Managing meningitis epidemics in Africa

A quick reference guide for health authorities and health-care workers

Revised 2015

World Health Organization

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PART ONE

Strategy for managing meningitis epidemics in Africa

Overview

This guide is for use by health workers and officials working in areas in Africa that are affected by outbreaks and epidemics of meningitis.

It provides a concise overview of the World Health Organization (WHO) strategy to detect and respond to meningitis epidemics and gives practical advice for those involved in all aspects of epidemic management, from pre-outbreak planning, to patient care and vaccination delivery. Quick reference cards are included in Part 2 of this guide.

The WHO strategy for the control of epidemic meningitis is based on three key pillars:

- surveillance
- treatment and care
- vaccination

This guide outlines the actions to be taken as part of this strategy – by the district authorities and by staff working within the health centres – before an epidemic strikes, as it evolves and after the event.

What is epidemic meningitis?

Meningococcal meningitis is a bacterial form of meningitis, a serious infection of the meninges (brain membrane). It can cause severe brain damage and is fatal in 50% of cases if untreated.

Several different bacteria can cause meningitis but it is *Neisseria meningitidis* (Nm) that has the potential to cause large epidemics. Five serogroups of Nm – A, B, C, W and X – are found across the 'meningitis belt' that stretches across Africa, from Senegal to Ethiopia. In these areas during the dry season, from December to June, populations are at high risk of outbreaks of this disease. Since 2010, a serogroup A conjugate vaccine (MenAfriVac®) has been introduced through mass campaigns to countries of the meningitis belt with the consequence that NmA outbreaks are disappearing. Meningitis epidemics due to other serogroups still occur at a lower frequency and of a lower magnitude.

N. meningitidis only infects humans; there is no animal reservoir. The bacteria are carried in the throat, sometimes with no symptoms, and are transmitted from person to person through droplets of respiratory or throat secretions as a result of prolonged, close contact. The incubation period is from 2 to 10 days.

The most common symptoms of the disease are high fever, headaches, a stiff neck, vomiting, confusion, sensitivity to light and bulging of the fontanelle in infants. Sometimes a haemorrhagic rash, ranging from a few petechiae to widespread ecchymoses, occurs as a result of septicaemia. Even when the disease is diagnosed early and adequate treatment is started, 5–10% of patients die, often within 24 to 48 hours after the onset of symptoms. The disease also results in severe after-effects such as brain damage or hearing loss in about 5–10% of patients who survive.

Understanding the early symptoms of the disease is essential both to ensure patients receive prompt treatment and to implement the measures needed to control a potentially widespread outbreak. Examination under a microscope of the cerebrospinal fluid (CSF), taken from a lumbar puncture, can detect the presence of the bacteria. Confirmation of the diagnosis, as well as the identification of the meningococcal serogroup responsible is then conducted under laboratory conditions.

Understanding the early symptoms of the disease is essential both to ensure patients receive prompt treatment and to implement the measures needed to control a potentially widespread outbreak.

Patients should receive treatment with antibiotics at a health centre as soon as possible. Isolation is not necessary. A range of antibiotics can treat the infection, including penicillin, ampicillin, chloramphenicol and ceftriaxone. During epidemics in sub-Saharan Africa, ceftriaxone by injection is recommended as first line treatment for a minimum of five days; treatment with single-dose antibiotics is no longer advised due to the lower magnitude of epidemics after the introduction of the serogroup A vaccine and the risk of inadequate treatment of meningitis due to other pathogens.

The 3-pillar strategy for preparedness and response in meningitis epidemics

Pillar 1: Surveillance

Ensuring that enhanced surveillance is in place is important to detect the first cases, identify the pathogen as well as the serogroup of the meningococcus (Nm) that is responsible for the infection, and serve as a trigger to launch a rapid response operation. Standard case definitions can be used to recognize early cases. These should then be confirmed by laboratory tests. Standard reporting mechanisms are needed in order to analyse the incoming data and determine the extent and evolution of an outbreak.

Pillar 2: Treatment and care

The second pillar focuses on reducing the impact of the disease on patients by providing prompt, appropriate, accessible and affordable treatment and care. Treatment for meningitis is with antibiotics. Ensuring sufficient stocks are available in the health centres well in advance of need requires careful planning and anticipation of areas likely to be most at risk of outbreaks.

Pillar 3: Vaccination

In order to limit the magnitude of the epidemic, WHO recommends large-scale vaccination of population groups that are at risk, with the appropriate vaccine (ACW/ACYW polysaccharide or A conjugate) for the meningococcal serogroup that is responsible for the outbreak. Vaccination campaigns on this scale require extensive coordination involving procurement, distribution and logistics, public information and post-vaccination follow-up.

Planning and coordination at district level

Overall planning and coordination of the 3-pillar strategy for epidemic meningitis preparedness and response should take place at the district level. It is the responsibility of the local health authorities but requires the input of a wide range of partners.

Experience has shown that establishing a committee for epidemic preparedness and response (EPR Committee), well in advance of the epidemic season, is the most effective way to plan, coordinate and supervise the activities of multiple partners to ensure outbreaks are detected early and an appropriate response is launched promptly.

- The EPR Committee should be led by representatives from the ministry of health, and should include staff from key hospitals in the area, reference laboratories and other partners who may be involved in treating patients and monitoring outbreaks.
- The EPR Committee should meet regularly – before and throughout the epidemic season.

The role of the EPR Committee is to:

- ensure the **surveillance system** is strengthened for the epidemic season and covers the entire district and that health workers receive training in the collection, reporting, analysis, and monitoring of the information as it becomes available;
- ensure that information, training and medical supplies are made available to provide the best possible **treatment for patients** in the most remote health centres;
- ensure the distribution of appropriate vaccines as needed, coordinating **vaccination campaigns**;
- disseminate **information** for the general public on the risks of meningitis, where and how to seek treatment and any plans for vaccination campaigns.

Planning and coordination is the responsibility of the local health authorities but requires the input of a wide range of partners.

Pillar 1: Surveillance

EPIDEMIC PREPAREDNESS

At the district level:

- design, print and distribute standard reporting forms and standard case definitions to all health centres;
- ensure all health centres are aware of standard case definitions;
- appoint and train surveillance officers in all areas of the district;
- compile surveillance data on a weekly basis of all suspected cases (as well as 'zero reporting'), analyse trends and monitor any signs of disease activity;
- pre-position diagnostic reagents and other surveillance material within district and reference laboratories.

In the health centres:

- be aware of and understand the standard case definitions;
- report on zero cases and be ready to report on suspected, probable and confirmed cases;
- conduct lumbar punctures on any suspected case;
- send CSF samples to laboratory;
- complete a case-based form for all suspected cases.

DURING THE EPIDEMIC SEASON

At the district level:

- monitor and analyse the in-coming surveillance data on a weekly basis to determine the weekly attack rate (AR) and the case-fatality ratio (CFR);
- disaggregate the data to identify disease activity within age groups and population areas of less than 100 000 people (district or sub-district);
- recognize as soon as a district has crossed an alert or epidemic threshold and alert all the health facilities in the area;
- investigate and verify the extent of any outbreaks that have been identified;
- once the alert threshold is crossed, ensure that CSF samples are collected when possible from all cases (see page 18) in order to determine the organism responsible and the serogroup if Nm;
- forward CSF samples received from health centres to reference laboratories for analysis at least twice a week (see page 21);
- continue monitoring disease activity for the duration of the epidemic season.

In the health centres:

- compile and submit reports on the number of cases and deaths on a weekly basis;
- continue to collect CSF samples from suspected cases and complete case-based forms;
- package and forward CSF samples to a reference laboratory in triple packaging.

Rapid diagnostic tests should be available at health centre level to help identify the organism and meningococcal serogroup.

Pillar 2: Treatment and care

EPIDEMIC PREPAREDNESS

At the district level:

- plan and implement training courses for health-workers on epidemic treatment protocols;
- print and distribute national treatment protocols (5–7 day treatment) to all health centres;
- calculate the amount of antibiotics and material that may be needed during an epidemic (see page 24), pre-position stocks in high-risk areas and establish smooth lines for distribution throughout the district.

In the health centres:

- following lumbar puncture, treat every new patient who is suspected of having meningitis with antibiotics as soon as possible;
- ensure any child under 2 years of age or any patient with severe symptoms is admitted to the health centre for in-patient treatment and adjust the treatment as necessary;
- record details of all patients in the registry.

DURING AN EPIDEMIC

- instruct all health centres to switch to the epidemic meningitis treatment protocol (ceftriaxone for 5–7 days; see page 23);
- launch a public information campaign informing communities of the importance of early treatment (WHO recommends free treatment in government health centres during an epidemic);
- monitor supplies of antibiotics and restock health facilities as stocks become limited.

REMEMBER!

Meningitis is a life-threatening emergency

- Start antibiotic treatment without delay
- Take CSF first whenever possible

Pillar 3: Vaccination

EPIDEMIC PREPAREDNESS

- As soon as the alert threshold has been crossed in a district or sub-district based on number of cases in populations of less than 100 000, preparation should be made for a possible vaccination campaign (page 18).

DURING AN EPIDEMIC

- Once the epidemic threshold has been crossed in a district or sub-district and the Nm serogroup responsible is preventable by vaccination, it is essential that a vaccination campaign is conducted promptly (within four weeks of crossing the epidemic threshold) in both the population affected and any adjacent district or sub-district that is considered to be at risk (see page 18).
- A micro-plan and budget for each area targeted for mass vaccination should be finalized quickly (see page 13).
- The criteria for vaccine decisions should be reviewed (see page 22). The decision tree should be used flexibly to guide the decision; it is important to consider all epidemiological and laboratory information available in the country, particularly:
  - Analysis of geographic distribution can orientate more targeted actions.
  - Analysis by age group could lead to different age groups being targeted for vaccination or the use of different vaccines for different age groups.
  - Status of the MenA introduction roll-out should be considered, for instance:.
    - — If a MenA preventive campaign is planned, MenA vaccine might be preferable for the response.
    - — If a MenA campaign has already been conducted and MenA is identified, an investigation should be launched.
- In special situations (e.g. epidemic among displaced persons, or in refugee camps or closed institutions), different decision criteria can be applied.

REMEMBER!

As soon as an epidemic is confirmed, responding rapidly with vaccination will save more lives

- Sufficient amounts of vaccines must be immediately requested from either the ministry of health, which maintains the national stocks, or from the International Coordinating Group (ICG) on Meningitis Vaccine Provision, which manages the international emergency stockpile (see page 13).
- Once vaccine supplies have been confirmed, a public information campaign must be launched among all the communities in the target area.
- A cold chain to distribute the vaccines to the target areas must be established.
- Preparations must be made to manage the waste from the campaign.
- A system for monitoring adverse events following vaccination will be needed.
- A survey to estimate immunization coverage should be planned.

To access the ICG emergency vaccine stockpile

- Provide evidence of a meningococcal disease outbreak
- Provide laboratory confirmation of the Nm serogroup responsible
- Develop and provide plan(s) of action for the vaccination campaign(s)
- Provide proof of necessary storage and transportation resources to ensure the safe and effective delivery and maintenance of the vaccines to the area affected

The International Coordinating Group (ICG) on Meningitis Vaccine Provision manages the international emergency stockpile.

Request forms to be downloaded at: http://www.who.int/csr/disease/meningococcal/icg/en/

ICG email address: ICGsecretariat@who.int

PREPARING A VACCINATION MICRO-PLAN

A micro-plan must be prepared for every district targeted for a vaccination campaign. It is the responsibility of the district health authorities to complete and submit the plan in order to prepare thoroughly for the campaign and to secure the necessary vaccines.

The micro-plan should include:

- the names of sub-districts targeted for vaccination;
- the total population currently present in the target areas;
- the population targeted for vaccination;
- the type and quantity of vaccine needed;
- the quantity of additional supplies needed – AD syringes, safety boxes, dilution syringes (10 ml), cotton wool, gloves;
- the number of teams conducting the campaign (each team requires vaccinators, recorders, crowd controllers and a supervisor);
- the number of supervisors – at team, district, provincial and central levels;
- the mechanism for training the vaccination teams;
- logistic needs – cold-chain equipment, vehicles;
- the mechanism for managing waste resulting from the campaign;
- the plans for vaccination campaign coverage surveys.

The budget should include:

- allowances for members of the vaccination team;
- social mobilization costs (including allowances for staff);
- costs of logistic equipment;
- costs of waste management;
- immunization coverage survey.

Post-epidemic follow-up

A meningitis epidemic is declared to be over when the attack rate descends below the alert threshold over two consecutive weeks. Once that point has been reached, a number of follow-up activities are needed:

- continue weekly reporting of both cases and laboratory results to monitor decreasing trends;
- gather remaining stocks of antibiotics or reposition for use in treatment for other conditions;
- return any remaining stocks of vaccines to district stockpiles;
- dispose of all waste following vaccination campaigns;
- conduct a vaccination coverage survey;
- revert to the national endemic treatment protocol;
- evaluate the outbreak response and complete a report on the outbreak;
- propose feedback to stakeholders.

PART TWO

Useful reference material

Standard case definitions for bacterial meningitis

Suspected meningitis case:

Any person with sudden onset of fever (>38.5 °C rectal or 38.0 °C axillary) and neck stiffness or another meningeal sign including bulging fontanelle in toddlers.

Probable meningitis case:

Any suspected case with macroscopic aspect of CSF turbid, cloudy or purulent; or with a CSF leukocyte count >10 cells/mm^3; or with bacteria identified by Gram stain in CSF.

In infants: CSF leucocyte count >100 cells/mm^3; or CSF leucocyte count 10–100 cells/mm^3 AND either an elevated protein (>100 mg/dl) or decreased glucose (<40 mg/dl) level.

Confirmed meningitis case:

Any suspected or probable case that is laboratory confirmed by culturing or identifying (i.e. by polymerase chain reaction, immunochromatographic dipstick or latex agglutination) of *Neisseria meningitidis*, *Streptococcus pneumoniae* or *Haemophilus influenzae* type b in the CSF or blood.

Incidence thresholds for detection and control of epidemic meningococcal meningitis (2014)

	POPULATION	
Intervention	30 000–100 000	Under 30 000
Alert threshold — Inform authorities — Strengthen surveillance — Investigate — Confirm (including laboratory) — Prepare for eventual response	■ 3 suspected cases / 100 000 inhabitants / week (Minimum of 2 cases in one week)	■ 2 suspected cases in one week *Or* ■ An increased incidence compared to previous non-epidemic years
Epidemic threshold — Mass vaccination within four weeks of crossing the epidemic threshold — Distribute treatment to health centres — Treat according to epidemic protocol — Inform the public	■ 10 suspected cases / 100 000 inhabitants / week	■ 5 suspected cases in one week *Or* ■ Doubling of the number of cases in a three-week period (e.g. *Week 1*: 1 case, *Week 2*: 2 cases, *Week 3*: 4 cases)
	If a neighbouring area to a population targeted for vaccination is considered to be at risk (e.g. cases early in the dry season, no recent relevant vaccination campaign, high population density), it should be included in a vaccination programme.	
	In special situations such as mass gatherings, refugees, displaced persons or closed institutions, two confirmed cases in a week should prompt mass vaccination.	

How to collect CSF for laboratory analysis

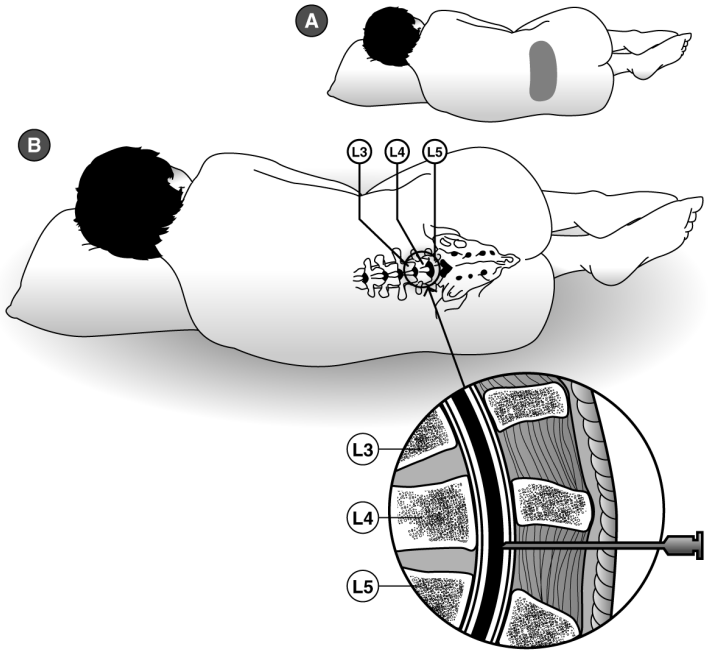
HOW TO PERFORM A LUMBAR PUNCTURE

What you need:

- lumbar puncture needles
- sterile tube and alcohol swabs
- sterile gauze pad
- adhesive bandage
- sterile gloves
- iodine
- adhesive labels.

Step by step:

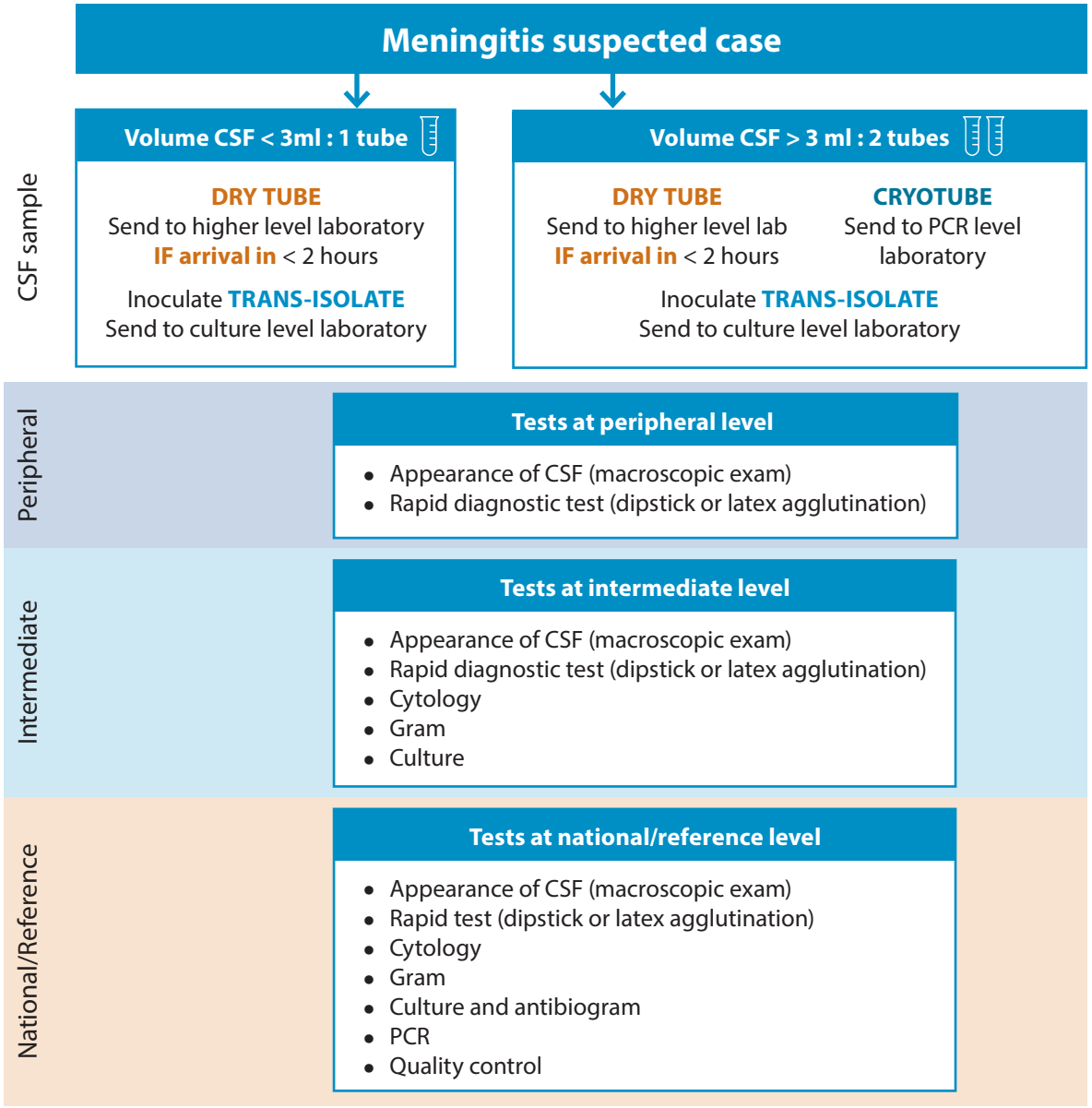
1. wash your hands
2. put on sterile gloves
3. disinfect the puncture site
4. locate the puncture site between L4 and L5 or L3 and L4
5. use a spinal needle to collect 1 to 3 ml of spinal fluid (CSF) in the sterile tube
6. dress the puncture site and allow the patient to lie flat for a minimum of 30 minutes.



A The patient lies on his/her side with knees flexed and back arched to separate the lumbar vertebrae, and the area overlying the lumbar spine is disinfected.

B The space between the L4 and L5 (or L3 and L4) is located and the spinal needle is carefully directed into the spinal canal.

Laboratory investigation of CSF samples



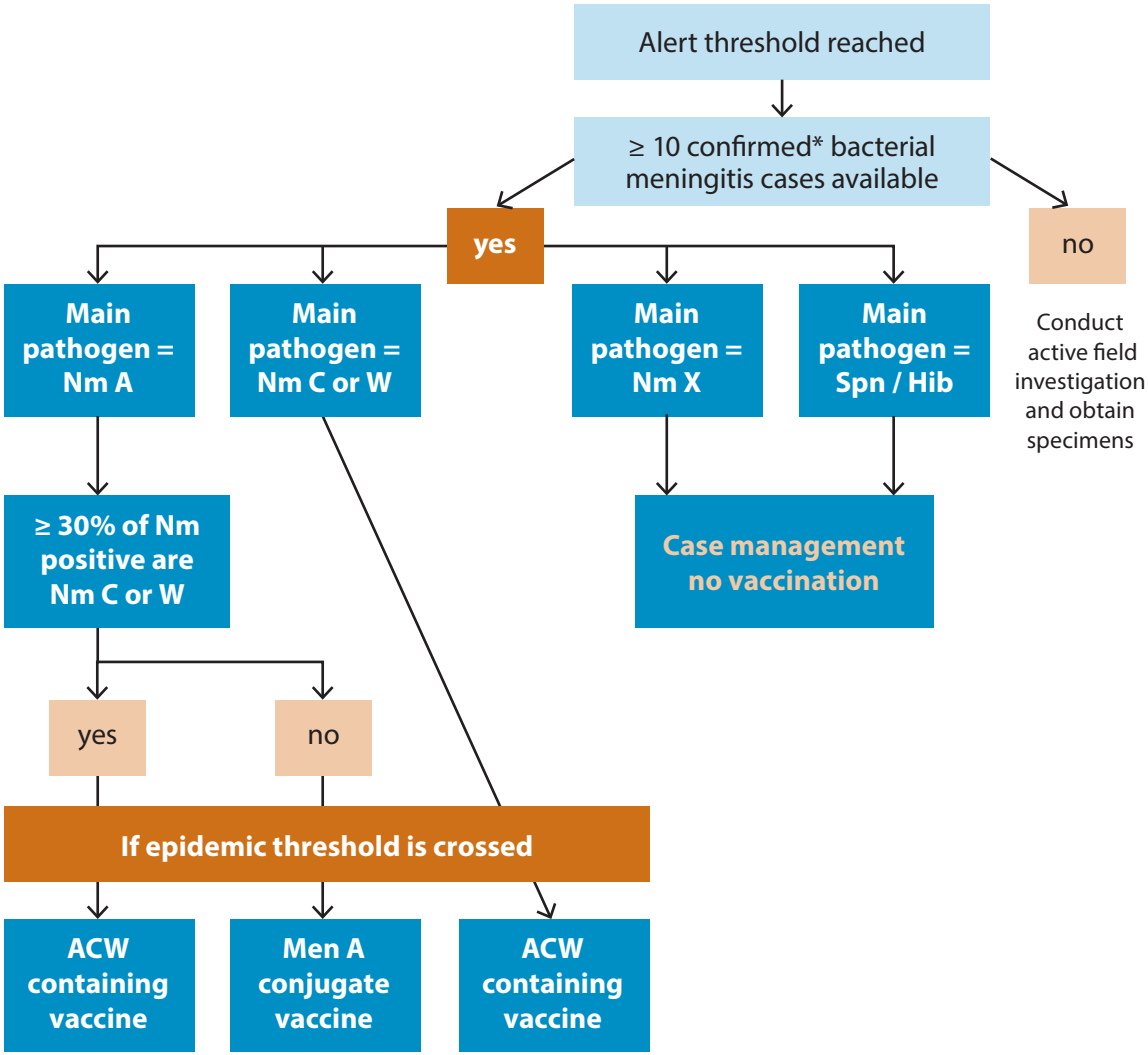
How to prepare CSF samples for transportation

REMEMBER!

- TI vials should never be frozen
- Before inoculation TI vials should be kept in the refrigerator
- Once inoculated, TI vials should be kept at room temperature
- Inoculated TI vials must be ventilated if not transported the same day.

- Inoculate Trans-Isolate (TI):
  - Remove a vial of TI medium from the refrigerator at least 30 minutes before inoculating it with the specimen.
  - Before inoculating the vial, check to see if there is any visible growth or turbidity. If there is visible growth or turbidity, discard the vial, because it may be contaminated.
  - Lift up the small lid in the middle of the metal cap on top of the TI vial.
  - Disinfect the top of the TI vial with alcohol and allow to dry.
  - With a new, sterile needle and syringe transfer 0.5 ml of CSF from the sterile tube into the TI vial.
  - If not transported the same day, puncture the top of the TI vial with a sterile needle to ventilate and ensure bacteria growth.
  - Keep the sample at room temperature away from light and cold.
  - Label the TI vial and complete the appropriate form.
  - TI vials should be forwarded to the district authority for onward transportation to a reference laboratory at least twice a week; remove the needle before placing the vial in triple packaging for travel.
- CSF in dry tube should be stored at room temperature and transported in triple packaging to the intermediate or reference laboratory only if it can arrive within 2 hours
- CSF in cryotube (1–2 ml, if CSF quantity is sufficient) should be stored at refrigerator temperature, approximately 4 °C (or freeze at -20 °C) and transported in cold chain to an intermediate or reference laboratory.

Indicative decision tree for meningitis vaccine choice in a reactive vaccination campaign



REMEMBER!

If there are NmA cases in the population already vaccinated with MenA conjugate, conduct field investigation.

* Confirmation includes a positive result from culture, polymerase chain reaction or rapid diagnostic test.

Treatment protocols for bacterial meningitis during meningitis epidemics* in Africa (without laboratory confirmation)

In children aged 0–2 months

Ceftriaxone 100mg/kg/day IM or IV once a day for 7 days

In children aged over 2 months

Ceftriaxone 100mg/kg/day once a day (maximum 2g) IM or IV for 5 days

In children aged >14 years and adults

Ceftriaxone 2g/day once a day IM or IV for 5 days

Transfer to higher-level health facility if no improvement within 48 hours, or if exhibiting convulsions or comatose

IM: Intramuscular (injection)
IV: Intravenous (injection)

REMEMBER!

Single-dose treatment with oily chloramphenicol or ceftriaxone is no longer recommended.

* Outside epidemics, treatment duration should be 7–10 days for all ages.

Antibiotic needs estimation

FORMULA	EXAMPLE
Total population in district	95 484
Likely cumulative attack rate for season (based on past epidemics)	120/100 000
Estimated number of cases during season (population × cumulative attack rate), less the number of documented cases	95 484 × 120/100 000 = 114 114 less 20 = 94
Plus additional 25 % buffer stock	94 plus 22 = 116
Antibiotics needed: Ceftriaxone treatment (10 1g-vials per adult)	116 × 10 = 1 160 vials of ceftriaxone
Plus water for injection, needles and syringes	

Information resources

International Coordinating Group (ICG) on Meningitis Vaccine Provision

Forms and guidelines for applying to the emergency stockpile: http://www.who.int/csr/disease/meningococcal/icg/en/index.html

Surveillance

Standard Operating Procedures for Enhanced Meningitis Surveillance (WHO-AFRO, 2015) http://www.afro.who.int/en/clusters-a-programmes/dpc/epidemic-a-pandemic-alert-and-response/epr-publications.html

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