COMPONENTS OF PREPAREDNESS – IMPORTANCE OF DISEASE REPORTING AND EPIDEMIOLOGY CAPACITY

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ABSTRACT

After the 9/11 disaster, not only the US, but also all the nations and all the people of the world realized that the threat of terrorism; chemical, biological, radiological or nuclear (CBRN), is real. With the understanding of the importance of preparing the public health infrastructure to prevent illness and injury, especially from a covered biological terrorism, a much vigorous effort is being made to improve and re-examine core public activities, information and detection systems in all developed countries. Epidemiology reporting system is one of the most effective means of combating CBRN terrorism, particularly with biological type. In this paper, the necessity and requirements for establishing and running of effective disease reporting and epidemiologic investigation systems in developing countries, and the major problems faced will be discussed.

INTRODUCTION

The main learning of the September 11 disaster is that there is no nation or state that is secure or immune from any kind of terrorist action. Not only the USA, but all the nations of the world are vulnerable to terrorist attacks, which could entail the use of chemical, biological, radiological, or nuclear (CBRN) weapons. Today, those weapons of mass destruction (WMD) are readily available to many countries, and WMD are a viable alternative to conventional weapons for most terrorist groups. As long as the conflicts, ignorance, poverty, socio-economical imbalances and political instabilities exist, this seem to continue. Thus, the threat is greater than ever today, with potentially devastating consequences, including enormous number of deaths and widespread diseases, and destruction of public health infrastructure.

Although there is no absolute protection against all possible CBRN agents, “preparedness” is essential to protect and reduce the harm in case of an attack, and the lessons of the past have thought everybody that preparedness by accumulating knowledge, equipment and an efficient “system” is mandatory to combat WMD and terrorism of all kinds.

Biological terrorism differs from any other types of CBRN terrorism in that it would impose particularly heavy demand on the nations’ public healthcare system, and impose stressful burdens. Understanding and quantifying the impact of a bioterrorist attack are essential in developing public health preparedness. With a covert biological agent attack, the most likely first indicator of an event would be an increased number of patients presenting with clinical symptoms caused by the disseminated disease agent. Therefore, health care providers must use epidemiology to detect and respond rapidly to a biological agent attack; understanding of the basic epidemiologic principles of biological agents used as weapons is critical to effectively counter the potentially devastating effects.

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Many diseases caused by weaponized biological agents present with nonspecific clinical features that could be difficult to diagnose and recognize as a biological attack. The disease pattern that develops is an important factor in differentiating between a natural and a terrorist or warfare attack. Although the recognition of and preparation for a biological attack is similar to that for any disease outbreak, the surveillance, response, and other demands on resources would likely be of an unparalleled intensity. A strong public health infrastructure with epidemiologic investigation capability, practical training programs, and preparedness plans are essential to prevent and control disease outbreaks, whether they are naturally occurring or otherwise (1).

Major components of an ideal public health and medical response system may include surveillance, epidemiology, laboratory capability, medical management, training/education and information/communication (2).

SURVEILLANCE

Earlier detection enables earlier recognition of the nature of the incident by epidemiologists and laboratory personnel and in turn, enables a more effective and efficient response. In order to provide this early warning function, a health surveillance system that enables the development of data baselines to establish normal health status, detection of minor changes, and continuous monitoring of health of the population need to be established. Such a system may collect information (unusual cases of illness, number of admissions or visits, animal illness incidents, sick calls, purchases of medications, infectious disease related unusual deaths, etc) from various resources and providers (hospitals, emergency departments, physicians and veterinary offices, pharmacies, schools and employers, etc), then, establishes systems of exchanging and analyzing this information.

EPIDEMIOLOGY

Whereas health surveillance systems provide the awareness or a detection tool, epidemiology serves as an assessment tool used to ascertain the exact nature of a bioterrorist event. Epidemiology/ epidemiologist interprets raw data gathered through surveillance and investigations, and recognizes the importance of the event, determines the source of the outbreak, mode of transmission, extent of exposure and pattern of progress. Based on this information, recommendations are made for the appropriate public health measures needed to contain the outbreak, and treatment.

LABORATORY CAPACITY

Laboratory is another essential tool of the response system to bioterrorism. Physician’s decision and treatment will be based on the detection of agents involved. Capability of testing for antimicrobial sensitivity and determining the effectiveness of available antibiotics and vaccines is also necessary. To organize a laboratory response network, which consists of a series of laboratories of varying capabilities and assisting each other through cooperative rearrangement, is essential for an efficient system of response. Since rapid diagnosis is critical, the existence of adequate number and quality of multilevel laboratories is highly important, whose capabilities should be continuously upgraded and continuous training of technicians should be provided.

MEDICAL MANAGEMENT

Medical response to bioterrorist actions involves triage, prophylaxis, treatment and logistics components, all of which are interrelated and dependent each other. Providing timely and adequate medical management is a challenging task and requires vigorous preparedness with knowledge, equipment and planning and organization.

TRAINING AND EDUCATION

Early recognition of biological attack depends on two critical resources: epidemiological warning system and individual clinical expertise of medical personnel. Therefore, education and training of medical personnel of all categories on the recognition of agents and outbreak, treatment of casualties and self-protection as well as the organization of the whole response system to enable them acting most efficiently is mandatory.

EPIDEMIOLOGIC INVESTIGATION

If we focus on epidemilogy further: once a biological attack or any outbreak of disease is suspected, the epidemiologic investigation should begin immediately. The first step is to confirm that a disease outbreak has occurred. A case definition should be constructed to determine the number of cases and the attack rate. The estimated rate of illness should be compared with rates during previous years to determine if the rate constitutes a deviation from the norm. Once the attack rate has been determined, the outbreak can be described by time, place, and person. The epidemic curve is calculated based on cases over time; the early parts of the epidemic curve will tend to be compressed compared with propagated outbreaks. The peak may be in a matter of days or even hours. Later phases of the curve may also help determine if the disease appears to spread from person to person, which can be extremely important for determining effective disease control measures (3).

The performance of epidemiology is highly dependent on the quality of the surveillance data and how quickly it is received is critically important. In order to function properly, capabilities of interpreting and continuous monitoring of surveillance data, conducting investigations and building case definitions are needed. Epidemiology has a central role in determining the point of initial exposure and localizations where to focus prophylaxis and treatment first, measures for containing the outbreak, clues for a low enforcement investigation, etc. Following a suspicion of an attack, a case definition is made to alert public health authorities and medical personnel, and treatment protocols and advanced clinical symptoms are provided. Epidemiologists' service continues thereafter, to provide information back to public health and medical personnel; however, this needs continuous access to information of patients' loads and symptoms and laboratory results. In other words, epidemiology is a continuous liaison between surveillance data and response and treatment teams that provides the most appropriate assessment for the basis of correct and prompt decisions. In order to achieve all these goals, the epidemiology service or the component of the response system ideally needs:

- Real-time access to surveillance data
- Adequate personnel to analyze surveillance data and investigate unusual outbreaks,
- Broad knowledge of a variety of disease patterns
- Electronic systems to compile and analyze patient data
- Information exchange and communication between laboratories, hospitals, physicians, public health services

Therefore, to establish and improve epidemiological capabilities of a nation against bioterrorism, the following basic initiatives should be undertaken:

- Improvement of disease reporting systems
- Funding of local and central public health departments to hire and maintain adequate number of qualified personnel
- Identification of epidemiological thresholds for triggering particular responses

WHAT ARE THE MAJOR ISSUES IN ESTABLISHING SUCH A SYSTEM?

Implementation of such an epidemiology system is a great challenge in many respects, and it is not an easy task at all, particularly for the developing countries. Although, numerous measures to improve preparedness for and response to biological warfare or terrorism are ongoing everywhere, and training efforts have increased both in the military and civilian sectors, it is known that, at present, even in the well-developed countries, very few localities have established epidemiology services, electronic systems for epidemiology, and public health and medical entities to receive or exchange surveillance data. Well before any event, public health authorities must implement surveillance systems so they can recognize patterns of nonspecific syndromes that could indicate the early manifestations of a biological warfare attack. The system must be timely, sensitive, specific, and practical. To recognize any unusual changes in disease occurrence, surveillance of background disease activity should be ongoing, and any variation should be followed up promptly with a directed examination of the facts regarding the change. Major problems faced in developing countries are as follows:

- Adequate personnel with proper qualification is in short supply
- Surveillance data collection needs a comprehensive organization system with personnel and equipment and a central body, which will work timely and efficiently, as well as individual data collections in medical units, hospitals, etc.
- Establishment of a comprehensive, efficient and friendly electronic system is not easy and inexpensive but, once the organization frame is funded, it may not be so difficult to implement and maintain a very basic but efficient model
- Another important problem is the number and quality of laboratories and a laboratory response network that the surveillance data and epidemiological assessment will be based on. Equipment and expertise is the most cumbersome aspects of this system to implement, particularly with its high cost

CONCLUSION

In conclusion, to build and run an efficient system of disease reporting and epidemiological assessment requires a well-organized, self-sufficient health care system. Without solving/improving the infrastructure of health care provisions in a given country, all efforts would be limited and with limited success, and the incidents will be highly effective and casualties and losses of all kinds would be highly and costly. However, we should always remember that the global biological warfare threat is serious, and globalization of its effects is inevitable, and the cost will be paid much or less by everybody.

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