

State of Kuwait
Ministry of Health
Infection Control Directorate

Guidelines for Management of Healthcare-Associated Outbreak

2010

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Introduction

Effective management of outbreaks in health care facilities is challenging. The purpose of this guide is to facilitate the management of outbreaks in health care facilities. Early recognition of outbreaks, rapid initiation of control measures and effective communication is critical for minimizing the extent of an

outbreak. To ensure effective outbreak management, all information must be exchanged with designated contacts and must be documented carefully, particularly in the early stages of an investigation.

Communicable disease and healthcare -associated infection (HAI) outbreak investigation reflects what an epidemiologist does when investigating disease patterns. Analysis of patterns of disease occurrence leads to an understanding of their spread and control. Outbreaks should be identified and investigated promptly because of their importance in terms of morbidity, cost, and institutional image. Outbreak investigations may lead to sustained improvement in patient care.

Early identification of an outbreak is important to limit spread by healthcare workers (HCWs) or contaminated materials. A potential problem may be initially identified by nurses, physicians, microbiologists, or other HCWs, or through an infection surveillance program. Appropriate investigations are required to identify the sources of the outbreak and to justify control measures.

Objectives

This document is intended to assist HCWs in establishing prompt action to:

- Identify and investigate all suspected outbreaks of communicable disease(s).
- Develop outbreak management plan.
- Identify and where possible, eliminate the source.
- Stop or limit further spread.
- Prevent recurrence.
- Ensure satisfactory communication between all concerned.
- Disseminate lessons learnt.

Definition of a healthcare-associated disease outbreak

Healthcare-associated disease outbreak can be defined as:

- Two or more cases of infection with indistinguishable organisms that are epidemiologically linked constitute an outbreak and suggest a breakdown in normal hygiene practice.

OR

- A rate of infection or illness above the expected rate for that place and time, where spread is occurring through cross infection, or person to person.

A single case of certain diseases such as diphtheria, aspergillus or viral hemorrhagic fever, may lead to initiation of the major outbreak plan, although not technically an outbreak.

It is usually impossible to be absolutely certain that two isolates of bacteria or viruses are the same, so they are generally referred to as indistinguishable. The number of cases indicating the presence of an outbreak will vary according to the disease agent, size and type of population exposed, previous exposure to the agent, and the time and place of occurrence.

Definition of a major outbreak

A definition of a major outbreak depends not only on the number of people affected, but also on the pathogenicity of the causative organism and its potential for spread in a community, or beyond one ward or department.

Outbreaks can be classified according to modes of transmission into:

1. Direct:

- Direct contact (mucous membranes, skin, oro-fecal)
- Droplet spread

2. Indirect:

- Airborne
- Vehicle borne (instruments, medications or fomites)
- Vector borne

Investigations of an outbreak

10 Steps in an Outbreak Investigation

The following steps are not necessarily in order of priority and may be done simultaneously depending on the outbreak situation encountered.

- 1) Conduct preliminary Investigations
- 2) Confirm the diagnosis
- 3) Establish the existence of an outbreak
- 4) Call for outbreak control team (OCT) meeting
- 5) Define and identify cases

- 6) Describe the data in terms of time (epidemic curve), place, and person
- 7) Develop hypotheses
- 8) Test hypotheses: (compare attack rates between exposed and non exposed)
- 9) Implementing control and prevention measures
- 10) Prepare the outbreak report

1) Conduct preliminary Investigations

Preliminary Investigations of an outbreak will be carried out by the infection control team (ICT) and will involve collection of the following data:

- Patient details including date of admission and where admitted or transferred from
- Consultant in charge of each affected patient
- Date and time of onset of relevant symptoms
- Type of infection if known
- Primary diagnosis
- Relevant medication e.g. antibiotics

If an outbreak is suspected, then the infection control nurse (ICN) will inform the infection control doctor. The ICT will immediately proceed with measures to prevent further transmission of suspected infection. The ICN must record all action taken, advice given and should visit the area daily if possible or as necessary.

After consideration of this data, no outbreak is found to exist; no further investigation will be required. If any doubt exists, the area will be kept under surveillance on a daily basis until a conclusion is reached.

2) Confirm the diagnosis

- Routine surveillance
- Describe cases clinically
- Collect specimens and send for laboratory

3) Establish the existence of an outbreak

Detection of an outbreak

Sporadic cases of infection may only be recognized if a pathogenic microorganism is cultured in the microbiological laboratory. All laboratory isolates are routinely monitored by the infection control team (ICT) to enable early detection of a potential outbreak. However, the monitoring of laboratory isolates can only relate to positive specimens sent to the laboratory and will not include pathogens not routinely

sought e.g. viral infections. Therefore, HCWs must be aware that two or more patients and /or HCWs with symptoms of a potential infectious condition will constitute an outbreak situation. The number of current cases maybe compared with the usual baseline incidence (from previous months or years). If local data are not available, compare to information from national surveillance systems or the literature. Outbreaks arising insidiously may reach considerable proportion before becoming apparent. Medical staff should report any suspicion of a potential outbreak to the ICT.

Existence of an outbreak

This can be defined as an increase in specific diseases or condition in a specific location (e.g. clinical symptoms, serotyping, PCR, radiology, expert opinion).

Notification of the outbreak

If infection control team recognizes the presence of outbreak through the daily monitoring of healthcare surveillance, notification of the outbreak to higher authorities should be done by outbreak control team (OCT). For every outbreak, an outbreak notification report (appendix 1) and Outbreak Case List form (appendix 2) should be completed by OCT Chairperson and send to Hospital Director and Director of Infection Control Directorate.

4) Call for outbreak control team (OCT) meeting

OCT is usually established as sub-committee of Infection Control Committee (ICC). It is chaired by infection control committee chairperson or infection control doctor.

Membership of the OCT

OCT members are the members of ICC in addition to the concerned persons in the existing outbreak such as in charge consultant doctors responsible for patient care and lead nurse for affected area.

Other members may vary depending on the outbreak e.g.

- Medical director or appropriate representative
- Communications manager (Public Relation officer)
- Head of hotel service
- Chief pharmacist
- Representative from CSSD (Central sterile supply department)
- Representative from central stores
- Representative from air biology department
- Engineer

Outbreak control team – responsibilities

- To review evidence and confirm there is an outbreak.
- To develop a strategy to deal with the outbreak and to allocate individual responsibilities for implementing action.
- To investigate the outbreak and identify the nature, vehicle and source of infection.
- To implement control measures and to monitor their effectiveness in dealing with the cause of the outbreak and in preventing further spread.
- To prevent further cases elsewhere by communicating findings to other health care facilities, when appropriate.
- To ensure adequate staff and resources are available for the management of the outbreak.
- To consider the potential staff training opportunities of the outbreak.
- To provide support, advice and guidance to all individuals directly involved in dealing with the outbreak including patients, HCWs, and visitors.
- To keep relevant outside authorities, the general public and the media appropriately informed.
- To declare the conclusion of the outbreak and to prepare a final report.
- To evaluate the response to the outbreak and implement changes in OCT procedures based upon lessons learnt.

Appendix (3) Check list for OCT Tasks can be used to as effective tool for fulfilling their responsibilities.

5) Define and identify cases

Establishment of case definition: a standard set of criteria for deciding whether a person should be classified as having the disease or condition under study, this usually includes:

- Clinical data about the disease (e.g. onset of signs and symptoms, frequency and duration of clinical features associated with the outbreak, treatment, devices).
- Characteristics about affected people or population risk factors (e.g. age, race, sex).
- Information about the location or place
- A specification of time during which the outbreak occurred.

Investigators often classify cases as one of the following:

Confirmed: usually has laboratory verification

Probable: usually have clinical features without lab verification

Suspected: usually have fewer of typical clinical features

Case definitions may need to be updated during an investigation (e.g. broad to specific case definition)

6) Describe the data in terms of time (epidemic curve), place, and person

Characterize the outbreak by time, place, and person (descriptive epidemiology). For every case, patient details, place and time of occurrence and infection details should be developed.

Characterizing by time

This is achieved by the epidemic curve or “epi-curve” which is a graph (histogram) in which the number of cases are plotted according to the time of onset of illness (Number of cases {y-axis} Vs Time the {x-axis}).

Drawing an epidemic curve

- The time intervals (x-axis) must be based on the incubation or latency period of the diseases and the length of the period over which cases are distributed.
- As a rule of thumb, select a unit that is one-fourth to one-third as long as the incubation period.
- There will be times when you do not know the specific disease and/or its incubation period.
- In that circumstance, it is useful to draw several epidemic curves, using different units on the x-axes, to find one that seems to show the data best.

Advantages of epi-curve:

- It is constructed to study the epidemic pattern of the disease from the shape of the curve
- May enable estimation of probable time period of exposure of the cases to the source(s) of infection
- Help in identifying the probable incubation period
- To determine if the problem is ongoing and whether the source of infection was common, propagated, or both
- Help in the evaluation of interventions

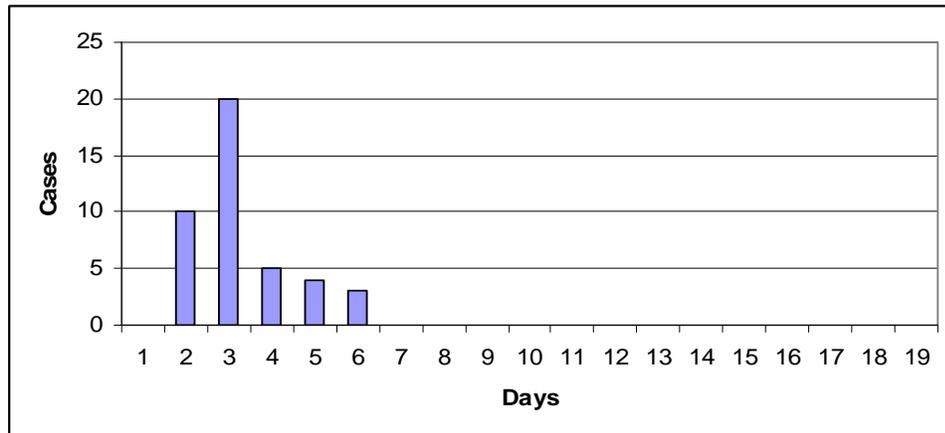
Interpreting epi-curves

Interpreting an epi-curve will help determine the source of infection in an outbreak. The source of infection maybe:

A. Single source or “Point source epidemic”

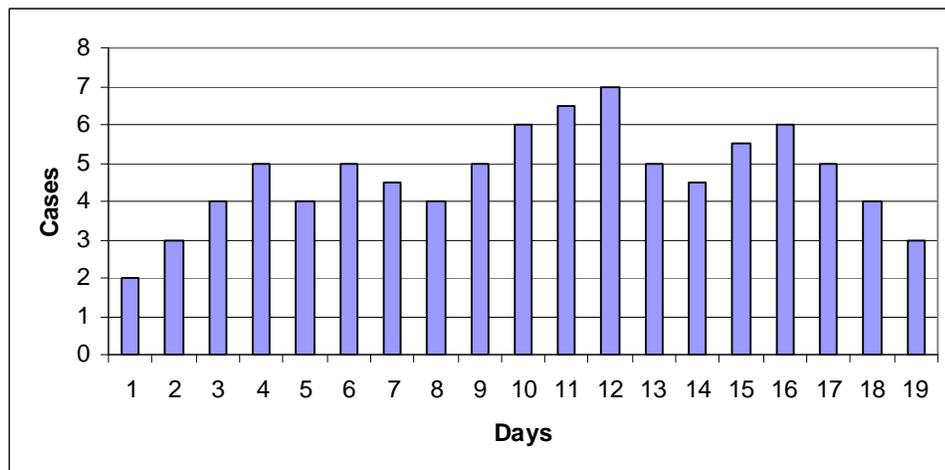
- Same origin (i.e., the same patient or vehicle is identified as the primary reservoir or means of transmission).
- Shape – a steep up slope, a peak and a gradual down-slope.

- Interpretation - patients are exposed to the same source over a relatively brief period. Any sudden rise in the number of cases suggests sudden exposure to a common source. In a point source epidemic, all the cases occur within one incubation period.



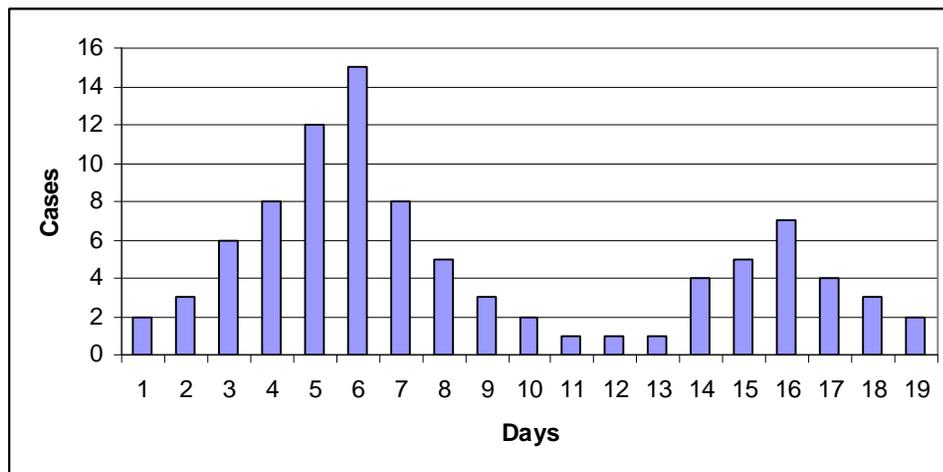
B. Continuous common source epidemic

- The duration of exposure to the source is prolonged.
- Shape - curve will have a plateau instead of a peak.
- Interpretation - patients are exposed to the same source over an extended period.



C. Person to person spread or “Propagated epidemic”

- Cases occur over a long period.
- Shape - series of progressively taller peaks one incubation period apart.
- Interpretation - Multiple waves. Explosive epidemics may occur due to person to person transmission (e.g., chickenpox). If secondary and tertiary cases occur, intervals between peaks usually approximate to the average incubation period. Person to person spread.



Characterizing by place

Assessment of an outbreak by place provides information on the extent of a problem and may also show clusters or patterns that provide clues to the identity and origins of the problem. On a spot map of a hospital, clustering usually indicates either a focal source or person to person spread, while the scattering of cases throughout a facility is more consistent with a common source such as a dining hall. In studying an outbreak of surgical wound infections in a hospital, we might plot cases by operating room, recovery room, and ward room to look for clustering.

Characterizing by person

- Determine the populations at risk for the disease by characterizing the outbreak by person
- Define such populations by:
 - Personal characteristics (e.g., age, ethnicity, sex, or medical status)
 - Exposures (e.g., occupation, leisure activities, use of medications, drugs)

After characterizing an outbreak by time, place, and person, you need to summarize what you know to see whether your initial hypotheses are on track. You may find that you need to develop new hypotheses to explain the outbreak.

7) Develop and test hypotheses

- Generate hypotheses to explain why and how the outbreak occurred.
- Hypotheses based on descriptive epidemiology - person, place and time, in-depth interviews, and relevant literature search.

- The hypotheses should address the source of the agent, the mode (vehicle or vector) of transmission, and the exposures that caused the disease. Also, the hypotheses should be proposed in a way that can be tested.

The credibility of the hypothesis should be evaluated. There are two approaches you can use, depending on the nature of your data:

- A. Comparison of the hypotheses with the established facts, this method should be used when the evidence is so strong that the hypothesis does not need to be tested.
- B. Analytic epidemiology, which allows you to test your hypotheses, this method used when the cause is less clear. With this method, you test your hypotheses by using a comparison group to quantify relationships between various exposures and the disease. There are two types of analytic studies you can use depending on the nature of the outbreak: **cohort studies** and **case-control studies**.

- **Cohort study:** A cohort study is the best technique for analyzing an outbreak in a small, well-defined population. In this type of studies compare patients who have been exposed to suspected risk factors with patients who have not been exposed.

Calculate attack rates in exposed and compare with attack rate in unexposed (relative risk).

Relative risk (RR): is a measure of association between a disease or a condition and exposure or a factor under study.

Interpreting RR:

If the $RR = 1$, the incidence in the exposed is the same as the incidence in the non-exposed; thus there is no association between exposure and the diseases.

RR more than 1 denotes a larger incidence in the exposed than in the non-exposed; thus exposure seems to increase the probability of developing the disease.

RR less than 1 denotes a smaller incidence in the exposed than in the non-exposed; thus exposure seems to decrease the probability of developing the disease.

Attack rates (AR):

AR for the *exposed* Group = Total number of exposed people who became ill/ Total number of exposed people.

For the *not exposed* group, AR = Total number of unexposed people but still became ill/ Total number of unexposed people

To identify source of outbreak, look for

- High attack rate among those exposed and

- Low attack rate among those not exposed (so the difference or ratio between attack rates for the two exposure groups is high)
- **Case-control study:** this is used in most instances where the outbreaks population is not well defined. Compare ill patients (cases) with well patients (controls). Calculate odds of specific exposure and compare odds of ill Vs well (odds ratio (OR)). Odds ratio is used to quantify the relationship between exposure and disease. This method does not prove that a particular exposure caused a disease, but it is very helpful and effective in evaluating possible vehicles of disease.

When you design a case-control study, conceptually, the controls must not have the disease in question, but should be from the same population as the case-patients. Common control groups consist of neighbouring patients of case-patients.

In general, the more case-patients and controls you have, the easier it will be to find an association. Often, however, you are limited because the outbreak is small. For example, in a hospital, 4 or 5 cases may constitute an outbreak. Fortunately, the number of potential controls will usually be more than you need. In an outbreak of 50 or more cases, 1 control per case-patient will usually suffice. In smaller outbreaks, you might use 2, 3, or 4 controls per case-patient. More than 4 controls per case-patient will rarely be worth the effort.

Testing statistical significance

The final step in testing your hypothesis is to determine how likely it is that your study results could have occurred by chance alone. In other words, how likely is it that the exposure your study results point to as the source of the outbreak was not related to the disease after all. A test of statistical significance is used to evaluate this likelihood.

The first step in testing for statistical significance is to assume that the exposure is not related to disease. This assumption is known as the *null hypothesis*. Next, you calculate a measure of association, such as a relative risk or an odds ratio. These measures are then used in calculating a chi-square test (the statistical test most commonly used in studying an outbreak) or other statistical test. Once you have a value for chi-square, you look up its corresponding p-value (or probability value) in a table of chi-squares.

Look for “statistical significance”; $P < 0.05$ (i.e the difference between the groups is not due to chance). The smaller the p-value, the stronger the evidence that the finding is statistically significant.

8) Carry out Additional Studies

Laboratory investigations

While epidemiology can implicate vehicles and guide appropriate public health action, laboratory evidence can confirm the findings. Many outbreaks of disease are microbial in origin and their investigation will usually require a microbiology laboratory.

Specimens should be obtained from individuals who manifest illness typical of the outbreak and from exposed, but not ill, persons.

When pathogenic bacteria are isolated from samples, their presence alone may be insufficient to support a presumptive association. Some organisms are very common (e.g. some *Salmonella spp.*) and their presence in related specimens may be purely coincidental.

Environmental studies

Environmental studies often help explain why an outbreak occurred. The specific objectives of an environment investigation are:

- To identify the source, mode and extent of the contamination ; and
- To assess the likelihood that pathogens or toxins survived processes designed to remove them or reduce their concentration

Environmental investigations will differ according to the nature and size of the outbreak. Because the amount of physical evidence will quickly diminish with time, environment investigations should be carried out as soon as possible.

Investigation methods have focused on visual inspection and end product testing suspected disease vector.

Sample collection:

The purpose of collecting environmental samples is to trace the source and the extent of the contamination that led to an outbreak. Samples may be taken from fomites, waste disposal systems, food materials, water, air, working surfaces, equipments or containers. In addition, samples should include clinical specimens from health-care workers and patients such as faecal samples and nasal or skin swabs. It is important to ensure the appropriate methods for collection, preservation and transfer of specimens is adopted in accordance with the receiving laboratory.

The analysis of many untargeted samples poses a heavy burden on a laboratory, is expensive and is relatively unlikely to identify the causative agent.

9) Implementing control and prevention measures

The primary goal of an outbreak management is to control ongoing disease and to prevent future outbreaks. At best, control measures are guided by the results of outbreak investigations. However, this may delay the prevention of further cases and it is unacceptable from a public health perspective to await conclusive findings before acting. On the other hand, some interventions can have serious economic and legal consequences and must be based on the best available information. Thus, timely implementation of appropriate control measures requires maintaining a delicate balance between the responsibility to prevent further disease and the need to protect the credibility of the facility.

Control measures can be implemented to:

I. Control the source:

I.I Address the source of the outbreak

The source of infection, mode of transmission and pathogenicity should be identified

I.II Control the source of the pathogen

- Remove the source of contamination as a primary measure, e.g., discard contaminated food.
- Inactivate or neutralize pathogen, e.g., disinfect and filter contaminated water.
- Remove persons from exposure to that pathogen.

II. Control transmission and Protect risk groups:

II.I Diagnose, treat and Facilitate investigations

- Investigate, diagnose and treat individual cases.
- Work with the primary investigator to facilitate specimen collection.

II.II Implement Transmission-Based Precautions

- Transmission-Based Precautions must be implemented while diagnostic test results are pending based on the clinical presentation and likely pathogens.
- Restrict infectious cases to their rooms or isolate them with the appropriate Transmission-Based Precautions until symptoms have completely resolved. For some pathogens the periods of communicability may be even longer.
- Certain clinical syndromes and conditions carry a sufficiently high Transmission- Based Precautions remain in effect for limited periods of time (i.e., while the risk for transmission of the infectious agent persists or for the duration of the illness. For most infectious diseases, this duration reflects known patterns of persistence and shedding of infectious agents

associated with the natural history of the infectious process and its treatment. (Refer to Isolation Policy for full details)

a. Cohorting Patients

- Cohorting is defined as the grouping together of individuals in a specific area to limit the contact between infected cases and non-infected cases, in order to decrease opportunities for transmission of infectious agents.
- If cases are confined to one unit, all patients from that unit should avoid contact with patients in the remainder of the facility.

b. Use Protective Personal equipment (PPE)

- The use of PPE such as masks, gowns, and gloves is recommended for direct patient care of ill patients during an outbreak depending on the mode of transmission of causative organisms.
- HCWs wearing masks must remove their mask before caring for another patient, and when leaving the patients dedicated space/room.
- Visitors need to be encouraged to wear gown, mask and gloves depending on the mode of transmission of causative organisms.
- Eye protection/safety glasses, goggles and face shields should be worn when there is a potential for splattering or spraying of blood, body fluids, secretions/excretions, including cough producing aerosol generating procedures while providing direct patient care.

c. Hand Hygiene

- To facilitate HCWs, patients and visitor hand washing, hand washing stations should be set up at designated areas in the facility (i.e., entrances, outside elevators)
- Hand hygiene should be performed:
 - Before direct contact with a patient
 - After any direct contact with a patient and before contact with the next patient
 - Before performing invasive procedures and after contact with secretions/ excretions
 - Before preparing, handling and administration of medications
 - After contact with items known or considered likely to be contaminated with secretions/excretions (e.g., oxygen tubing, masks, used tissues and other items handled by the patients)
 - Immediately after removing gloves and other protective equipment

- Between certain procedures on the same patient where soiling of hands is likely, to avoid cross-contamination of body sites
- Before preparing, handling, serving or eating food and before feeding a patient
- Waterless alcohol antiseptic hand rinses are effective for hand hygiene and should be readily available as an adjunct to hand washing. If there is visible soiling, hands must be washed with soap and running water before using hand rinses.
- Patients, HCWs and visitors should be instructed in proper hand hygiene practice.

d. Enhanced Environmental Cleaning/Sanitizing

- Ensure cleaning and disinfection of environmental surfaces frequently contaminated by patients /HCWs (i.e., hand rails, door knobs, bathroom units, furniture).
- Ensure a process for proper disposal of contaminated materials.
- Disinfection methods should be reviewed regularly.
- Disposable dishes and cutlery are not required.

e. Cohorting HCWs

- If possible, exposed HCWs should remain caring for symptomatic cases on a daily basis and avoid transferring to another unit/floor during the outbreak.
- During outbreaks, discuss the possibility of one HCW looking after only ill patients and others looking after only well patients. Alternatively, discuss the possibility of keeping HCWs working on only one unit if possible. Attempts should be made to minimize movement of HCWs, students, or volunteers between floors/wings especially if some units are unaffected.

f. Exclusion of Symptomatic HCWs from Work/Facility

- HCWs who meet case definition are excluded from the facility until asymptomatic; if the causative agent is known, other measures may apply.

g. Limited Visiting

- Any symptomatic (potentially infectious) visitors should be excluded at anytime.
- Signs should be posted in the facility indicating that there is an outbreak and visitors should be warned that they may be at risk of acquiring infection within the facility.
- During an outbreak, visitors should visit only their own friend/relative, in their own room (not in a common area), and should wash their hands before and after the visit at hand washing stations in the facility.

- No recommendation about closing the facility to visitors/volunteers; only in the case of extremely virulent disease would the hospital director order the facility to be closed to the public.

h. Suspension of Social Activities

- As much as possible, all social activities should be restricted to each respective unit. The Outbreak Management Team must find a balance between restricting activities to control the spread of infection, and providing therapeutic opportunities from social activities.
- Visitation by outside groups shall not be permitted. Also, visitation of multiple patients shall be restricted.

i. Restrict New Admissions, Re-Admissions and Transfers

- Restricting admissions unnecessarily will create a backlog in acute care or other health care facilities; on the other hand, admitting persons who are susceptible into an outbreak situation poses a risk to their health. In general, admission of new patients to an outbreak affected unit/area/s is not permitted.
- Patients can be transferred from the outbreak health care facility to another facility at any time, provided that:
 - Appropriate control measures are implanted during transfer and in the new admission location.
 - Prior notification to hospital infection control office is made. Also, designated HCWs at the outbreak facility should contact the new transferred location directly by phone to inform that the patient is coming from an outbreak situation.
 - Information should include the type of outbreak, the pathogen if known and if the patient is symptomatic or not.
 - New admissions should not be permitted during the outbreak. Ward closure for new admissions should be recommended by the ICC and the issue should be raised to the hospital director.
- Patient (case or non-case) transfers within an outbreak facility are not permitted until the outbreak has been declared over.

j. Working at Other Facilities

- During outbreaks, HCWs/volunteers should not work at any other facility. If asymptomatic HCW chose to work at another facility, they must wait one incubation period after working the last shift at the outbreak facility (if the causative organism is known, the waiting period may differ).

- HCWs working at two facilities must inform the receiving designate at the non-outbreak facility.

k. Medical Appointments

Non-urgent appointments made before the outbreak shall be rescheduled.

l. Ward Closure

The decision to close a ward will be taken by the Hospital Director according to the recommendations of OCT. OCT should ensure that the following are informed of any decisions taken:

- Regional director
- Director of Infection Control Directorate

III. Prevention:

III.I Modify host response to exposure

Immunize susceptible host, or use prophylactic chemotherapy.

III.II Education

Provide patient education of all cases and contacts. Provide education of HCWs, visitors, volunteers, and patients' families about infection and outbreak prevention and related policies.

Topics to be included in education programs for all HCWs and patients are:

- Importance of hand hygiene.
- Appropriate disinfection of equipment (any equipment that is shared between patients must be disinfected after each use).
- Barrier precautions, e.g., appropriate use of gloves and gowns, eye protection, and masks (respirators/surgical) according to the type of isolation.
- Standard environmental cleaning.
- Information about disease morbidity, mortality, transmission, as well as prevention
- Advising HCWs, visitors and volunteers that persons experiencing symptoms of infection should not be working/visiting the facility.
- Immunization and other control measures.

10) Outbreak report

- Follow-up report (Appendix 1) should be made available by the OCT within 2-4 weeks after the end of the investigations followed by a written final report.
- It should include discussion of factors leading to outbreak
- Evaluation of the methods used for the control of outbreak
- Recommendations for prevention of similar outbreak. By formally presenting recommendations, the report provides a record of the event to assist others in preventing and responding to similar events in future as well as representing a record of performance to assist with any legal matters.
- Record of performance and enhances quality of the investigation
- The report should follow the scientific format of an outbreak investigation report. It should include a statement about the effectiveness of the investigation, the control measures taken and recommendations for the future to avoid similar events.

Conclusion of outbreak

The outbreak will be concluded when; in the opinion of the outbreak committee if the following aspects have been successfully handled:

- The source of the infection has been controlled.
- Control measures have been taken to contain the infection.
- Preventative measures have been taken to obviate any recurrence or emergence of new episodes of the same type of infection.

EXAMPLES OF OUTBREAKS

A) OUTBREAK OF MULTIDRUG RESISTANCE ORGANISMS (MDROs)

When the first case or outbreak of an epidemiologically important MDRO (e.g., vancomycin resistant *enterococci* (VRE), methicillin resistant *staph aureus*(MRSA), vancomycin intermediate resistant *staph aureus* (VISA), vancomycin resistant *staph aureus* (VRSA), multi drug resistant gram negative bacilli (MDR-GNB)) is identified within a healthcare facility or unit Or when incidence or prevalence of MDROs are not decreasing despite implementation of and correct adherence to the routine control measures, intensify MDRO control efforts by adopting one or more of the interventions described below.

These interventions have been utilized in various combinations to reduce transmission of MDROs in healthcare facilities. Neither the effectiveness of individual components nor that of specific combinations of control measures has been assessed in controlled trials. Nevertheless, various

combinations of control elements selected under the guidance of experts have repeatedly reduced MDRO transmission rates in health care settings.

1. Administrative measures

- Evaluate healthcare system factors for their role in creating or perpetuating transmission of MDROs, including: staffing levels, education and training, availability of consumable, communication processes, policies and procedures, and adherence to recommended infection control measures.
- Develop, implement, and monitor action plans to correct system failures.

2. Educational interventions

- Intensify the frequency of MDRO educational programs for HCWs, especially those who work in areas in which MDRO rates are not decreasing.
- Provide individual or unit-specific feedback when available.

3. Judicious use of antimicrobial agents

- Review the role of antimicrobial use in perpetuating the MDRO problem targeted for intensified intervention.
- Control and improve antimicrobial use as indicated. Antimicrobial agents that may be targeted include vancomycin, third-generation cephalosporins, and anti-anaerobic agents for VRE; third-generation cephalosporins for ESBLs; and quinolones and carbapenems.

4. Surveillance

- Calculate and analyze prevalence and incidence rates of targeted MDRO infection and colonization in populations at risk; when possible, distinguish colonization from infection.
- Develop and implement protocols to obtain active surveillance cultures (ASC) for targeted MDROs from patients in populations at risk (e.g., patients in intensive care, burn, bone marrow/stem cell transplant, and oncology units; patients transferred from facilities known to have high MDRO prevalence rates; roommates of colonized or infected persons; and patients known to have been previously infected or colonized with an MDRO).
- Obtain ASC from areas of skin breakdown and draining wounds. In addition, include the following sites according to target MDROs:
 - For MRSA: Sampling the anterior nares is usually sufficient; throat, endotracheal tube aspirate, percutaneous gastrostomy sites, and perirectal or perineal cultures may be added

to increase the yield. Swabs from several sites may be placed in the same selective broth tube prior to transport.

- For VRE: Stool, rectal, or perirectal samples should be collected.
- For MDR-GNB: Endotracheal tube aspirates or sputum should be cultured if a respiratory tract reservoir is suspected, (e.g., *Acinetobacter* spp., *Burkholderia* spp.)
- Obtain surveillance cultures for the target MDRO from patients at the time of admission to high-risk areas, e.g., ICUs, and at periodic intervals as needed to assess MDRO transmission.
- Conduct culture surveys to assess the efficacy of the enhanced MDRO control interventions:
 - Conduct serial (e.g., weekly, until transmission has ceased and then decreasing frequency) unit-specific point prevalence culture surveys of the target MDRO to determine if transmission has decreased or ceased.
 - Repeat point-prevalence culture surveys at routine intervals or at time of patient discharge or transfer until transmission has ceased.
 - If indicated by assessment of the MDRO problem, collect cultures to assess the colonization status of roommates and other patients with substantial exposure to patients with known MDRO infection or colonization.
 - Obtain cultures of HCWs for target MDRO when there is epidemiologic evidence implicating the HCW as a source of ongoing transmission.

5. Enhanced infection control precautions

- Use of Contact Precautions
- Implement Contact Precautions routinely for all patients colonized or infected with a target MDRO.
- Because environmental surfaces and medical equipment, especially those in close proximity to the patient, may be contaminated, don gowns and gloves *before or upon entry* to the patient's room or cubicle.
- In LTCFs, modify Contact Precautions to allow MDRO colonized/ infected patients whose site of colonization or infection can be appropriately contained and who can observe good hand hygiene practices to enter common areas and participate in group activities.
- When ASC are obtained as part of an intensified MDRO control program, implement Contact Precautions until the surveillance culture is reported negative for the target MDRO.
- No recommendation is made regarding universal use of gloves, gowns, or both in high-risk units in acute-care hospitals.

6. Implement policies for patient admission and placement as needed to prevent transmission of MDRO

- Place MDRO patients in single-patient rooms.
- Cohort patients with the same MDRO in designated areas (e.g., rooms, bays, patient care areas).
- When transmission continues despite adherence to Standard and Contact Precautions and cohorting patients, assign dedicated nursing and ancillary service staff to the care of MDRO patients only. Some facilities may consider this option when intensified measures are first implemented.
- Stop new admissions to the unit of facility if transmission continues despite the implementation of the enhanced control measures described above.

7. Enhanced environmental measures

- Implement patient-dedicated or single-use disposable noncritical equipment (e.g., blood pressure cuff, stethoscope) and instruments and devices.
- Intensify and reinforce training of HCWs who work in areas targeted for intensified MDRO control and monitor adherence to environmental cleaning policies. Some facilities may choose to assign dedicated HCWs to targeted patient care areas to enhance consistency of proper environmental cleaning and disinfection services.
- Monitor (i.e., supervise and inspect) cleaning performance to ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and those likely to be touched by the patient and HCP (e.g. bedrails, carts, bedside commodes, doorknobs, faucet handles).
- Obtain environmental cultures (e.g., surfaces, shared medical equipment) when there is epidemiologic evidence that an environmental source is associated with ongoing transmission of the targeted MDRO.
- Vacate units for environmental assessment and intensive cleaning when previous efforts to eliminate environmental reservoirs have failed.

8. Decolonization

- Each case should be evaluated regarding the appropriate use of decolonization therapy for patients or HCWs during limited periods of time, as a component of an intensified MRSA control program.
- When decolonization for MRSA is used, perform susceptibility testing for the decolonizing agent against the target organism in the individual being treated or the MDRO strain that is epidemiologically implicated in transmission. Monitor susceptibility to detect emergence of resistance to the decolonizing agent.

- Because mupirocin-resistant strains may emerge and because it is unusual to eradicate MRSA when multiple body sites are colonized, do not use topical mupirocin *routinely* for MRSA decolonization of patients as a component of MRSA control programs in any healthcare setting.
- Limit decolonization of HCP found to be colonized with MRSA to persons who have been epidemiologically linked as a likely source of ongoing transmission to patients. Consider reassignment of HCP.

B. ENTERIC OUTBREAK MANAGEMENT

Criteria for an enteric outbreak in an institution

An enteric outbreak can be defined as a greater than expected number of epidemiologically linked cases of enteric illness among patients. The decision as to whether an outbreak is occurring depends on several factors including the type of health-care facility the population and the usual frequency of the illness (baseline) in that particular population

Enteric case definition:

A patient must present with a minimum of one of the following signs or symptoms in order to be listed as a case:

- Two or more episodes of loose or watery stool (diarrhea) above what is normal for that person within a 24 hour period and no evidence of a non-infectious cause;
- Two or more episodes of vomiting within a 24 hour period with no evidence of a non-infectious cause;
- One episode of loose or watery stool (diarrhea) above what is normal for that person **AND** one episode of vomiting within a 24 hour period and no evidence of a non-infectious cause.
- Stool culture positive for an enteric pathogen (e.g., Norovirus, Typhoid, Salmonella, Shigella, Campylobacter, etc.)

The following non-infectious causes must be ruled out:

- For diarrhea: laxative use, change in tube feeds, medication or diet.
- For vomiting: change in medication, or diet, peptic ulcer disease, or gallbladder disease.

The most common cause of enteric (gastroenteritis) outbreaks in health-care facility is the norovirus, an enteric virus.

Develop the initial case definition

Each enteric outbreak requires its own case definition. Develop the initial outbreak case definition based on the following:

- Clinical signs and symptoms (from most prevalent to least prevalent)
- Location in the facility (individuals/population affected)
- Severity of symptoms (e.g., 2 or more episodes of diarrhea)
- Time-frame, if necessary

Example Case Definition: patient on any unit of the facility with 2 or more episodes of diarrhea (loose, watery stool) and/or vomiting, occurring within 24 hours.

Implement initial general outbreak control measures

The outbreak control measures mentioned earlier should be implemented as early as possible when an enteric outbreak is suspected in the facility with emphasis on standard and contact precautions.

Isolation precautions

Patients with suspected enteric infection should be managed with contact Precautions with careful attention to hand hygiene practices, disinfection of environment and non-critical patients care items.

Collect laboratory samples

As soon as an enteric outbreak is suspected, stool specimens should be collected from the most recently ill, to determine the causative organism(s).

Food sampling

- Collect samples from hazardous and high risk foods from meals in the institutional kitchen as precaution in the event of a food borne disease outbreak.
- Hazardous food: is defined as “any food that is capable of supporting the growth of pathogenic organisms or the production of the toxins of such organisms”. Such foods typically include milk, milk products, eggs, meat, poultry, fish and shellfish.
- Food samples should be collected until food is no longer suspected as a possible source of the outbreak. Food is always assumed to be the source of an enteric outbreak until proven otherwise.

Note: Available food samples must be kept on hold under refrigeration until it has been no longer required.

Gather details regarding the diets and foods consumed by ill residents/patients for the 7 day period prior to the onset of symptoms of the first case. Bring this information to the outbreak management team meeting for discussion

C. RESPIRATORY TRACT INFECTION OUTBREAK

Respiratory outbreak definition:

A respiratory outbreak may exist when there are two or more cases of health care acquired acute respiratory infection occurring within 48 hours on a specific hospital unit.

Investigations

As soon as a respiratory outbreak is suspected, steps must be taken to determine a common causative agent (e.g., chest x-ray, serology, Nasopharyngeal (NP) swab, urine for Legionella antigens, sputum smear/culture, blood culture, etc.).

NP: Swabs should be collected from the most recently ill cases (preferably within 48 hours of onset of symptoms).

Initial general outbreak control measures

General control measures apply to everyone entering the health care facility for the duration of the outbreak, including, but not limited to HCWs, visitors, and patients for the duration of the outbreak:

1. Hand hygiene.
2. PPE (Mask, Eye Protection, Gloves and Gown).

Declaring the outbreak over

Criteria for declaring the outbreak over:

As a general rule respiratory outbreaks can be declared over if no new cases have occurred within:

- 8 days from the onset of symptoms of the last patient case (8 days = 5 days period of communicability for the case plus 3 days incubation period).

OR

- 3 days after the onset of symptoms in the last HCWs case (whichever is longer).

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Appendix 1

Outbreak Notification Report

Type of outbreak e.g. MRO, gastroenteritis, respiratory illness; or others (specify)

Incubation period: _____ hours/days

Etiological agent (if known):

Likely mode of transmission: Contact Airborne Droplet Food-borne
Water borne other Provide details: _____

Date of outbreak was detected /reported to infection control: ____/ ____/ ____

Outbreak location /Facility: _____ Wards affected: _____

Facility code: _____

Health care facility source: Yes/ No

Index case identified: Yes/ No

If health care facility source was the index case a HCW: Yes/ No

Date of onset of first ill person: ____/ ____/ ____ Date of outbreak commenced: ____/ ____/ ____

Total number of affected cases: Patients: Staff:

Number of laboratory confirmed cases:

No. of patients still hospitalized: No. of deceased patients:

Outbreak status

Ongoing (new cases occurring) Yes No if no provide details

Continued (existing cases but no new cases) Yes No

Date of onset of last ill person: ____/ ____/ ____

Resolved (no outstanding cases) Yes No

Date of outbreak complete ____/ ____/ ____

Additional information: _____

* Some of the fields may not be completed due to unavailable information at the time of notification.

Outbreak Control Team Chair Person

Appendix 2

OUTBREAK CASE LIST

Hospital name:.....

Hosp Code:.....

Ward:.....

Total No. of staff:.....

Date of onset:.....

Total No. of beds:.....

Pt's File no./staff	Age	Sex	Room/Bed No.	Date of Admission	Site of infection	Clinical details	Date of onset of Symptoms	Date of Specimen Collection	Specimen Result	Outcome

1. Copy to infection control directorate

Date:.....

2. Copy to hospital director

signature:

Appendix 3

Checklist for Outbreak Control Team Tasks

The principal aim of the OCT is to investigate the cause of the outbreak and to implement action to identify the source, minimize spread and prevent recurrence of the communicable disease. The following tasks must be undertaken in order to deal effectively with an outbreak. The step-by-step approach does not imply that each action must follow the one preceding it. In practice, some steps must be carried out simultaneously and not all steps will be required on every occasion.

Preliminary Phase

- Consider whether or not cases have the same illness and establish a tentative diagnosis
- Determine if there is a real outbreak
- Establish a single comprehensive case list
- Collect relevant clinical or environmental specimens for laboratory analysis
- Conduct unstructured, in-depth interviews of index cases
- Conduct appropriate environmental investigation including inspection of involved or implicated premises
- Identify population at risk
- Identify persons posing a risk of further spread
- Initiate immediate control measures
- Assess the availability of adequate resources to deal with the outbreak

Descriptive Phase

- Establish a case definition (clinical and/or microbiological)
- Search for other cases
- Collect and collate data from affected and unaffected persons using a standardized questionnaire
- Describe cases by time, place and person
- Form preliminary hypotheses on the cause of the outbreak
- Make decision about whether to undertake detailed analytical studies

Analytical Phase

- Calculate attack rates
- Confirm factors common to all or most cases
- Test and review hypotheses of the cause
- Collect further clinical or environmental specimens for laboratory analysis
- Ascertain source and mode of spread

Control Measures

- Control the source: animal, human or environmental
- Control the spread by:
 - (a) Isolation or exclusion of cases and contacts
 - (b) Treatment of cases to reduce infectious period, where possible (e.g. antivirals)
 - (c) Screening and monitoring of contacts
 - (d) Protection of contacts by immunization or chemo-prophylaxis

(e) Enhanced infection control practices by staff and visitors including cleaning and equipment decontamination procedures

(f) Closure of premises

- Monitor control measures by continued surveillance for disease.
- Declare the outbreak over.

Evaluation

- Evaluate the management of the outbreak and make recommendations for the future

Communication

- Consider the best means of communication with colleagues, patients and the public, including the need for an incident room and/or help-lines
- Notify the department of preventive medicine.
- Ensure appropriate information is given to the public, especially those at high risk
- Ensure accuracy and timeliness
- Include all those who need to know
- Use the media constructively.
- Prepare written report
- Disseminate information on any lessons learnt from managing the outbreak

Further Studies

- Conduct further analytical case control or cohort studies
- Conduct further microbiological studies