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Casualty management

Introduction

Management Approach

Precise diagnosis of BW casualties in a NBC environment is likely to be difficult. BW casualties may coexist with conventional, nuclear and/or CW casualties. In that case both casualties and medical personnel may be in full IPE. Signs and symptoms of biological agent infection or intoxication are common to many diseases. Adequate or appropriate laboratory facilities may not be available. The treatment required for BW casualties will not differ in basic principle from that in patients suffering from the same disease incurred by natural means, but the approach to casualty management will need to consider additional factors related to operating in the context of a BA attack. One of these additional factors may be the implementation of Restriction of Movement (ROM).

EMERGENCY MEDICAL TREATMENT (EMT) OF BIOLOGICALLY CONTAMINATED CASUALTIES

Casualty Types

Casualties arising after a BA attack may be suffering from traumatic wounds, the effects of a BW agent or a combination of both. In addition, casualties may be contaminated with CW agent. Management of all these casualties must minimise the risk of cross contamination without significantly compromising the effective treatment of their traumatic wounds or effects from CW and BW agents.

Triage

Triage of arriving casualties is extremely important. A decision must be made whether EMT or decontamination of the casualty requires priority. Airway management and/or control of haemorrhage will usually be more urgent than any decontamination procedures. EMT measures may have to be performed in rapid sequence with decontamination or by simultaneous team actions.

EMT Procedures

When a contaminated casualty has

Fig 1. Burial of infectious casualties.

respiratory difficulty, haemorrhage, or shock, the order of priority for emergency action is as follows:

- Control respiratory failure (provide assisted ventilation) and/or massive haemorrhage; administer CW antidotes as necessary.
- Decontaminate the casualty as necessary.
- Administer additional EMT for shock, wounds, and illnesses so severe that delay may be life or limb threatening.
- Evacuate the casualty as appropriate.

CASUALTY DECONTAMINATION

Decontamination of Exposed Personnel

Primary Contamination. Dermal exposure from a suspected BW attack should be managed by decontamination at the earliest opportunity. In the absence of agent-specific guidance, exposed areas should be cleansed using an appropriately diluted sodium hypochlorite solution (0.5%), with contact time of 10 - 15 minutes, or copious quantities of plain soap and water. Note: hypochlorite solutions should not be used in open body cavity wounds or with brain and spinal cord injuries. Precedence should be given for decontamination of chemical agents. Potentially contaminated clothing should be removed as soon as is practical by protected personnel (that is, in full IPE) in an area away from non-contaminated patients. Following decontamination, the casualty should be protected from further exposure if transported or cared for outside a COLPRO system.

Secondary Contamination. Secondary contamination of medical personnel from clothing or equipment of exposed soldiers may be important. This is particularly worrisome from casualties recently exposed near the dissemination source where high levels of contamination may occur. Since it will be difficult to distinguish those soldiers exposed near the source from those contaminated some distance away, proper physical protection of health care providers or other persons handling exposed personnel should be maintained until decontamination is complete.

TREATMENT

Principles of Treatment

General Supportive Measures. Measures should be taken to lower temperature, relieve pain, maintain spontaneous respiration, and secure intravenous access for the administration of drugs and fluids. Symptomatic treatment and treatment of coexisting injuries should follow established principles.

Isolation Procedures (Barrier Nursing). In the context of BW casualties, adherence to principles of patient isolation is essential to preventing cross-infection with transmissible BA. Separation of non-affected individuals from contaminated victims of BA attack (cohorting; reverse isolation) and implementation of barrier nursing procedures should be initiated as soon as practical after a BW incident.

Antibiotic Therapy. Antibiotics must be offered to all BW casualties, even without a firm diagnosis. Most bacterial, chlamydial, and rickettsial diseases respond to antibiotics. The choice of drug depends on the clinical circumstances, but one broad-spectrum antibiotic should be administered in full therapeutic doses, parenterally if possible, and preferably intravenously, and commenced at the earliest possible level of medical care. The choice of antibiotic will depend upon many factors, including the specific threat or threats, evidence or suspicion of natural antibiotic resistance among strains, and the ease with which drug resistance can be artificially engineered. Where applicable, specific guidelines are included in the chapters on Medical Classification of Potential BW Agents 1,2 & 3.

Antiviral Therapy. The only "broad-spectrum" antiviral drug currently available is Ribavirin. This compound has been a useful adjunct to the treatment of some potential viral threats when they have occurred under natural conditions (Lassa Fever, Crimean-Congo Haemorrhagic Fever, Haemorrhagic Fever with Renal Syndrome). In addition, there is evidence of antiviral activity *in vitro* and *in vivo* against certain other viruses (Influenza, Junin Virus, Rift Valley Fever (RVF) Virus), but little or no activity is seen with other (Filoviruses, Togaviruses) agents. Other antiviral drugs, such as Amantadine, Acyclovir, and Azidothymidine, are restricted in their therapeutic spectrum to single virus families, and thus have little application as non-specific antivirals. Cidofovir and its oral derivatives are now IND for post-exposure prophylaxis and treatment of some viruses (for example, smallpox). Where applicable, specific guidelines are included in Chapter 5.

Antitoxin Therapy. Specific antitoxins are available for certain conditions. Where applicable, specific guidelines are included in Medical Classification of Potential BW Agents 1,2 & 3. No broad-spectrum antitoxins currently exist.

PROTECTION OF HEALTH CARE PERSONNEL

Use of Barrier Techniques

Following decontamination, patients are cared for using standard nursing management techniques including universal infectious disease precautions (barrier nursing). Protection of medical personnel is offered through use of impermeable surgical gowns/oronasal masks/face shields or goggles /surgical gloves and observance of universal (body fluid) precautions/barrier nursing techniques.

Potential Biological Hazards

Significant risk for person-to-person spread may exist for individuals not directly involved in patient care. In particular, materials soiled by patient secretions and excreta, as well as samples for diagnostic laboratory study, must be clearly identified as hazardous and appropriate handling procedures applied. Similarly, invasive medical and surgical procedures pose potential risks. It must be emphasised, however, that not all BA pose a hazard for secondary transmission (See the chapters on Medical Classification of Potential BW Agents 1,2 & 3 for specific concerns). For example, clinical laboratory samples from toxin-exposed subjects can be dealt with routinely. Patients showing signs of pneumonic plague generally should be considered hazardous, as some will disperse plague bacilli by aerosol. Although cutaneous anthrax may result from contact with blood or other body fluids contaminated with vegetative anthrax bacilli, exposure of health care providers to open lesions or blood from anthrax patients does not pose a risk of inhalation anthrax. Bacilli exposed to air, however, will sporulate (after a period of hours). This will pose a subsequent theoretical risk for inhalation anthrax. On the other hand, vegetative forms of plague bacilli may be dangerous, since, under some circumstances, they are known to cause aerosol infections. Therefore, postmortem examinations of victims of transmissible BA should be performed using

barrier techniques, with appropriate consideration given to specific respiratory protection.

HANDLING OF CONTAMINATED REMAINS

General Considerations

The handling of biologically contaminated remains within the medical system is a medical responsibility. However, the disposal of biologically contaminated remains on the battlefield or after removal from the medical system is not a medical responsibility, but medical expertise should be sought.

Fig 2. Decontamination of corpses may be necessary.

Risk Avoidance Procedures

Those charged with the responsibility for handling and disposing of biologically contaminated remains must be cognisant of potential secondary transmission hazards. Corpses should be interred according to current NATO procedures until definitive decontamination measures are implemented. Interment for a period of days permits natural chemical and microbiological decomposition processes to reduce or eliminate any later risk from toxins, viruses, and non spore-forming bacteria. Current evidence indicates that remains contaminated with spore-forming bacteria can be reliably sterilised only by gamma-ray irradiation or by electro-beam. The safety of complete incineration has not yet been elucidated. However, alternative decontamination schemes may be employed which could reduce spore burdens to levels acceptable with regard to later transmission risk.

MASS CASUALTY MANAGEMENT

Basic Care Provisions

There will be significant differences in the methods of providing basic medical care in mass casualty situations. NATO STANAG 2879: 'Principle of Medical Policy in the Management of a Mass Casualty Situation' is a useful reference.

Facilities

If physical facilities have been destroyed by other means of warfare, most civilian casualties will be cared for in the home; military casualties may well be treated by unit medical personnel rather than being moved to a hospital. Unlike a typical mass casualty situation, few of these patients will require surgery. However, the ROM of contagious casualties by necessity would impact the medical estimate. This would have a major influence on the required medical resources in theatre.

Fig 3.Basic infection control is appropriate for must patients.

Equipment

There is likely to be great demand for intensive care facilities including both equipment and qualified personnel but the vast majority of patients will not require surgical procedures. This is especially true of biological toxins where dramatic, acute signs such as respiratory paralysis would necessitate various types of advanced equipment (for instance, mechanical ventilators).

Level of Care

If the BA causes an illness that results in relatively few deaths (for example, Venezuelan Equine Encephalitis, Q Fever), medical care can be effectively provided on the local level. If the disease is one for which specific therapy such as antibiotics is indicated (for example, Tularaemia), instructions for obtaining and administering the drug should be disseminated. With a disease like Yellow Fever, with high mortality and for which no specific therapy is available, instructions for general supportive care that might be provided by non-medical personnel should be disseminated. The level of medical care required can only be precisely defined, and planned for, once the BA has been definitively identified.

Staggered Effect of BA

Although many individuals becoming ill from an attack with a BA would be likely to present for medical evaluation over a short time span, all would not become casualties simultaneously, as they would for example, following saturation bombing or a massive surprise attack with nerve gas. An exception to this pattern might be seen following an attack with a biological toxin.

Effective Duty Period
Personnel potentially exposed to a BA can safely remain operationally active during the incubation period until the initial appearance of clinical signs.

Employment of Physicians
It may be necessary for one physician, with a small number of ancillary personnel, to care for several hundred patients. Information could be disseminated about the normal course of the disease, the specific signs or symptoms of adverse prognostic significance, the situations requiring individual medical attention or advice, and the procedures for obtaining essential medical supplies. This arrangement would allow a limited number of professional personnel to care for the maximum number of patients.

Psychological Considerations
An essential aspect of medical management in such a situation would be to allay panic. This could be done effectively only if everyone in the area (both civilian and military) could be assured that the cause of the illness was known, the course of the disease could be described with reasonable accuracy, and the outcome could be predicted. This type of assurance could be provided only if an accurate aetiological diagnosis can be made shortly after the onset of illness. If this assurance cannot be provided, the psychological response might create greater problems than the disease itself.

PSYCHOLOGICAL EFFECTS

Psychological Impact
The term "biological warfare" may provoke feelings of horror; even if the direct effects of a recognised biological attack were slight, the psychological impact of this invisible, intangible threat could lead to panic, collapse of morale and overwhelming inappropriate demand on medical resource. There may be an accompanying loss of confidence in IPE and medical countermeasures, all of which may have serious repercussions on the military operation.

Effect on Individuals
On the battlefield, there are many psychological pressures on the individual. Command, control, and communications will be made more difficult by the wearing of respirators. The psychological effect of biological attack on the individual and the unit must be considered in a full nuclear, biological, and chemical (NBC) context.

Psychological Operations
Enemy saboteurs may be used as panic mongers for the purpose of spreading rumours of a biological attack. The effectiveness of such psychological operations would depend largely on the mental preparedness of the target populations. For operations in which BW is considered possible, each case of illness on the battlefield could be attributed to a biological attack; even minor symptoms might be interpreted as the initial signs of an artificially produced disease. Control of panic and misinformation thus assumes a significant role.

Countermeasures
An adequate appreciation of the threat, together with the implementation of defensive measures, will help to prevent panic. This can be achieved only by adequate preparation (for example, standard operating procedures) and by training prior to such an attack. Many positive defensive measures can be taken prior to, or in anticipation of, this contingency. Food chains and water sources should be protected. The control of rodents and insects should be a hygiene priority. Available biological detection equipment and decontamination equipment should be fielded. Soldiers must be trained in the proper use and rapid deployment of IPE. Attention to such preparatory measures will increase confidence and enable the BW threat to be met.

Defensive measures should not be limited to the military population. Civilian populations are unlikely to have any form of specialised protective equipment. It is imperative that medical planning include co-ordination between military and civilian medical authorities in order to minimise casualties and prevent panic. As an initial step, such fundamental concepts as protection of food and water supplies, creation of rudimentary COLPRO shelters, and the effectiveness of hygiene and sanitation in an NBC environment might be introduced.