

Concept Document

Implementation of syndromic and event-based surveillance during the Hajj -

I. Introduction

Mass gatherings (MGs) are usually large, pre-planned events and are known to amplify the risk of infectious disease. Among Muslim religious events, Hajj and Umrah stand out as the largest perennial mass gatherings event with over 3 million people from over 180 countries attending the hajj pilgrimage in Mecca in Saudi Arabia and over 5 million people visiting Mecca and Medina for Umrah.

The risk and pattern of spreading disease at mass gatherings vary depending on the features of the event such as crowding, shared accommodations, the possibility of participants having prolonged exposure and close contact with infectious individuals, type of activities, and the characteristics of the participants including their age and immunity to infectious agents.

Timely detection and response are key to the effective prevention of communicable disease outbreaks in such settings. For this reason, the sensitivity of the surveillance system through introduction of syndromic and event-based surveillance during the Hajj needs to be enhanced.

II. Objective

Through collaboration between the Saudi Ministry of Health (MOH) and World Health Organization Office for the Eastern Mediterranean Region (EMRO), the need to enhance the surveillance system by introducing event-based/syndromic surveillance as a tool for close and timely monitoring of health status of pilgrims during Hajj season has been identified.

Specific objectives include:

1. Address the need for syndromic surveillance as an early warning system during Hajj season.
2. Raise awareness of the importance of event-based surveillance as an alert system for early detection of unusual health events.
3. Review the current surveillance system and the tools used in reporting.
4. Design an assessment tool to be ready for data collection.
5. Draft an implementation plan to be discussed with higher-level officials.

III. Description of surveillance activities during the Hajj

In order to establish event-based/syndromic surveillance to complement existing surveillance efforts, the surveillance system that has been used in Makkah during Hajj should be well understood.

Under the current surveillance system, the public health committee is responsible for the surveillance program. The surveillance program supervises a number of units including the field investigation unit, food safety unit, environmental health unit, and medical missions unit.

a). Reporting health care facilities

Public health and investigation teams inside hospitals are responsible for reporting all infectious diseases. In PHCs located in Makkah, the health inspector is the one who notifies the central investigation team.

The reporting teams are distributed in hospitals, primary health care centers, and medical offices within Hajj missions from different countries (Table 1). These teams receive all reportable cases from different departments and report them through available notification methods.

Table 1. Categories of health care facilities and method of reporting

Category	Number of facilities	Method of reporting	Estimated time of reporting	Receiver of the report
Hospitals in Holy Places	8	HESN	Immediate	Public health
Hospitals in Makkah	8	HESN	Immediate	Public health
PHCs in Makkah	30	Email +Phone	Immediate	Public health
PHCs in Mina	25	Phone +Refer to Nearest Hospital	Immediate	Public health
PHCs in Arafat	46	Phone +Refer to Nearest Hospital	Immediate	Public health
PHCs in Muzdalifa	6	Phone +Refer to Nearest Hospital	Immediate	Public health
PHCs on Aljamarat Bridge	16	Phone +Refer to Nearest Hospital	Immediate	Public health
Medical Offices	N/A	Daily Report	Every morning	Public health

b). Priority diseases and health events reported

MOH usually distributes a list of diseases of high importance during Hajj season. This list is subject to change according to epidemiologic situations worldwide as listed in Table 2.

Table 2. List of priority diseases during the Hajj season

Diseases/ Year	2013	2014	2015	2016	2017
MERS-CoV	✓	✓	✓	✓	✓
Cholera	✓	✓	✓	✓	✓
Neisseria Meningitidis	✓	✓	✓	✓	✓
Dengue Fever	✓	✓	✓	✓	✓
Influenza	✓				
Rift Valley Fever	✓	✓	✓	✓	✓
Poliomyelitis	✓	✓	✓	✓	✓
Yellow Fever	✓	✓	✓	✓	✓
Crimean Congo Fever	✓	✓	✓	✓	✓
Ebola		✓	✓	✓	
Zika Fever					✓

All other communicable diseases are also included in surveillance, every reported case will be investigated, and preventive measures will be taken and reported accordingly. The duration of this type of surveillance lasts from 15 of Du Alqada up to 15 of Du Alhijja in the Hijri calendar and may be extended according to the need.

c). Health recording, how reporting is done and means of data transmission

PHCs inside the holy places use paper forms to register every person seeking medical services. The same form is also used in outpatient clinics in Arafat and Mina. This form requires some demographic data and the diagnosis and treatment. This form is used to provide medical services to pilgrims. Usually these forms are collected and reported to the statistical department in order to be included in the report. Recently, a computerized tool was introduced as a substitute for the paper forms. With this tool, the patient is only given a barcode on paper and then receives the medical service needed.

Suspected and confirmed cases are usually reported through HESN, which is an electronic surveillance system. In case of urgency, an early notification by phone is indicated until the completion of the HESN report which is usually completed within 15 to 60 minutes depending on the number of cases.

d). Frequency of reporting and how data flows from reporting level to central level

In hospitals, when an emergency doctor or treating doctor suspects an infectious disease, a public health team is usually informed immediately. The public health team in turn will fill out the disease-specific

form and give notice of the case through HESN as soon as possible. When the suspected case is submitted, it will be displayed on the dashboard so the central surveillance team will notice it directly. Also, if the suspected case is one of the prioritized diseases, an SMS will be sent by the system to all key persons immediately. Investigation and preventive measures will be done by a field team if needed. Once the case is confirmed, the case status should be switched from suspected to confirmed. This will also be displayed on the dashboard and sent by SMS to key persons. If more action is needed, it will be taken by a field team with supervision from the central surveillance team.

In PHCs, reporting differs between Makkah PHCs and those located in holy places. In Makkah, all notifiable diseases are reported to the central surveillance team, who pay attention to the diseases of high importance. In PHCs located in holy places, once there is a suspected case, it will be transferred to the nearest hospital where the reporting is processed as above.

e). Data management and data analysis

Surveillance data will be shown on the HESN dashboard and presented using tables and graphs. Comparisons to previous data are available. It is also possible to list the number of cases by region. Analysis is needed in situations such as an increased number of suspected or confirmed case of a disease compared to previous years. There is also a daily report that summarizes the reported cases and is discussed by key persons.

f). How surveillance information is disseminated and used

Information from surveillance is collected by a central investigation team. A daily report is exported each morning to be discussed in the presence of His Excellency, the Minister of Health.

III. The proposed syndromic/event-based surveillance during the Hajj

Based on the current resources for data collection during Hajj season, it is proposed that early detection be established and strengthened through development of:

a). Syndromic Surveillance system:

The aim of the proposed syndromic surveillance system is to enhance the national capacities for early detection of increases in cases of specific diseases based on the clinical presentation without waiting of the lab confirmation. A list of syndromes will be identified by MOH with clear case definitions. All primary health care centers and units are sources of reporting. Several scenarios have been discussed regarding the

reporting tool. The reporting tool for syndromic surveillance would either be created as a separate tool or it can be embedded in one of the current tools. If a new tool is selected, it can be either a very simple tool for counting the number of selected syndromes or it can be designed to offer more useful data to be displayed and analyzed. In this case, double work is inevitable since every physician would manage the patient, then he would enter the data again in the new tool.

On the other hand, the current computerized program in PHCs which is used for managing patients is suitable for syndromic surveillance. There should be some modifications to the demographic items and diseases list to fit this type of surveillance. Timely data sharing needs to be discussed and approved by high-level authorities as a critical condition to use the existed system.

b), Event-based surveillance system:

The aim of establishing Event-Based Surveillance (EBS) during Hajj is the early detection of clusters or other public health signals or alerts that cannot be detected through other ordinary forms of surveillance (such as indicator-based surveillance).

For event-based surveillance, currently the emergency hotline (911) is functioning during Hajj to report all types of emergencies including those related to public health. This system of emergency detection can be modified and strengthened to find possible threats. The direct and timely communication and sharing of relevant data is required to establish event-based surveillance.

Different ways of reporting can be developed by using the new communications technology and smart phone applications such as WhatsApp. A list of events and triggers should be addressed by MOH. A number of reporting sources have been suggested such as health facilities, medical offices and missions, ambulance teams and community health volunteers. Those reporting sources are geographically linked to the intermediate level of rapid response teams and public health officers who will do the verification of each signal. Based on the verification, the proper intervention/s can be selected. The central level will be responsible for following up on reporting, verification and response.

IV. Prioritization of disease syndromes and public health events for syndromic and event-based surveillance

There is a need to assess past epidemiological patterns of communicable diseases and public health events in order to develop a comprehensive list of priority disease syndromes and public health events for inclusion in the proposed syndromic and event-based surveillance system for the Hajj.

Common syndromes and events in overcrowded settings such as mass gatherings are provided in Table 3 and may form the basis of the assessment and prioritization exercise.

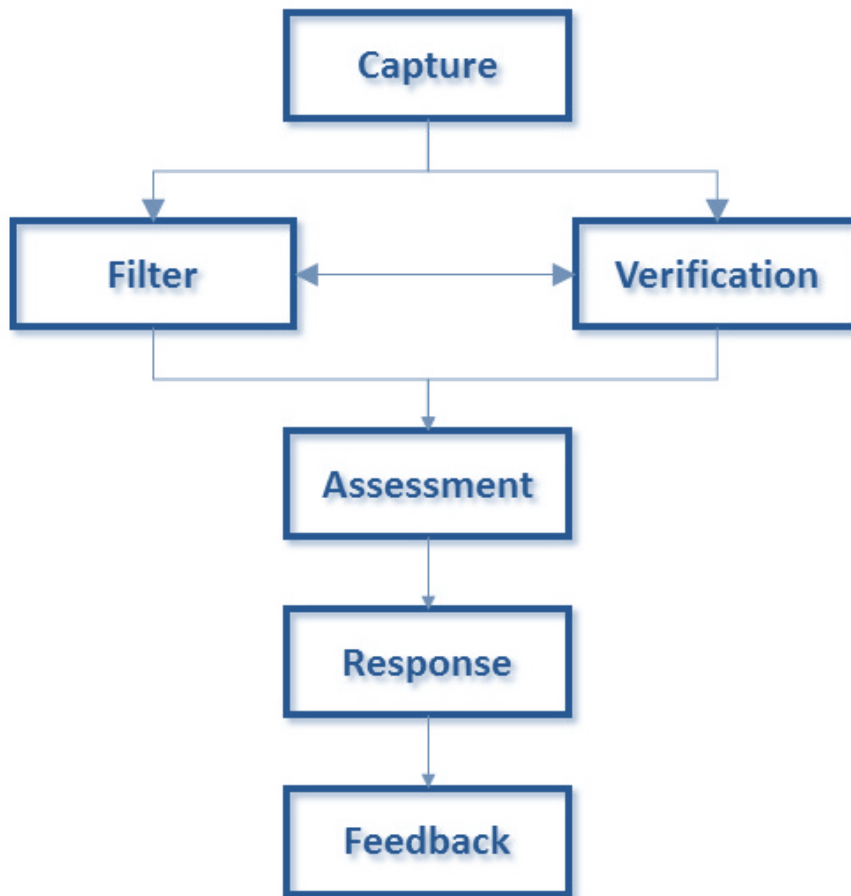
Table 3. List of priority disease syndromes and unusual events

Syndrome/Event	Possible causes
a). Disease Syndromes	
1. Acute Febrile Syndrome	Malaria, Brucellosis, Leishmaniasis, Leptospirosis, Plague, Typhoid fever, West Nile Fever
2. Acute Flaccid Paralysis (AFP)	Poliomyelitis
3. Acute Hemorrhagic Fever	Dengue Fever Rift Valley Fever, Crimean-Congo Hemorrhagic Fever West Nile Fever virus, Ebola virus disease
4. Acute Jaundice Syndrome	Hepatitis A, hepatitis E, Toxic agents
5. Acute Neurological Syndrome	Meningococcal Meningitis, rabies
6. Acute Respiratory Infections	Coronavirus, Avian influenza/H5N1, Zoonotic Influenza, Diphtheria, Legionellosis, S. Pneumoniae, Pertussis, Anthrax
7. Acute Diarrheal diseases	Cholera, E. Coli
8. Acute Bloody Diarrhea	Shigellosis, Amoebiasis E. coli
b). Public health events	
Usual events	events with health consequences such as fires
Adverse events following immunization	An individual at a healthcare facility has an anaphylactic reaction to a vaccination
Cluster of unusual health events	A health workers at a local hospital report a high incidence of cases with similar clinical manifestations such as heat exhaustions; accidental injuries, etc
Food poisoning	A doctor at a primary healthcare clinic sees several patients with bloody diarrhoea who attended the same wedding
Unusual increased prescription of certain drugs	Surveillance of pharmacy prescriptions reveals increased prescription of high dose, broad range antibiotics
Detection of unusual pathogens	Laboratory detects wild poliovirus
Increase in the laboratory detection of a particular disease	Increased incidence of meningococcal disease detected in blood or CSF specimens

V. Core processes for syndromic and event-based surveillance

The six core processes required for an effective syndromic and event-based surveillance system are shown in Figure 1.

Figure 1: Core processes for syndromic and event based surveillance



a). Capture/detection

Disease syndromes and possible public health events are captured and detected by various sources including the health sector, animal health sector, and the public (Table 4). Timely detection and capture ensures early detection of outbreaks and enable a rapid and appropriate response.

Table 4: Potential sources of disease syndromes and events detection

Source	Example of role in reporting events	Reporting method
Primary healthcare facilities	Encountering patients with one of the priority disease syndromes or unusual disease or high rates of an infectious disease	a). Syndrome: Use standard reporting form
		b). Event: Standard immediate notification form
Secondary healthcare facilities	Encountering patients with one of the priority disease syndromes or unusual disease or high rates of admission for a particular disease	a). Syndrome: Use standard reporting form
		b). Event: Standard immediate notification form
Medical missions	Encountering patients with one of the priority disease syndromes or unusual disease or high rates of admission for a particular disease	a). Syndrome: Use standard reporting form
		b). Event: Standard immediate notification form
Laboratories	Detecting an unusual pathogen, increased number of samples submitted or increased incidence of an infectious agent	Standard immediate notification form; Phone call/Text Message/whatsapp group
Pharmacies	Detecting high rates of prescription of a particular medication	Standard immediate notification form; Phone call /Text Message/whatsapp group
Animal sector	Noticing the occurrence of an unusual disease or high death rates in animals	Phone call/ Text Message/whatsapp group
Local municipalities	Contamination of the main water supply reported to the municipality	Phone call/ Text Message/whatsapp group
Public health volunteers	Witnessing an unusual event or inquiries related to an outbreak reported in the media	Phone call/ Text Message/whatsapp group
Ambulances	Encountering patients with unusual disease or high rates of an infectious disease	Phone call/ Text Message/whatsapp group

b). Reporting

Those reporting syndromes and public health events should know who to report to, how to report and what kinds of events are relevant to report. People and agencies well-placed to report include doctors and nurses in health facilities, and animal sector workers.

For adequate reporting of events by the public or other sources, there must be a clearly designated, known and contactable centre for such reporting. Stakeholders with a role in reporting events must be aware of what types of event to report, in what instances, to whom and by what method of reporting. Potential methods for reporting are listed in Table 4.

Standardised reporting tools must be outlined for those responsible for capturing event information. A standardised event reporting form outlines which details are key areas for information capture by those involved in initial event reporting.

c). Filter

Syndromic and event-based surveillance approaches tend to generate a large number of false positives. A filtering process determines which syndromes and events warrant further investigation and verification and which are unlikely to represent any significant threat to public health. Filtering may also involve some degree of triage, for example deciding priorities for the investigation of potential events according to degree of risk they pose to the public in terms of both likelihood of occurrence and the potential impact of that occurrence.

Red flags for events that are likely to pose a high risk to public health include:

- An **unknown, unexplained or unusual** illness or event
- Reports of **high mortality** or **high morbidity** (high rates of illness)
- Reports of **syndromes crossed the threshold**
- Reports of disease occurrence **interfering with trade or travel**
- Occurrence of a **disease for eradication**, e.g. poliovirus
- Accidental or deliberate **chemical, biological or radio-nuclear threats**
- **Double or multiple reporting** of the same event

c.2) Alert Colour Code:

- The alert has to remain Fresh **Red** for all alerts first 6 hours,
- once it last more than 6 hours, colour should turn **dark red**,
- if more than 24 hours should be **Black** .
- The alert remain open till it is verified and either :
 - Need further investigation and verification, it turns **Orange**.
 - if not of hazard or case been verified and no further action needed, it turn **Green**, which mean also alert is closed
- if the alert been verified and confirmed as outbreak or need immediate action to contain the problem the Alert should become **Flashing Red** colour

d). Verification

Events may not be reported reliably or adequately, as there is the potential for exaggeration, under-reporting or misleading information. Verification relies on triangulation (verification through multiple sources) and understanding the authority and likely validity or reliability of different sources (for instance, a healthcare professional is likely to report more relevant symptoms and have a better understanding of an illness in relation to the diagnosis and possible public health implications than a member of the general public). The process of verifying an event also involves confirming basic information on time, place and person. The process overlaps with initial assessment, as additional information is gathered where possible to understand the possible public health implications of the event. For example, after reports of an explosion at a chemical factory, it would be necessary to verify exactly what chemicals are present at the factory before consulting experts on the possible public health implications of these chemicals.

An event investigation form is outlined which details the procedures and additional information gathering necessary for initial filtering, investigation and verification of reported events.

VI. Implementation action plan

Table 5. Implementation plan

No.	Activity	Method	Responsible	Timeline
1.	Prioritization of syndromes, public health events for inclusion in the system and case definitions	Consultative workshop		
2.	Mapping of reporting sources		Implementation team	
3.	Specification of reporting methods		Implementation team	
4.	Design of information flow		Implementation team	
5.	Designation of roles and responsibilities in the system		Implementation team	
6.	Development of SOPs, reporting forms	Expert consultant for		

		working drafts; consultative workshop for review and finalization		
7.	Determination of human and material resource requirements		Implementation team	
8.	Installation of the system in health facilities		Implementation team	
9	Orientation/training g of health workers		Implementation team	

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Syndromic surveillance form

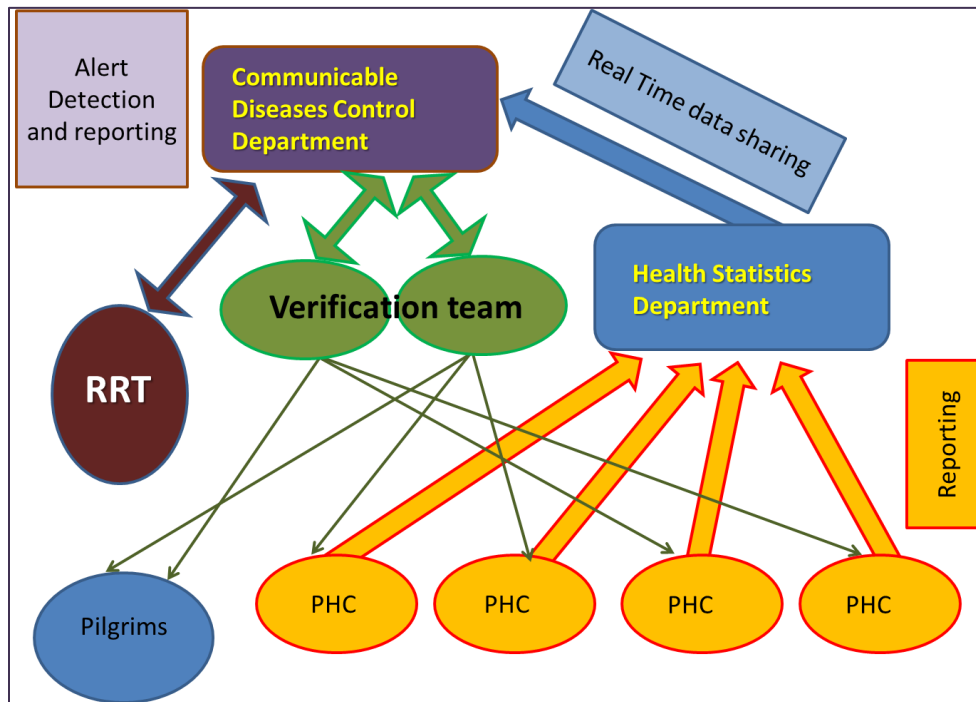
Name of Health Facility:	Type of health facility	
Name of Doctor	Date:	
Name of Patient	Age:	Sex:
Nationality	Residence (Camp/Tent No.)	
Does the patient know other similar cases in the same residence? Yes No		

Disease	Case definition and information	Check Here
Suspected acute flaccid paralysis (poliomyelitis)	Any child < 15 years with acute flaccid paralysis OR any paralytic illness in a person of any age if poliomyelitis is suspected	
Acute haemorrhagic fever syndrome	Acute onset of fever of less than 3 weeks duration in a severely ill patient AND TWO of the following signs: <ul style="list-style-type: none"> • haemorrhagic or purpuric rash • vomiting blood (haematemesis) • blood in stools • other haemorrhagic symptom and absence of predisposing host factors for haemorrhagic manifestations • bleeding from the nose (epistaxis) • coughing up blood (haemoptysis) 	
Suspected measles	Any person with fever AND maculopapular (non-vesicular) generalized rash AND ONE of the following: cough, runny nose (coryza) or red eyes (conjunctivitis) OR any person in whom a clinician suspects measles	
Suspected cholera/AWD	Any person 5 years or older with severe dehydration or death caused by acute diarrhoea (three or more abnormally loose or fluid stools in the past 24 hours)	
Acute jaundice syndrome	Acute onset of jaundice (yellowing of whites of eyes or skin or dark urine) AND severe illness with or without fever AND the absence of any known precipitating factors	
Suspected meningitis	Any person with sudden onset of fever (>38.0 °C axillary) AND ONE of the following signs: <ul style="list-style-type: none"> • neck stiffness • altered consciousness • petechial or purpurial rash • Other meningeal signs (severe neck stiffness causing the patient's hip and knees to flex when the neck is flexed, severe stiffness of the hamstrings causing inability to straighten the leg when the hip is flexed 90 degrees) In children < 1 year, meningitis is suspected when fever is accompanied by a bulging fontanel	
Suspected shigellosis/bloody diarrhoea	A person with diarrhoea (three or more abnormally loose or fluid stools in the past 24 hours) with visible blood in stool (preferably observed by the clinician)	
Confirmed malaria	Positive laboratory confirmation by blood smear or rapid diagnostic test for malaria	

Event Based surveillance Reporting Form:

Source of report:	
Date of reporting:	
Description of the event:	
Event start Date:	
Location of the event:	
No. of cases	
No. of deaths (if any)	

Syndromic surveillance data flow:



Event Based surveillance data flow

