from New Zealand are also members of the Committee. The Committee is chaired by the

Exercise Canister *2005 Initial FESA decontamination point for walking wounded*

Deputy Secretary of the Department of Health and Ageing.

The main purpose of this high level committee is to identify Australia's level of preparedness to respond to the consequences of a terrorist or naturally occurring disaster and to co-ordinate a national response in the event of mass casualties or outbreak of disease. The AHDMPC provides a forum to assess the national capability, identify gaps and advise on a strategic national approach for the development of policy and operational plans. While the AHDMPC is fully cognisant of the need to provide a response to a terrorist threat, broader planning is undertaken using an all-hazards approach with consultation with clinicians and other experts. The Committee has succeeded in strengthening collaboration in both planning and response across jurisdictions.

To further enhance the committee's planning work, AHDMPC and the Department of Health and Ageing convened a Clinical Stakeholder Forum in May 2004. Clinicians with expertise in areas of intensive care, trauma surgery, anaesthesia, burns, thoracic medicine, infectious diseases, pharmacology, pain management and disaster medicine attended the forum and discussed issues associated with health disaster management. The outcomes from the Forum led to the formation of a national Clinical Advisory Group that is chaired by the Australian Chief Medical Officer.

One of the earliest tasks undertaken by the AHDMPC was a comprehensive assessment of Australia's national health assets to respond to the consequences of a terrorist incident resulting in mass casualties. This was the first time an audit of Australia's overall emergency medical capacity had been undertaken. This work identified that the factors that could limit a health response in Australia are similar to those identified by other countries and include workforce issues, the efficient use

Preparing for an emergency response

March 2005 – FESA WA successfully conducted its biggest ever multi-agency training exercise at the Perth Convention Centre. The exercise, named *Exercise Canister,* involved approximately 400 personnel from FESA Fire Services, the WA Police Service, St John Ambulance, the WA Chemistry Centre and the Department of Environment, working together in a biological contaminant scenario.

Volunteers from the State Emergency Service and Emergency Service Cadets acted as casualties, suffering a range of 'symptoms' after being exposed to an unidentified gas from a canister located in one of the theatres of the Convention Centre.

FESA WA CBR Responder suited up for Exercise Canister *2005*

Exercise Canister *2005 Decontamination Sector Commander and team.*

of medical resources, provision of emergency supplies and transport arrangements in a hostile environment. The assessment has been vital for the AHDMPC to provide accurate and practical advice on national capacity to ensure adequate resources are in place to support a response to a terrorist attack. The national capacity assessment will be repeated during 2005.

The activities of the AHDMPC are currently focused on confirming and providing nationally co-ordinated actions to address issues identified in the audit, particularly those associated with workforce. A working party is now identifying ways of providing surge capacity in the workforce and sustaining a response. This involves promoting disaster medicine training and education opportunities in health training facilities. Since the Asian tsunami disaster, consideration has also been given to the best ways to establish teams of qualified volunteers that can respond to a health emergency either within Australia or overseas.

Australia's capacity to respond effectively

A terrorist attack that involves chemical, biological or radiological materials can have devastating physical and psychological health consequences, which would require specialist healthcare. The Australian Government with States and Territories are ensuring that Australia has appropriate guidelines and treatments available to manage the health consequences of these events with a major focus on biological incidents. An on-going epidemic of an infectious disease poses a considerable threat to the capacity of the health system to respond and, in particular, capacity to provide adequate treatment, decontamination and isolation facilities.

A special sub group of the AHDMPC is examining the psychological consequences of a terrorist or naturally occurring health disaster, to ensure that we have appropriate strategies and plans in place to assist victims both during and in the recovery phase of a disaster.

Following the events of September 11, and the subsequent anthrax mail attacks in the USA, the Australian Government has committed more than $27 million to establish a National Medicines Stockpile. The Stockpile is a national reserve of essential vaccines and specific medications able to be sent to jurisdictions to support the health response to a terrorist event that involves a chemical, biological or radiological agent. The Stockpile is designed to supplement existing medical stocks kept in the Australian hospital system. It also includes specialist medical supplies, such as the nation's stock of smallpox vaccine.

The Australian Government has also taken a leadership role in supporting the jurisdictions by establishing a National Incident Room (NIR). The NIR has proved to be a focal point for co-ordination of AHDMPC, the Communicable Diseases Network of Australia (CDNA), and the Department of Health and Ageing with other agencies during the national response to SARS and avian influenza. Similarly, the NIR would be a focal point for information and advice during a terrorist incident. Through the National Incident Room, the AHDMPC was immediately activated to co-ordinate the national health response to the Asian tsunami disaster in December 2004. The AHDMPC facilitated the formation of civilian medical teams and supplies and established a public health advisory group.

An effective response to a bioterrorist incident depends upon early warning of a potential event. In the 2004 Federal Budget, $10.1 million was provided to develop a comprehensive public health surveillance system to provide real-time disease monitoring information for the purpose of early detection. The system will integrate jurisdictional and national surveillance systems, enhance the involvement of general practitioners in surveillance and use secure communications to improve detection. Early warning is supplemented by confirmation and rapid diagnosis. Enhancements are also underway to strengthen security and capacity of Australia's public health laboratories to test disease agents that may be deliberately released by terrorists.

Protection of critical infrastructure

Security around health infrastructure is also vital to ensure stability of health services. Most health infrastructure is in the public domain, but a few important elements are within the private health system. As a result, the Health Infrastructure Assurance and Advisory Group (HIAAG) was established in November 2003. This Group is developing a national strategy for the protection of private sector owned and operated critical health infrastructure and is also providing communication links with Government and owners and operators of private health infrastructure. The HIAAG has undertaken a project to examine vulnerabilities in critical supply chains for essential medical products that would be required in a health disaster.

Australia has many structures in place to effectively respond to a terrorist threat that impacts on the health of its people. Within these structures national plans have been developed over recent years for health disaster response. These plans include:

- a National Burns Plan;
- Guidelines for the treatment and management of smallpox and anthrax;
- the *Mass Casualty Transport Review*;
- Mental Health Disaster Response plans; and
- the *National Response Plan for Mass Casualty Incidents Involving Australians Overseas* (OSMASSCASPLAN).

No plan is effective without being properly tested in an exercise. The Department of Health and Ageing along with State and Territory health departments are participating in a number of national operational exercises to test responses to a health disaster.

Conclusion

Ensuring that Australia is prepared to respond to the health consequences of a terrorist event is a continuous process of preparation and review to ensure health systems are capable of dealing with a variety of scenarios. The current level of preparedness and awareness is strong and has been tested in responses to the threat of SARS and avian influenza outbreaks and the Asian tsunami disaster. In all of these health threats agencies have debriefed and used the lessons learnt to further strengthen preparedness and capacity to respond to a health emergency.

Australia's preparedness and response for a health disaster from any cause requires close collaboration between the Australian Government and States and Territory health authorities, and integration of health plans into broader emergency plans. Involving clinical and disaster management experts has been critical to the planning process. Since 2003, the AHDMPC has proved to be a useful mechanism to undertake this complex co-ordination.