

guage literature; informal questionnaire survey of first responders in several European countries.

Results: The initial on-scene measures during a HAZMAT response—cordoning off the scene and rescue out of the contaminated area—are done uniformly by fire service responders. In most cases, emergency decontamination of casualties at the scene (disrobing and flushing), is performed by firefighters, however, reliability appears variable. The probability of a coordinated patient handover from fire personnel to emergency medical services (EMS) staff is rated “low” by most sources.

In many countries, specialized casualty decontamination units have been commissioned and are operated by a variety of services: fire, EMS, military and civil protection.

Hospital decontamination facilities are in most countries still the exception and depend mostly on local commitment.

Substantial detection usually invalues only simple measurements performed by the first responders; specialized support is planned to be given mainly by military, civil protection and specialized laboratories.

Conclusions: Initial on-scene response to chemical/radiological incidents is fundamentally similar in most countries. However, distinctive differences beyond the first steps restrict the transferability of organizational solutions.

Keywords: chemical, biological, radioactive, nuclear; chemical substance; contaminated patient; decontamination; detection;

HAZMAT; radioactive substance

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Effect of Physical Exertion in Level-C Chemical and Biological Protective Equipment on Physiological Function

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Introduction: The objective of this study was to assess the effect of 20 minutes of heavy treadmill exertion in military-style, Level-C chemical and biological personal protective equipment (PPE), including a filtering face piece respirator, on physiological variables including venous pH, venous PCO₂, SpO₂ and tympanic temperature.

Methods: Baseline physiological variables were measured in 19 healthy subjects who undertook heavy physical exertion on a treadmill at a constant room temperature of 20°C: (1) once while wearing a short-sleeved t-shirt, shorts, and running shoes; and (2) once while wearing chemical and biological PPE. Repeat measurements of physiological variables were made after 10 and 20 minutes of exertion in both groups.

Results: Twenty minutes of physical exertion was undertaken by healthy subjects wearing chemical and biological PPE resulted in moderate hypoxemia, significantly decreased pH ($p = 0.003$), elevated PCO₂ ($p = 0.018$) and elevated tympanic membrane temperature ($p < 0.001$), compared to baseline values. Despite these significant differences, none of the mean venous blood gas values deviated from the normal range during physical exertion.

Conclusions: The degree and duration of physical exertion undertaken in chemical and biological PPE induced some significant changes in physiological variables compared to control but, with the exception of SpO₂, did not result in changes considered to represent abnormal physiology. However, it is likely that core body temperature was underestimated by tympanic measurement. Blood gas data indicating that CO₂ was retained during exertion in this type of PPE were unanticipated and require further investigation.

Keywords: chemical and biological warfare; emergency medical services; physical exertion; protective clothing

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Comfort Level of Emergency Medical Services Providers in Responding to Weapons of Mass Destruction Events: Impact of Training and Equipment

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Introduction: Emergency medical services (EMS) providers are ill-prepared in the areas of training and equipment for weapons of mass destruction (WMD) events and other public health emergencies.

Methods: A nationally representative sample of the basic and paramedic emergency medical service providers in the United States was surveyed to assess whether they had received training in WMD and/or public health emergencies, as part of their initial provider training and as continuing medical education (CME) within the past 24 months. Providers also were surveyed as to whether their primary EMS agency had the necessary specialty equipment to respond to these specific events.

Results: More than half of EMS providers had some training in WMD response. Hands-on training was associated with EMS provider comfort in responding to chemical, biological and radiological events and public health emergencies (OR = 3.2; 95% CI = 3.1–3.3). Only a small portion (18.1%) of providers surveyed indicated that their agencies had the necessary equipment to respond to a WMD event. The comfort level and having equipment to respond to these incidents was not as highly associated as the comfort level and having had training to respond to these incidents.

Conclusions: Lack of training and education as well as the lack of necessary equipment to respond to WMD events is associated with decreased comfort among emergency medical services providers in responding to chemical, biological, and radiological incidents. Better training and access to appropriate equipment may increase provider comfort in responding to these types of incidents.

Keywords: bioterrorism; emergency medical services; equipment; training; weapons of mass destruction

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The New Austrian Plan for Medical Diagnostics and Therapy after Radiation Accidents

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Recently, the plan for Medical Diagnostics and Therapy after Radiation Accidents was developed in Austria as part

of the National Intervention Plan for Radiological Emergencies. After a review of the available open source literature, the plan was developed in cooperation with the involved authorities, mainly based on the recommendations of International Atomic Energy Agency (IAEA), Radiation Protection Commission (Germany), and the British Institute of Radiology (BIR) *Manual on the Acute Radiation Syndrome*.

If a radiation accident cannot safely be handled by the occupational radiation protection system, the concept envisages a multi-step approach based on the hazardous material response of the first responders at the scene (hand-over to emergency medical services (EMS) after gross-decontamination by the fire service). Any patient should be transported to a hospital for further management. Hospitals are divided in the categories “basic”, “regional”, and “central”.

Basic hospitals should not receive patients known to be involved in radiation accidents, but must prepare for self-referred victims and to be able to perform emergency decontamination similar to that done on scene and first diagnostic measures before transferring the patient. In regional hospitals all specialties with knowledge about radiation effects (mainly radiotherapy and nuclear medicine) must form a cooperational network. A Radiation Emergency Management Plan should comprise the preparation of facilities and equipment, alerting procedures, and an emergency telephone number for inquiries. In central hospitals, this cooperational network is augmented by hematological and intensive care competencies in order to provide all measures of diagnostics and therapy. If necessary, the REMPAN-network can be contacted for further assistance.

The described multi-step-approach appears appropriate for Austrian circumstances; however, its practicality still needs to be demonstrated by exercises and experience.

Keywords: Austria; acute radiation syndrome; contaminated patients; decontamination; detection; planning; radiation accidents

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Care of the Chemically Dead: A Tale of Two Bodies

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Introduction: A case of suicide by ingestion of aluminum phosphide in 1998 in Sydney, Australia and a case of suicide by potassium cyanide ingestion in 2003 in Avon, United Kingdom, resulted in cadavers that posed a residual chemical hazard. The difficulties experienced in managing the contaminated body, from the hospital through to burial in Sydney, provided the basis for planning through a response subsequently used to manage the contaminated cadaver in Avon.

Methods: This is a case review of the two incidents from emergency department and fire service records, and video footage of the burial of the cadaver in Sydney.

Discussion: The aluminum phosphide incident in Sydney highlighted the need for the effective handling of chemically contaminated cadavers. This included the safe handling and storage of the body, an effective multi-agency

hazardous materials response at the hospital, and the need for dignified arrangements to be in place from death to burial.

The lessons learned and subsequently, used successfully in Avon, United Kingdom in 2003, included the ready availability of gas-tight, chemical-resistant, body bags, and chemical-resistant personal protective equipment for health service staff.

Conclusions: Planning for the handling of chemically contaminated cadavers ensures a dignified approach to the cadaver and the family of the deceased. Planning for the management of one chemically contaminated body provides a template for managing a multiple fatality chemical incident. Effective, international cross-discipline communication allows lessons identified from incidents to be shared, and subsequently improve response procedures elsewhere.

Keywords: body; cadaver; chemical; contamination; incident management

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Management of Mass Fatalities following a Chemical, Biological, or Radiological Attack

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Contaminated mass fatalities following the release of chemical, biological, or radiological agents pose a potential major health hazard. A United Kingdom government investigation has identified a number of areas of risk. This presentation outlines the findings of the study and describes specific pathways for the management of contaminated and non-contaminated fatalities. Factors determining the choice between cremation and burial are discussed. Effective decontamination remains a neglected area of study for both fatalities and casualties.

Keywords: casualties; chemical, biological, or radiological agents; decontamination; risk factors; United Kingdom

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Poster Presentations—CBRNE

(D36) Effect of Wearing Chemical Protective Equipment on Placement of Airway Devices in a Cadaveric Model

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Background: Medical personnel may be called to provide life-saving techniques while wearing chemical protective equipment (CPE). The effect of placing airway devices while wearing the Joint Services Lightweight Integrated Suit Technology, butyl rubber gloves, and the M-40 protective mask were evaluated.

Methods: Twenty emergency medicine residents placed an endotracheal tube (ETT) using direct laryngoscopy, a laryngeal mask airway (LMA), and King LT airway in four unembalmed cadavers while either wearing CPE or using only standard precautions. Mean differences in time to placement were evaluated using a paired *t*-test.

Results: The difference in the means for the first attempts with and without CPE was 3.8 seconds (95%CI 0.9–6.8, *p* = 0.014).