Communicable Diseases and Outbreak Control

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SUMMARY

Infectious disease during an emergency condition can raise the death rate 60 times in comparison to other causes including trauma. An epidemic, or outbreak, can occur when several aspects of the agent (pathogen), population (hosts), and the environment create an ideal situation for spread. Overcrowding, poor regional design and hygiene due to poverty, dirty drinking water, rapid climate changes, and natural disasters, can lead to conditions that allow easier transmission of disease. Once it has been established that an emergency condition exists, there must be a prompt and thorough response for communicable disease control. A camp should be created, and the disease managed rapidly. The overall goals are rapid assessment, prevention, surveillance, outbreak control, and disease management.

Keywords: Communicable disease; outbreak control; disaster; prevention; surveillance.

Introduction

Infectious or communicable disease can be defined as an illness caused by another living agent, or its products, that can be spread from one person to another.[1] An emergency condition can be defined as a state of disarray that has occurred during or after a regional conflict, or a natural disaster (i.e.: flood, earthquake, hurricane, drought).

Infectious disease during an emergency condition can raise the death rate 60 times in comparison to other causes including trauma.[2] Greater than 40% of deaths in emergency conditions occur secondary to diarrheal illness with 80% of those involving children less than 2 years of age.[3]

Of note, there is no dependable performance assessment tool in improving communicable disease surveillance in regards to outbreaks of infectious disease although the Centers for Disease Control (CDC) has proposed viable mechanisms for public health in general.[1]

Emergency Department Precautions

The emergency department (ED) is the front line response system in many developed countries, and can act as the primary entry method for several communicable diseases. Prevention of transmission is paramount in keeping the ED a safe environment and limiting spread.

Hand hygiene prevents harboring transient flora (including *Staphylococcus aureus, Clostridium difficile* among others) by reduction of bacterial counts. The recommendation is to use alcohol-based materials such as foam with an alcohol by volume of 60-70%, or if suspected C. difficile, hand washing with vigorous physical manipulation to reduce the amount of spores of pathogens.[4] This must be coupled with Standard Precautions, which involves the use of barriers such as gloves, gowns, masks, and eye wear, in order to prevent infection of the healthcare worker.[4]

Other safeguards such as airborne droplet, regular droplet, and contact precautions are necessary to prevent spread of unique vectors. Airborne particles are small (less than or

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equal to 5 micrometers), and remain in the air for several hours. Measles and Tuberculosis (TB) among others are transmitted via airborne particles. N95 mask or powered air-purifying respirators are required.[4,5] Isolation rooms that have high ventilation (several changes in the air system per hour), and negative pressure should also be used.[4,6]

Large particle droplet transmission occurs with vectors such as *Haemophilus influenzae*, Group A *Streptococcus*, and *Bordetella pertussis* among many others.[4] Patients suspected of meningitis or a respiratory infection that does not qualify under airborne should wear a surgical mask, in addition to the provider, and this is usually sufficient to prevent major spread. If able, a separate room or at least an area blocked by curtains is preferred.[5]

Contact precautions are used for pathogens infecting mucosal or skin surfaces such as S. aureus, Methicillin Resistant *S. Aureus* (MRSA), or *C. Difficile*. Use of protective gowns and gloves is usually sufficient unless suspicion of a higher level of precautions exists.[5]

Vaccinating health care personnel against pathogens including, but not limited to, Hepatitis B, Measles, Mumps, Rubella, Pertussis, Varicella, and Seasonal Influenza, is highly efficient in decreasing the risk of transmission of many infectious diseases.[7] This is not a replacement for standard precautions, airborne, droplet, contact precautions, or hand hygiene, but is another measure of safety to undertake.[4]

Communicable Disease Control

An epidemic, or outbreak, can occur when several aspects of the agent (pathogen), population (hosts), and the environment create an ideal situation for spread. Infectious agents are plentiful, mutate rapidly, and can become resistant to drugs if not destroyed completely. Low vaccination rates, poor nutrition, age (young and elderly), and immunosuppression all contribute to infectious risk. Overcrowding, poor regional design and hygiene due to poverty, dirty drinking water, rapid climate changes, and natural disasters, can lead to conditions that allow easier transmission of disease.[3]

Once it has been established that an emergency condition exists, there must be a prompt and thorough response for communicable disease control. A camp should be created, and the disease managed rapidly. The overall goals are rapid assessment, prevention, surveillance, outbreak control, and disease management. For more detailed information on the logistics of communicable disease control, please view the World Health Organization (WHO) field manual.[8]

Rapid Assessment

"Rapid assessment" involves identification of the main disease, and obtaining detailed information about the host country in less than four days.

First, compose the team. This will include public health experts in addition to experts in other fields such as sanitation, nutrition, and statistics. Second, assign tasks, and communicate thoroughly with the host country. Third, prepare a systematic method for data collection alongside statisticians. Data should focus on security, mapping the site, morbidity, mortality, demography, food availability, nutritional status, water, and sanitation among many other topics. Additionally, coordinate a visual inspection of the area prior to arrival, and interview key leaders of the area. This data should be clear, concise, goal-oriented, standardized, timely, and widely distributed to the team and all involved organizations. This will help guarantee appropriate funding, and communication with the host country.

Prevention

"Prevention" involves shelter, site planning, cleanliness, vaccination, vector control, and education.

First, shelter and site planning, involves creating an environment that will avoid packing together individuals tightly as well as avoiding areas with high vector transmission, poor water supply, low security, poor vegetation and soil, and low ability for access (ie: close enough to a major center, but not so far as to make travel impossible).

Second, cleanliness covers many aspects of what has already been discussed in the emergency room setting. Of note, full biohazard precautions should be taken with viral hemorrhagic fevers such as Ebola (to be discussed below).

Water must be available for up to seven liters per person per day (in the most extreme situations), and it must be clean. This can rise up to 20 liters per person per day if taking into account bathing as well as cooking. Diseases spread in contaminated water are plentiful, and their evasion is of utmost importance in emergency conditions. Biological quality (less than 10 fecal coliforms per 100 ml of water) is important. Chlorine can be used to disinfect water. Chemical quality is of less importance than biological quality.

Waste disposal is important.[8,9] Areas for excretion should not be near water sources, and they should be maintained with detail for sanitation. Pits to dispose of the contents should be created. Solid waste should be buried and/or burned. Liquid waste (ie: bathing) should be diverted into either storm water drains, or if in a dry area, to an isolated, separate pond, for disposal at a later time. Medical waste could be incinerated, preferably near the camp itself, making sure the contents do not travel to other dwellings. Otherwise, they should be buried after being sealed in a metal container.