# Infective Endocarditis

## *Executive summary*

## Introduction

## Infective endocarditis (IE) refers to infection of the endocardial surface of the heart; it usually refers to infection of one or more heart valves or infection of an intracardiac device.

### Target users

* Doctors

### Target area of use

* Ward
* OPD

### Key areas of focus / New additions / Changes

This guideline focuses on the diagnostic criteria and the anti- infective therapy for infective endocarditis. It covers treatment of bacterial and fungal infective endocarditis.

Users should take particular note of the indications for surgical intervention.

## Limitations

Patients requiring surgical intervention may need to be referred to surgeons outside of the Gambia.

## Risk factors

* Age >60 years
* Male sex
* Poor dentition or dental infection
* Heart problem: Structural heart disease, Valvular disease, Congenital heart disease
* Prosthetic valve
* History of prior IE
* HIV infection
* Injection drug use
* Chronic hemodialysis
* Intravascular device

## Pathogen

* *S.aureus* (31%)
* Viridans group streptococci (17%)
* Enterococci (11%)
* Coagulade-negative staphylococci (11%)
* *Streptococcus bovis* (7%)
* Other streptococci (5%)
* Non-HACEK gram-negative bacteria (2%)
* Fungi (2%)
* HACEK (2%): organisms in this category include a number of fastidious gram-negative bacilli: ***H****aemophilus aphrophilus,* ***A****ctinobacillus actinomycetemcomitans,* ***C****ardiobacterium hominis*; ***E****ikenella corrodens*; and ***K****ingella kingae*

## Presenting symptoms and signs

Fever is the most common symptom (> 90%). It is often associated with chills, anorexia, and weight loss.

Other common symptoms include malaise, headache, myalgia, arthralgia, night sweats, abdominal pain, dyspnoea, cough, and pleuritic pain. Note that these symptoms are non-specific and there may be not much more than a sense that something is wrong.

Patients with IE associated with dental infection may report tooth pain or related symptoms.

## Examination findings

Cardiac murmurs are the most common sign. Supportive signs include splenomegaly and cutaneous manifestations such as petechiae or splinter hemorrhages.

Relatively uncommon clinical manifestations that are highly suggestive of IE include:

* **Janeway lesions** – Nontender erythematous macules on the palms and soles.
* **Osler nodes** – Tender subcutaneous violaceous nodules mostly on the pads of the fingers and toes, which may also occur on the thenar and hypothenar eminences.
* **Roth spots** – Exudative, edematous hemorrhagic lesions of the retina with pale centers.

Complications as presenting symptoms:

* Cardiac complications (>50%) – Valvular insufficiency, heart failure, and others
* Neurologic complications (>40%) – Embolic stroke, intracerebral hemorrhage, brain abscess, and others
  + Septic emboli (>25%) – Infarction of kidneys, spleen, and other organs. In right-sided endocarditis, septic pulmonary emboli may be seen.
  + Spleen embolic: radiating abdominal pain that goes to the left shoulder
  + Renal: flank pain in the groin with possible pus or blood in the urine
  + Brain (stroke): changes in neuro status, confusion, speech difficulty
  + Pulmonary: chest pain, shortness of breath, dyspnea, decreased oxygen saturation
* Metastatic infection – vertebral osteomyelitis, septic arthritis, psoas abscess
* Systemic immune reaction – glomerulonephritis

**Diagnosis**

This is based on a combination of clinical suspicion, the presence of risk factors, examination findings and the following investigations:

* Urine dipstick (looking especially for blood)
* ECG
* ECHO
* Blood cultures – 3 samples each from 2 or more different sites at least 1 hour apart and ideally taking 10 ml of blood each time. These must be completed before antibiotics are started.

These results can be combined to formally make a diagnosis of IE using modified Duke criteria. Note that some patients will not meet these criteria in our setting, but will still have a high suspicion of IE and no alternative treatable diagnosis, so will need to be treated for IE anyway.

### Modified Duke criteria

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| **Major criteria** |
| ***Positive blood culture*** with common endocarditis pathogen (grown in 2 separate cultures) |
| ***Evidence of endocardial involvement*** either  Echocardiogram vegetation **OR**  New valvular regurgitation |
| **Minor criteria** |
| One of the risk factors |
| Fever (Documented temp => 38.0°C) |
| ***Vascular phenomena:*** major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhage, conjunctival hemorrhages, or Janeway lesions |
| ***Immunologic phenomena:*** Glomerulonephritis, Osler nodes, Roth spots, or rheumatoid factor |
| ***Microbiologic evidence:*** Positive blood cultures that do not meet major criteria **OR** serologic evidence of active infection with organism consistent with IE |

**Definite IE:** 2 major criteria *or* 1 major + 3 minor criteria *or* 5 minor criteria

**Possible IE:** 1 major + 1 minor criteria *or* 3 minor criteria

## Management

### Antibiotic therapy

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| --- | --- | --- |
|  | **Native heart valve** | **Prosthetic heart valve(s)** |
| Empiric  *(paediatric dosing)* | Ampicillin 2 g (*50 mg/kg*) q4h IV **AND**  Gentamicin 3 mg/kg OD IV | Ampicillin 2 g (*50 mg/kg*) q4h IV **AND**  Gentamicin 5 mg/kg OD IV **AND**  Rifampicin 600 mg (*10 mg/kg*) BD PO |

Note on usage of gentamicin for IE

The gentamicin dose is adjusted from UK guidelines (but is consistent with US / European guidelines) because we do not have access to the therapeutic drug monitoring necessary to safely dose gentamicin in a more than OD regimen.

eGFR must be calculated as soon as possible when gentamicin is started. If this is reduced below < 50 ml/min, then the dose of gentamicin should be reduced to by 50%. All patients expected to receive gentamicin for more than 1 week must have their U&Es checked 3 times per week and the gentamicin stopped as soon as there is any change in the results.

### Blood culture positive

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| --- | --- | --- | --- | --- |
|  | **Native heart valve** | | **Prosthetic heart valve(s)** | |
| **Pathogen** | **Dose** (*paediatric dosing)****)*** | **Duration (weeks)** | **Dose** *paediatric dosing****)*** | **Duration (weeks)** |
| *S.aureus* (Methicillin sensitive) | Cloxacillin 2 g (*50 mg/kg*) QDS IV | 4 | Cloxacillin 2 g (*50 mg/kg*) QDS IV **AND**  Rifampicin 600 mg (*10 mg/kg*) BD PO | 6  6 |
| MRSA | Requires vancomycin or teicoplanin and rifamipicin. Would be very difficult to treat in our setting. | | |  |
| *Streptococcus* spp | Benzylpenicillin 2.4 g (*35 mg/kg*) q4h IV **AND**  Gentamicin 3 mg/kg OD IV | | | 4-6  2 |
| *Enterococcus* | Ampicillin 2 g (*30 mg/kg*) q4h IV **AND**  Gentamicin 3 mg/kg OD IV | | | 4-6  4-6 |
| HACEK | Ceftriaxone 2 g (*80 mg/kg*) OD IV **AND**  Gentamicin 3 mg/kg OD IV | | | 4-6  2 |

### Blood culture negative

It is not possible to distinguish between different causes of blood culture negative IE in our setting. Therefore, empiric treatment is used as below where good quality blood cultures taken before antibiotic therapy are negative and there is suspicion of possible infection with *Brucella*, *Coxiella burnetii* or *Bartonella*. Specialist advice should be sought about this as soon as possible.

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| **Agent** | **Dose** (*paediatric dosing)* | **Duration (weeks)** |
| Empiric | Doxycycline 200 mg (*4.4 mg/kg*) OD PO **AND**  Ceftriaxone 2 g (*80 mg/kg*) OD IV **AND**  Gentamicin 3 mg/kg OD IV | 6 (may need to be longer)  4 |

Note doxycycline cannot be used below the age of 12 years.

### Fungal endocarditis

Fungal endocarditis is most common in patients with prosthetic valves, but also occurs in intravenous drug abusers, neonates and immunocompromised patients. Mortality is very high (50%), and treatment necessitates combined antifungal administration and surgical valve replacement.

Unfortunately, we do not have access to the necessary drugs, so the best we can do is use high dose fluconazole.

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| --- | --- | --- | --- |
| **Agent** | **Primary** | **After patient is stable** | **Duration** |
| **Dose** *(paediatric dosing)* | Fluconazole 1200 mg *(18 mg/kg) OD PO* | Fluconazole 800 mg (12 mg/kg) OD PO | For at least 6 weeks after surgery  \*For patients who cannot undergo valve replacement; lifelong |

In case a patient has the means to purchase more effective drugs, they would need to be given amphotericin and flucytosine.

**Indications for Surgery**

Ideally, a surgical opinion should be sought for every patient with endocarditis. Unfortunately, this is not possible here for most patients. However, it may be possible to discuss children with endocarditis with the Chain of Hope team. The indications for surgery are listed below.

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| **Heart Failure** |
| Aortic or mitral IE with:   * Severe acute regurgitation or valve obstruction * Persistent heart failure * Refractory pulmonary oedema / cardiogenic shock |
| **Uncontrolled infection** |
| * Abscess, false aneurysm, enlarging vegetation * Persisting fever and positive blood culture for > 10 days after commencing appropriate antimicrobial therapy * Caused by fungi or multiresistant micro organisms |
| **Prevention of embolism** |
| * Large vegetations (> 10 mm) + embolic episodes * Large vegetations (> 10 mm) + other predictors of complicated cause * Very large vegetation (> 15 mm) |

**Endocarditis Prophylaxis**

**Indication**: A cardiac condition AND a procedure

**Cardiac conditions**: Prosthetic valve, unrepaired cyanotic congenital heart disease, some patients with repaired congenital heart disease (check online for current guidance), previous infective endocarditis.

**Procedures**:

1. Dental procedure: manipulation of gingival tissue or periapical region of teeth or perforation of the oral mucosa.
2. Respiratory procedure: incision or biopsy of respiratory mucosa.

**Regimens**: Amoxicillin 2 g IV (Penicillin allergic: clindamycin 600 mg PO)

**Timing**: 30-60 min before the procedures

## Key Issues for Nursing care

* Monitor vital signs especially temperature, heart rate, blood pressure, oxygen saturation.
* Educate the patient about:

1. The need to inform other healthcare practitioners about history of endocarditis because they are at risk for it again and will need prophylactic antibiotics prior to invasive procedures
2. How to take or administer antibiotics (complete all doses)
3. The importance of good oral care.

## References

Guidelines for the diagnosis and antibiotic treatment of endocarditis in adults: Journal of Antimicrobial Chemotherapy, Volume 67, Issue 2, 1 February 2012, Pages 269–289

2015 ESC Guidelines for the management of infective endocarditis: European Heart Journal (2015) 36, 3075–3123 doi:10.1093/eurheartj/ehv319

Up to date: Antimicrobial therapy of prosthetic valve endocarditis: last updated: Sep 06, 2018

Up to date: Clinical manifestations and evaluation of adults with suspected native valve endocarditis last updated: Apr 27, 2018

Up to date: Epidemiology, risk factors, and microbiology of infective endocarditis: last updated: Oct 26, 2018.

Up to date: Infective endocarditis in children: last updated: Nov 29, 2017.

Endocarditis NCLEX Review| Registered Nurse RN. com| NCLEX Review. Web. 19 Aug. 2016

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| **Written by:** | Name: Eriko Ikeda | Date: 16 November 2018 |
| **Reviewed by:** | Name: Karen Forrest | Date: 21 November 2018 |
|  | Name: Thushan de Silva | Date: 21 November 2018 |
| **Version:** | **Change history:** | **Review due date:** |
| 1.0 | New document | 31 January 2021 |
| 1.1 | Executive summary added | 31 January 2021 |
| Review Comments (*if applicable)* |  |  |