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Review Article

Public Health Emergencies and Preparedness

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Introduction

The concept of a public health emergency is not limited to epidemic prone diseases but extends to biological, chemical and nuclear hazards, including the chemical or nuclear contamination of the environment and contaminated food and pharmaceuticals.[1] International Health Regulations (IHR) adopted by the World Health Assembly in 2005 are binding on all WHO member states and provide a regulatory framework for international management of public health emergencies.[2] The purpose of the IHR is to prevent and manage the public health risks arising from the international spread of disease while avoiding unnecessary interference with international traffic and trade.[3] Each country must develop and maintain the capacity to assess health risks within its territory and to notify WHO of all events that may constitute a public health emergency of international concern.[4] In South-East Asia the main public health issues are infectious diseases and communicable diseases[5] . This article describes the definition of public health emergencies, types of Public Health Emergencies, Public Health Emergencies of International Concern (PHEIC), examples of some public health emergencies in this century, public health emergencies preparedness (PHEP), key elements of public health emergency preparedness, capability assessment for public health emergency preparedness and response, and steps of developing preparedness and response capabilities planning model in deed.

Definition of public health emergencies

A situation becomes emergent when its health consequences have the potential to overwhelm routine community capabilities to address them. Thus, the proposed definition focuses on situations "whose scale, timing or unpredictability threatens to overwhelm routine capabilities."[6]

According to the National Disaster Medical System Federal Partners Memorandum of Agreement defines a public health emergency as *"an emergency need for health care [medical] services to respond to a disaster, significant outbreak of an infectious disease, bioterrorist attack or other significant or catastrophic event."*[7]

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Types of public health emergencies

1. Man-made emergencies

People have caused public health emergencies. Whether these events are planned or accidental, they render casualties, inflict, massive property damage and threaten survivors' sense of security.

- ❖ Bioterrorism**:** A growing number of terrorists are attempting to spread lethal diseases. The diseases that could be used in an attack are-
  - Anthrax
  - Smallpox
  - Tularemia
  - Plague e.t.c
- ❖ Chemical
- ❖ Fires
- ❖ Radiation

2. Natural disasters

County may faces weather-related challenges year-round. For examples:

- Earthquakes
- Extreme Heat
- Floods & Droughts
- Power Outages
- Tornadoes
- Lightening
- Winter Weather (Snow/Ice)

3. Other emergencies

- Foodborne Outbreaks
- Pandemic Flu[8].

Public Health Emergencies of International Concern (PHEIC)

PHEIC is defined as; an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response.[9]

A Public Health Emergency of International Concern (PHEIC) is a formally declared by the World Health

Organization (WHO) as “an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response", formulated when a situation arises that is "**serious**, **sudden**, **unusual** or **unexpected**", which "carries implications for public health beyond the affected state's national border" and "may require immediate international action".[10,11]

In order to declare a PHEIC, the WHO Director-General is required to take into account factors which include the risk to human health and international spread as well as advice from an internationally made up committee of experts. On an average each emergency response lasted approximately 4 months and used approximately 9.5% of our workforce.

Under the International Health Regulations (IHR) act, countries have a legal duty to respond promptly to a PHEIC.[12] After declaration of Public Health Emergency of International Concern, WHO member states have 24 hours, within which to report potential PHEIC events to the WHO.[13] It does not have to be a member state that reports a potential outbreak, hence reports to the WHO can also be received informally. [14]

The IHR decision algorithm assists WHO member states in deciding whether a potential PHEIC exists and the WHO should be notified. The WHO should be notified if any two of the four following questions are affirmed:[13]

- Is the public health impact of the event serious?
- Is the event unusual or unexpected?
- Is there a significant risk for international spread?
- Is there a significant risk for international travel or trade restrictions?

Some public health emergencies in this century

2009 swine flu declaration:

In the spring of 2009, a novel influenza A (H1N1) virus emerged. It was detected first in the United States and spread quickly across the US and the world.[15] On 26 April 2009, more than one month after its first emergence, the first PHEIC was declared when the H1N1 (or swine flu) pandemic was still in Phase Three.[16,17]

2014 polio declaration:

The second PHEIC was the 2014 polio declaration, issued in May 2014 with the resurgence of wild polio after its near-eradication, deemed "an extraordinary event".[18,19]

2014 Ebola declaration:

Confirmed cases of Ebola were being reported in Guinea and Liberia in March 2014 and Sierra Leone by May 2014. On Friday, 8 August 2014, following the occurrence of Ebola in the United States and Europe and with the already intense transmission ongoing in three other countries for months, the WHO declared its third PHEIC in response to the outbreak of Ebola in Western Africa.[20]

2016 Zika virus declaration:

On 1 February 2016, the WHO declared its fourth PHEIC in response to clusters of microcephaly and Guillain–Barré syndrome in the Americas, which at the time were suspected to be associated with the ongoing 2015–16 Zika virus epidemic.[21] Later research and evidence bore out these concerns; in April, the WHO stated that "there is scientific consensus that Zika virus is a cause of microcephaly and Guillain–Barré syndrome.[22]This was the first time a PHEIC was declared for a mosquito-borne disease.[23]

Public health emergencies preparedness (PHEP):

PHEP should include a full range of prevention, mitigation and recovery activities, not just those designed to enable responses to events. It also involves operational capabilities—the ability to quickly execute preparedness tasks. PHEP is not a steady state; it requires continuous improvement, including frequent testing of plans through drills and exercises and the formulation and execution of corrective action plans. PHEP also includes the practice of improving the health and resiliency of communities.[6]

Key elements of public health emergency preparedness

A prepared community is one that develops, maintains and uses a realistic preparedness plan integrated with routine practices and having the following components:

1. *Health risk assessment*: Identify the hazards and vulnerabilities (e.g., community health assessment, populations at risk, high-hazard industries and physical structures of importance) that will form the basis of planning.
2. *Legal climate*: Identify and address issues concerning legal authority and liability barriers to effectively monitor, prevent or respond to a public health emergency.
3. *Roles and responsibilities*: Clearly define, assign and test responsibilities in all sectors at all levels of government and with all individuals and ensure each group's integration.
4. *Incident Command System*: Develop, test and improve decision making and response capability using an integrated Incident Command System (ICS) at all response levels.
5. *Public engagement*: Educate, engage and mobilize the public to be full and active participants in public health emergency preparedness.
6. *Epidemiology functions*: Maintain and improve the systems to monitor, detect and investigate potential hazards, particularly those that are environmental, radiological, toxic or infectious.

7. *Laboratory functions*: Maintain and improve the systems to test for potential hazards, particularly those that are environmental, radiological, toxic or infectious.
8. *Countermeasures and mitigation strategies*: Develop, test and improve community mitigation strategies (e.g., isolation and quarantine, social distancing) and countermeasure distribution strategies when appropriate.
9. *Mass health care*: Develop, test and improve the capability to provide mass health care services.
10. *Public information and communication*: Develop, practice and improve the capability to rapidly provide accurate and credible information to the public in culturally appropriate ways.
11. *Robust supply chain*: Identify critical resources for public health emergency response and practice and improve the ability to deliver these resources throughout the supply chain.[6]

Capability assessment for public health emergency preparedness and response:

The National Preparedness Goal describes a vision for preparedness nationwide and identifies 32 core capabilities necessary to achieve that vision across five mission areas: *Prevention, Protection, Mitigation, Response* and *Recovery*. Among the core capabilities first 15 capabilities must be adaptable by jurisdictional public health agencies when responding to public health threats and emergencies within the context of their communities[24]

Capability 1 : Community Preparedness

Capability 2 : Community Recovery

Capability 3 : Emergency Operations Coordination

Capability 4 : Emergency Public Information and Warning

Capability 5 : Fatality Management

Capability 6 : Information Sharing

Capability 7 : Mass Care

Capability 8 : Medical Countermeasure Dispensing and Administration

Capability 9 : Medical Materiel Management and Distribution

Capability 10: Medical Surge

Capability 11: Non-pharmaceutical Interventions

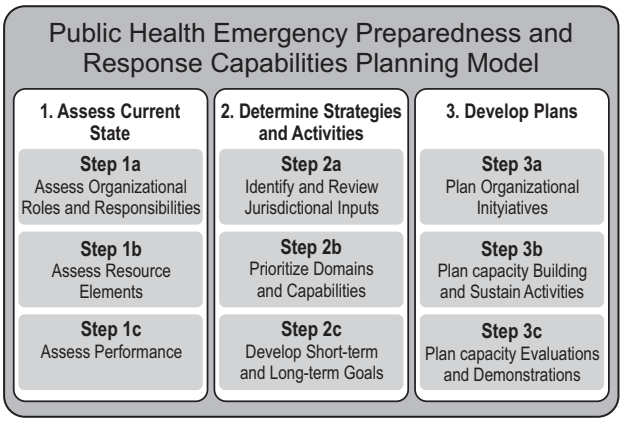
Capability 12: Public Health Laboratory Testing

Capability13 : Public Health Surveillance and Epidemiological Investigation

Capability 14: Responder Safety and Health

Capability 15: Volunteer Management[24]

Steps of developing preparedness and response capabilities planning model



Centers for Disease Control and Prevention, 2018.

Challenges for Bangladesh regarding PHEP and response:

Major challenges include:

- An overly- centralized health system
- Weak governance structure and regulatory framework
- Weak management and institutional capacity in the Ministry of Health and Family Welfare
- Fragmented public service delivery
- Inefficient allocation of public resources
- Lack of regulation of the private sector – which employs 58% of all physicians
- Shortage of human resources for health
- High turnover and absenteeism of health workers and
- Poor maintenance of health facilities and medical equipment

Conclusion

There are still several issues that Bangladesh health care system is yet to tackle. Despite of those challenges public health has improved markedly over the past two decades. Bangladesh shows strength during the all previous emergencies (eg- Polio eradication, measles outbreak, Dengue epidemic situation etc) and hope that all the experiences will help to make a strong preparedness plan with quick and adequate response against any further public health emergencies in future.

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