UNIVERSITY OF NAIROBI

Kenyatta National Hospital Guidelines on Antibiotics use for Surgical Prophylaxis

2nd Edition 2023

Foreword

Antimicrobial stewardship programs provide coordinated strategies that promote appropriate use of antimicrobial medications to improve patient outcomes, reduce microbial resistance as well as decrease infections caused by multi-drug resistant organisms. The development of this guide was spearheaded by the KNH Antimicrobial Stewardship Committee as an important strategy in meeting this goal.

This guide seeks to promote appropriate and effective prescribing of antibiotics for surgical prophylaxis and gives a pointer to situations where antibiotics are not useful.

There are many factors in a patient's journey through surgery that can contribute to the risk of surgical site infection. This guideline aims to standardize the prescribing of surgical antimicrobial prophylaxis at the Kenyatta National Hospital.

The prevention of surgical site infections is complex and requires integration of various measures-before, during and after surgery. These guidelines should be used together with other measures for prevention of surgical site infections to enhance quality of patient care and improve clinical outcomes.

On behalf of the KNH management, I wish to thank and acknowledge United Kingdom Agency for International Development (UKAID) through the Fleming Fund for the support provided in reviewing these guidelines and printing them.

We encourage all health care workers to adhere to these guidelines.

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Editorial Note

This guideline has been developed by a multidisciplinary team comprising surgical and medical specialists, microbiologists, clinical pharmacists, infection prevention and control specialists and the Medicine and Therapeutics Committee of the Kenyatta National Hospital.

The document gives guidance on classification of surgical procedures according to the likelihood of post-surgical infections, organisms likely to cause infections at various surgical sites and suggests the most appropriate antibiotic choice and duration of the same. It is important to select an antibiotic with the narrowest antibacterial spectrum required, to reduce the emergence of multi-resistant pathogens.

This guideline should be implemented by all the relevant health care providers and where there is need for significant variation in antimicrobial choice, the Infectious Disease or antimicrobial stewardship team at the hospital should be consulted.

This is the first edition of the guideline and will be regularly updated in line with changes in medical information and local data.

Signed

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Introduction

Surgical site infections (SSIs) are defined as infections that occur up to 30 days after surgery (up to one year after surgery in patients receiving implants). They affect either the incision or deep tissue at the operation sites. SSIs remain a significant clinical problem associated with substantial mortality and morbidity despite improvements in their prevention, the incidence may be as high as 20% depending on the procedure.

Most SSIs are caused by organisms that are endogenous to the patient, with the commonly isolated organisms being *Staphylococcus aureus,* coagulase -negative staphylococci, *Enterococcus* spp., and *Escherichia coli*. It is imperative that we follow guidelines for prevention of SSIs including good patient preparation, aseptic practice and attention to surgical techniques; antimicrobial prophylaxis is indicated in specific circumstances.

The goal of antimicrobial prophylaxis is to reduce the incidence of post-operative wound infection by reducing the numbers of viable bacteria to levels which are unlikely to overwhelm the host defense and prevent infection from occurring.

Table 1: Surgical wound classification and subsequent risk of infection (prophylaxis not recommended)

Classification	Description	Infective Risk (%)
Clean (Class I)	Uninfected operative wound No acute inflammation Closed primarily Respiratory, gastrointestinal, biliary, and urinary tracts not entered No break in aseptic technique Closed drainage used if necessary	**< 2**
Clean-contaminated (Class II)	Elective entry into respiratory, biliary, gastrointestinal, urinary tracts and with minimal spillage No evidence of infection or major break in aseptic technique. Example: appendectomy	**< 10**
Contaminated (Class III)	Non- purulent inflammation present Gross spillage from gastrointestinal tract Penetrating traumatic wounds < 4 hours Major break in aseptic technique	**About 20**
Dirty-infected (Class IV)	Purulent inflammation present Preoperative perforation of viscera Penetrating traumatic wounds >4 hours	**About 40**

RECOMMENDATIONS

- Antimicrobial prophylaxis should be considered where there is a clear indication, a risk of postoperative infection, or if postoperative infection will have serious consequences.
- The recommended antimicrobial prophylaxis regimens are for specific surgical procedures, and include alternative regimes for patients with a high risk of penicillin/ cephalosporin allergy.
- If pre-existing infections at surgical site (known or suspected) are present, use an appropriate treatment regimen instead of prophylactic regimen for procedure.
- Consider individual risk factors for every patient – need for prophylaxis, drug choice or dose may need to be altered (e.g., immune suppression, presence of prostheses, allergies, obesity, malnutrition, diabetes, infection at another site, available pathology or malignancy).
    - Antibiotic prophylaxis does not substitute for good surgical technique.
    - **Local epidemiology:** Modify antibiotic prophylaxis if there is a high local incidence of specific infections.
    - **Obese patients:** Consider increased dose of cefazolin (3g) if patient is obese (>120kg). Consult Infectious Disease specialist for advice.

Drug administration

- IV bolus – should be timed ≤ 60 minutes before skin incision (optimal 15-30 minutes). Administration after skin incision or > 60 minutes before incision reduces effectiveness.
- IV infusion – should be commenced 30-60 minutes prior to skin incision (e.g., metronidazole).
- See appendix 1 for dose adjustment in renal insufficiency.

Repeat intra-operative doses

A single pre-operative dose is sufficient for most procedures; however, repeat intra-operative doses are advisable:

- for prolonged surgery (> 4 hours from the time of the first pre-operative dose) when a short-acting agent is used (e.g., cefazolin); or if the procedure exceeds two half-lives of the drug
    - Or
- If major/rapid blood loss occurs (over 1.5litres), and/or following fluid resuscitation.

MRSA Risk

Definition: history of methicillin-resistant S. aureus (MRSA) colonization or infection or inpatient of high-risk hospital or unit (where MRSA is endemic) for more than the last 5 days; add vancomycin.

Prophylaxis regimen: Give vancomycin 1g (1.5g for patients >80kg actual body weight) by IV infusion started 30-120 minutes before surgical incision and given at a recommended rate of 1g per hour (1.5g over 90 minutes).

High risk penicillin/cephalosporin allergy

Careful history taking about antimicrobial allergies should be carried out to determine whether a true allergy exists before selection of an agent for prophylaxis. History should include exact details of the reaction, including description of reaction e.g., rash, timing of reaction, reason for antibiotic prescription, other antibiotics received since then.

Types of Penicillin allergy

Severe penicillin allergy includes;

- Immediate: Type Ig-E mediated hypersensitivity reactions such as hives, angioedema, wheezing, anaphylaxis
- Late reactions: Hemolytic anemia, thrombocytopenia, serum sickness, drug reaction with eosinophilia, Steven Johnson syndrome (SJS)/ Toxic epidermal necrolysis (TEN)
- **Do not re-challenge**
- Alternative prophylactic regimes (e.g., with Vancomycin, Clindamycin, Erythromycin) are provided in the guidance tables as per the specific indications**.**
- **Non-severe penicillin allergy** includes:
- Rash and other non-allergic reactions such as gastrointestinal intolerance.
- **Re-challenge or use alternative beta lactam**

General guidance when prophylaxis is not recommended:

- Bronchoscopy unless incision or biopsy of respiratory mucosa
- Gastrointestinal and genitourinary procedures unless indicated for surgical reasons.

Surgical Prophylaxis Guidelines

A. Cardiothoracic and Vascular Procedures

Table 2: Cardiac Surgery

Procedure	Common organisms	Recommended Prophylaxis
Valve Replacement Surgery	*Staphylococcus aureus, Coagulase-negative staphylococci, Corynebacteria*	**Cefazolin 2g** for patients > 80kg and **1g** for < 80kg, initiated 30 to 60 minutes before skin incision Repeat dose of 1 g in patients with normal renal function every 3-4 hours if surgical incision still open or with massive blood loss. If apparent that cardiopulmonary bypass will be discontinued in 4hrs can delay until off bypass/ pump to maximize effective blood levels **Cefazolin dose for children**: 50mg/kg initiated 30 to 60 minutes before skin incision then intra-operatively, 30mg/kg every 4hours and post-operatively 30mg/kg/dose 8 hourly for 24 hours **Addition of adjuvant vancomycin ONLY IF**: • Setting of presumed or known staphylococcal colonization **OR** • Institutional presence of high incidence of MRSA **OR** • Patients susceptible to colonization e.g., Hospitalized more than 3 days, transfer in from another in-patient facility or already on antibiotics **OR** • Re-do surgery in patients with prosthetic valves **Vancomycin** dose of **1 to 1.5 g** or weight adjusted 15mg/kg administered slowly over 1 hour and completion within 1hour of the skin incision. May repeat a dose of 7.5mg/kg during cardiopulmonary bypass although usefulness not well established.
Coronary Artery Bypass Surgery (CABG)	*Staphylococcus aureus, Coagulase-negative staphylococci, Corynebacteria*	**Cefazolin 2g** for patients > 80kg and **1g** for < 80kg, initiated 30 to 60 minutes before skin incision Repeat dose of 1g every 3-4 hours for patients with normal renal function, if incision is still open or there is massive blood loss (this can be given as a continuous infusion).

Post-operative antibiotics (>24 hours from first dose) are NOT indicated unless infection is confirmed or suspected, regardless of the presence of surgical drains. If infection is suspected, consider modification of antibiotic regimen according to clinical condition and microbiology results.

Table 3: Thoracic Surgery

Procedure	Common organisms	Recommended Prophylaxis
Pneumonectomy / Lobectomy	*Staphylococcus aureus* *Coagulase negative staphylococci, Coliforms* *Streptococcus species*	**Cefazolin 2g** for patients > 80kg and **1g** for < 80kg, initiated 30 to 60 minutes before skin incision **THEN** **Cefazolin 2g IV** (child: 30mg/kg up to 2g) 8- hourly for 2 more doses commencing 4 hours after the initial dose *If anaerobic cover required (empyema or abscess) then* ADD: **Metronidazole 500mg IV infusion** commenced 30-60 minutes prior to skin incision (child: 12.5mg/kg), repeated 12 hourly for 2 more doses commencing 6 hours after initial dose
Decortication / Pleurectomy	*Staphylococcus aureus* *Coagulase negative staphylococci* *Coliforms*	Peri-operative antibiotics for empyema should be based on culture and sensitivity. If culture and sensitivity results not available: 1. For community acquired: **Cefuroxime 1.5 g** with **metronidazole 500mg** or **clindamycin 600mg** alone 2. For hospital acquired empyema: **Ceftazidime 2g**
Video-assisted thoracoscopic surgery (VATS)	*Staphylococcus aureus* *Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** commenced 30-60 minutes prior to skin incision (child: 30mg/kg up to 2g)

Procedure	Common organisms	Recommended Prophylaxis
Tube thoracostomy (in setting of trauma) **No prophylaxis needed for tube thoracostomies done in non-traumatic settings**	*Staphylococcus aureus* or *Streptococcus species*	**Cefazolin 1** to **2g** for a maximum of three doses. In penicillin allergy cases: **Vancomycin 1g (**1.5g for >80kg) as infusion or **clindamycin** 600**-900mg** are appropriate alternative choices.
Esophageal surgery	*Enteric gram-negative bacilli* *Streptococci* *Oropharyngeal anaerobes*	**Cefazolin 2g** for patients > 80kg and **1g** for < 80kg, initiated 30 to 60 minutes before skin incision Repeat dose of **1g** in patients with normal renal function then 1g 8 hourly for 24 hours In penicillin allergy: **Vancomycin 1g (**1.5g for >80kg) as infusion then 12 hourly for 24 hours If high anaerobic burden e.g., with perforation: Add **Clindamycin 600mg** 8 hourly for 3 doses.

Table 4: Vascular Surgery

Procedure	Common organisms	Recommended Prophylaxis
Vascular reconstruction (e.g. abdominal aorta, graft/stent insertion, groin incision)	*Staphylococcus aureus* *Coagulase negative staphylococci* *Corynebacteria* *Coliforms in groin incisions*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g), repeated 8-hourly for 2 further doses post- operatively
Amputation of ischaemic limb	*Staphylococcus aureus* *Coagulase negative staphylococci* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) repeated 8-hourly for 2 further doses post- operatively **PLUS** **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg), repeated 12 hours after initial dose)
Primary autogenous arteriovenous fistula (AVF) formation	**Prophylaxis NOT recommended**	
AVF revision or AVF with insertion of prosthetic material (e.g Dacron graft)	*Staphylococcus aureus* *Coagulase negative staphylococci* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g)
Venous insufficiency surgery	**Prophylaxis NOT recommended**	

B. Gastrointestinal Procedures

Table 5: Endoscopic Gastrointestinal Procedure

Procedure	Common organisms	Recommended Prophylaxis
Percutaneous Endoscopic Gastrostomy/Jejunostomy (PEG/PEJ) insertion/revision	*Coliforms* *Peptostreptococci*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (Child: 30mg/ kg up to 2g) **PLUS** consider adding **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg) in complicated cases
Endoscopic Retrograde Cholangiopancreatography (ERCP) (For patients with a high risk of infection, e.g. known or suspected biliary obstruction, biliary sepsis, pancreatic pseudocyst)	*Coliforms* *Anaerobes* *Enterococci*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/ kg up to 2g) **OR** **Gentamicin 2mg/kg IV** **PLUS** consider adding **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg)
Endoscopic ultrasound-guided fine-needle aspiration	*Coliforms* *Anaerobes* *Enterococci*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/ kg up to 2g) **PLUS** **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg)
Sclerotherapy	*Coliforms* *Anaerobes* *Enterococci*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/ kg up to 2g)
All other procedures (with or without biopsy), e.g. endoscopy, colonoscopy, sigmoidoscopy, oesophageal dilatation	**Prophylaxis NOT recommended**	

Table 6: Gastrointestinal Surgery

Procedure	Common organisms	Recommended Prophylaxis
Gastric / duodenal / Oesophageal (bypass, resection, ulcer oversew, esophagectomy etc.)	*Coliforms (e.g. Escherichia coli, Klebsiella, Citrobacter, Enterobacter)*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) **PLUS** **Metronidazole 500mg IV** (Child: 12.5mg/kg up to 500mg)
Biliary procedures (including laparoscopic procedures)	*Escherichia coli* *Anaerobes*	**OMIT metronidazole if low risk as defined by:** • Upper GI surgery: normal gastric acidity/mobility; no obstruction, bleeding, or malignancy; no previous gastric surgery • Biliary tract surgery: patient < 60yrs of age; no diabetes; elective cholecystectomy with low risk of exploration of common bile duct
Colorectal (Colon/small bowel resection, revision of anastomosis/stoma, appendectomy etc.) **Pancreatic** (Whipple's etc.) **Liver resection** **Exploratory laparotomy/ division of adhesions**	*Coliforms, Anaerobes, Enterococci*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (Child: 30mg/ kg up to 2g) **PLUS** **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg) **PLUS** **Gentamicine 2mg/kg IV**
Hernia repair	**Prophylaxis NOT recommended** when mesh is **not** inserted	
Hernia repair with mesh insertion	*Staphylococcus aureus, Coagulase negative staphylococci*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/ kg up to 2g)

Post-Operative Care

Except where included above, post-operative antibiotics are NOT indicated unless infection is confirmed or suspected, regardless of the presence of surgical drains.

If infection is suspected, consider modification of antibiotic regimen according to the clinical condition and microbiological results.

C. Neurosurgery

Table 7: Neurosurgery

Procedure	Common organisms	Recommended Prophylaxis
Elective Craniotomy procedures	*Coagulase negative staphylococci* *Staphylococcus aureus* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) Penicillin allergy: **Vancomycin 1g IV** infusion (1.5g for patients > 80kg actual body weight)
Emergency Craniotomy Procedures	*Coagulase negative staphylococci* *Staphylococcus aureus* *Corynebacteria*	**Cefazolin 2g IV** stat (Child 30mg/ kg) Penicillin allergy: **Vancomycin 1g IV** or **Clindamycin** (600mg IV if <70kg, 900mg if>70kg)
Procedure with involvement of Paranasal Sinuses (including Trans-sphenoidal and Skull base procedures)	*Streptococcus pneumoniae,* *Haemophilus influenzae,* *Moraxella catarrhalis*	**Cefazolin 2g IV** and **Clindamycin (600mg IV** initiated 30 to 60 minutes before skin incision if <70kg, 900gms if>70kg) Penicillin allergy: **Vancomycin 1g IV** or **Clindamycin** (600mg IV if <70kg, 900mg if>70kg)
Elective spine surgery	*Gram positive staphylococci and propionibacterium*	**Cefazolin 2g IV** or **Amoxicillin+ clavulanic acid 1.2g** at induction and a repeat 8 hrs later Penicillin allergy**: Vancomycin 1g IV** or **Clindamycin** (600mg IV if <70kg, 900mg if>70kg)
Insertion of Implants	*Coagulase negative* *staphylococci* *Staphylococcus aureus* *Corynebacteria*	**Vancomycin 1g IV** infusion (1.5g for patients > 80kg actual body weight) and **Ceftazidime 2g IV** Penicillin allergy**: Vancomycin 1g IV** or **Clindamycin** (600mg IV if <70kg, 900mg if>70kg)

Procedure	Common organisms	Recommended Prophylaxis
Ventriculo- peritoneal Shunting and insertion of External ventricular Drains	*Coagulase negative staphylococci.* *Staphylococcus aureus* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) Penicillin allergy: **Vancomycin 1g IV** infusion (1.5g for patients > 80kg actual body weight)
Other minor clean procedures	**Prophylaxis NOT recommended**	

D. Obstetric and Gynecology

Table 8: Gynecologic Surgery

Procedure	Common organisms	Recommended prophylaxis
Dilation & Curettage / Evacuation for lost pregnancy	*Coliforms Enterococci* *Group B streptococci*	**Amoxicillin+clavulanic acid 1.2g** Stat For penicillin allergy: **Clindamycin 900mg IV** plus **Gentamicin 5mg/kg**
Total abdominal hysterectomy, radical hysterectomy and laparoscopic hysterectomy	*Staphylococcus aureus* *Coliforms Enterococci* *Group B Streptococci*	**Cefazolin 2g IV** (3g if patient is >120kg) Repeat dose after 3hours if surgery prolonged
Vaginal Hysterectomy	*Coliforms Enterococci* *Group B Streptococci*	**Cefazolin 2g IV** plus **Metronidazole 500mg IV**
Diagnostic Laparoscopy without breach of bowel, uterine or vaginal cavity	**Prophylaxis NOT recommended**	
Operative Laparoscopy	*Coliforms, Enterococci* *Group B Streptococci*	**Cefazolin 2g IV** Stat
Diagnostic and Operative hysteroscopy	**Prophylaxis NOT recommended**	
Open myomectomy	*Coliforms, Enterococci* *Group B Streptococci*	**Cefazolin 2g IV** Stat
Laparatomy for ectopic pregnancy	*Coliforms, Enterococci* *Group B Streptococci*	**Cefazolin 2g IV** Stat
Insertion of IUD, contraceptive implants	**Prophylaxis NOT recommended**	
Vesico-vaginal fistula (VVF)	*Coliforms, Enterococci*	**Amoxicillin+clavulanic acid 1.2g** Stat **OR** **Gentamicin 80 mg** Stat given immediately pre-op or intra-op

Procedure	Common organisms	Recommended prophylaxis
Recto-vaginal Fistula (RVF)	*Coliforms, Enterococci*	**Amoxicillin+clavulanic acid 1.2g** Stat **OR** **Gentamicin 80 mg** **PLUS** **Metronidazole 1g** STAT given intraoperatively
Valvectomy	*Coliforms, Enterococci* *Group B Streptococci* *Staphylococcus aureus*	**Cefazolin 2g IV** Stat

Table 9: Obstetrics Surgery

Procedure	Common organisms	Recommended prophylaxis
Postpartum Bilateral Tube Ligation (BTL)	**Prophylaxis NOT recommended**	
Cervical Cerclage	**Prophylaxis NOT recommended**	
Emergency or elective Caesarean Section (no labor, no rupture of membranes)	*Staphylococcus aureus, Coliforms Enterococci, Group B Streptococci*	**Cefazolin 2g IV** Penicillin allergy:
Emergency or elective Caesarean Section where there is need for broader spectrum antibiotics: • **Prolonged labour (>24hrs)** • **Prolonged rupture of membranes (>24hrs)** • **multiple number of vaginal examinations (>5 examinations)** • **post-partum** • **hemorrhage (PPH) or anemia** **Difficult or prolonged surgery due to adherence of placenta or numerous adhesions**	*Staphylococcus aureus, Coliforms Enterococci Group B Streptococci*	**Cefazolin 2 g IV** and **Azithromycin 500mg IV**
Emergency Caesarean Section with Chorioamnionitis	*Staphylococcus aureus Coliforms, Enterococci, Group B Streptococci*	**Amoxicillin+clavulanic acid 1.2g** 8hourly **PLUS** **Metronidazole 500mg** 8 hourly **Treat for 5 days** Samples for bacteriology should be taken before initiating antibiotics
Normal vaginal delivery	**Prophylaxis NOT recommended except** in case of 3rd or 4th degree tears	

Procedure	Common organisms	Recommended prophylaxis
Perineal Tear **1st or 2nd degree perineal tear**	**Prophylaxis NOT recommended**	
3rd and 4th degree perineal tear	*Coliforms, Enterococci, Group B Streptococci*	**Cefazolin 2g** Stat
Assisted Vaginal Delivery (vacuum delivery and forceps delivery)	*Coliforms, Enterococci Group B Streptococci*	**Amoxicillin+clavulanic acid 1.2g** stat before the procedure
Manual removal of placenta	**Prophylaxis NOT recommended**	
Labour, epidural analgesia	**Prophylaxis NOT recommended**	

Special considerations

In penicillin allergy use **Clindamycin 900mg IV** prior to incision; may repeat in 6 hours; (Maximum single dose: 900mg)

OR

Vancomycin 1g IV, administered 30 to 60 minutes prior to incision. No re-dosing required perioperatively.

Patients already on antibiotics: dosing adjustment to allow for dosing prior to surgical procedure

Table 10: Prevention of Early Onset Group B Streptococcal Infections

Prevention of early onset neonatal Group B Streptococci (GBS)

Intrapartum antibiotic prophylaxis to reduce the risk of GBS early onset disease is based on:

1. Decreasing the incidence of GBS colonization which requires adequate maternal drug levels
2. Reducing the risk of neonatal sepsis which requires adequate antibiotic levels in the fetus and newborn

Universal bacteriology screening is not recommended.

Clinical Risk factors of having baby with early onset of neonatal GBS will determine bacteriological screening

For those at risk there is a 50% chance of GBS in current pregnancy. The management options include:

Option 1: Intrapartum antibiotic prophylaxis to the at-risk woman

Option 2: Perform bacteriological testing at 35-37 weeks gestation

OR

3-5 weeks prior to anticipated delivery date

Option 3: Women with previous baby affected by GBS, intra-partum antibiotic prophylaxis is given

NB: Maternal request is not an indication for bacteriological screening

Option 4: For women with GBS bacteriuria treat when detected and offer intrapartum antibiotic prophylaxis.

Membrane sweeping is not contraindicated in women who are carriers of GBS

Antibiotic prophylaxis specific for GBS is not required for women undergoing planned caesarian section in absence of labor and with intact membranes

Offer intrapartum antibiotic prophylaxis for GBS carriers undergoing induction of labor

Women with fever in labor (38 degrees C or more) should be offered a broad-spectrum antibiotic with GBS cover intra-partum

Intrapartum antibiotic prophylaxis for women with confirmed preterm labor and premature rupture of membranes

For patients with Preterm premature rupture of membranes, obtain vaginal-rectal swab for GBS culture and start antibiotics which include coverage for GBS prophylaxis.	
Not allergic to penicillin	**Penicillin G 5million units IV** load then 2.5- 3 Million Units IV every 4 Hours until delivery. OR **Ampicillin 2g IV** Load then **1g** Every 4 Hours until delivery
Allergic to Penicillin	• Low Risk penicillin allergy **Cefazolin 2gm IV** load then **1g IV** every 8 Hours until delivery • High risk penicillin allergy Request Clindamycin susceptibility on lab sample Clindamycin susceptible GBS give **Clindamycin 900mg IV** every 8 Hours until delivery Clindamycin resistant GBS give Vancomycin 20mg/kg every 8Hours (max single dose 2g) minimum infusion time is 1 hour or 500mg for 30min for a dose more than 1g. • Unknown Risk Penicillin allergy testing administer a **Cefazolin 2gm IV** load then **1g IV** every 8 Hours until delivery OR Administer clindamycin if isolate susceptible Administer vancomycin if GBS not susceptible to clindamycin

Notes:

This section will be updated as evidence from laboratory data is generated.

Low Risk Penicillin Allergy: Individuals with a history of any of the following non-specific symptoms: Gastrointestinal distress, headaches, yeast vaginitis, non -urticarial maculopapular rash without systemic symptoms, pruritis without a rash, family history of penicillin allergy but no personal history, patient reports history but has no recollection of symptoms

High Risk Penicillin Allergy: Individuals with a history of any of the following after administration of penicillin; pruritic rash, urticaria, immediate flashing, hypotension, angioedema, respiratory distress or anaphylaxis, recurrent reactions, SJS syndrome.

Unknown Risk: No information available to direct which antibiotic choice is best in this scenario

E. Orthopedic Procedures

Table 11: Orthopaedic Surgery

Procedure	Common organisms	Recommended Prophylaxis
Internal fixation of large bones	Skin commensals **e.g.** *Staphylococcus aureus, Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child <12 years: 30mg/ kg up to 2g) THEN **Repeat 8-hourly for 2 further doses. (Max 3 doses irrespective of the presence of surgical drains)**
Other (closed) internal fixation	Skin commensals e.g., *Staphylococcus aureus*, *Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** (child < 12 years: 30mg/ kg up to 2g)
Open fractures	The commencement of broad-spectrum antibiotics should be within 3 hours of injury and should continue until first debridement1. Farm injuries, heavy contamination, or possible bowel contamination - add high dose penicillin for anaerobic coverage (clostridium)	
Gustilo type Iand II	*Staphylococcus aureus*	**Amoxicillin + Clavulanic acid 1.2g**, 8 hourly **OR** **Cefazolin 1g**, 8 hourly Penicillin allergy: **Clindamycin 600 mg IV**, 6 hourly preoperatively **Duration - 24 hours post-surgery**

Procedure	Common organisms	Recommended Prophylaxis
Gustilo type III	*Staphylococcus aureus*	**Amoxicillin + clavulanic acid 1.2g**, 8 hourly **OR** **Cefazolin 1g**, 8 hourly **PLUS,** Gentamicin **(1.5 mg/kg),** 8 hourly **PLUS, Metronidazole 500mg,** 8 hourly Duration of treatment- 72 hours after surgery or within 24 hours after skin closure. Please justify need for on-going antibiotic use (Note that longer duration of antibiotic therapy has not been shown to reduce the incidence of infection)
Type III fractures and potential water or sewage exposure	*Pseudomonas spp.*	**Ceftazidime 2 g IV** 8 hourly **OR** **Cefepime 2 g IV** 6 hourly for 72 hours after surgery
Arthroscopic and other clean procedures not involving foreign material (e.g. pins, plates)	**Prophylaxis NOT recommended**	
Lower limb amputation	**Risk of anaerobic infection e.g., gas gangrene**	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/ kg up to 2g) **THEN** Repeat 8hourly for up to 2 further doses If limb is ischemic **ADD** to above **Metronidazole 500mg IV** infusion (child < 12 years: 12.5mg/kg up to 500mg), may be repeated after 12 hours
Spinal procedures	Skin commensals **e.g.,** *Staphylococcus aureus, Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/ kg up to 2g)

Table 12: Orthopaedic Surgery (Joint Replacement)

Procedure	Common organisms	Recommended Prophylaxis
Primary Total Hip Replacement (THR) OR Total Knee Replacement (TKR)	Skin commensals **e.g.,** *Staphylococcus aureus, Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g), then 8-hourly for 2 more doses
Patients requiring revision / re-operation	Skin commensals **e.g.,** *Staphylococcus aureus, Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g), then 8-hourly for 2 more doses **PLUS** **Vancomycin 1g IV** infusion (1.5g for patients > 80kg actual body weight) **Note:** Pre-existing infections (known or suspected) – if present, use appropriate treatment regimen instead of prophylactic regimen for procedure. Doses should be scheduled to allow for re-dosing just prior to skin incision.
Routine arthroscopic procedures	Skin commensals **e.g.** *Staphylococcus aureus*, *Coagulase negative staphylococci, Coliforms*	**No prophylaxis required (unless prosthesis is being inserted or patient is immunocompromised)**

- If a tourniquet is to be used, the full dose of the antibiotic should be infused prior to application of the tourniquet
- There is no role for routine diagnosis or treatment of asymptomatic bacteriuria among patients undergoing joint arthroplasty or other orthopedic hardware placement
- A dental evaluation should be undertaken to assess and manage for the presence of gingivitis, occult dental abscess, or decay prior to joint replacement

F. Plastic and Reconstructive Surgery

Table 13: Plastic and Reconstructive Surgery

Procedure	Common organisms	Recommended Prophylaxis
Groin/axilla/neck dissections Open reduction and internal fixation of fractures Insertion of implants, mesh, prostheses, screws, plates etc.	Skin commensals e.g., *Staphylococcus aureus, Coagulase negative staphylococci, Coliforms*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g)
Clean bone or soft tissue injury Hand surgery (without implants) Non-infected lesions & minor excisions	**Prophylaxis NOT recommended**	

Unless otherwise stated, antibiotic prophylaxis is NOT required for the following plastic surgery indications:

- Clean elective surgery with no implants
- Clean trauma with no fracture and less than 24 hours since injury

Topical antibiotics should NOT be applied to the wound during or after surgery

G. Prevention of Endocarditis or Infection of Prosthetic Implants or Grafts

Cardiac conditions for which antibiotic prophylaxis to prevent endocarditis is recommended**. (These are high cardiac risk conditions)**

- Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
- Previous infective endocarditis
- Congenital heart disease, only if it involves:
  i. Unrepaired cyanotic defects, including palliative shunts and conduits; OR
  ii. Completely repaired defects with prosthetic material or devices, whether placed by surgery or catheter intervention, during the first six months after the procedure (after which the prosthetic material is likely to have endothelialised); OR
  iii. Repaired defects with residual defects at, or adjacent to the site of a prosthetic patch or device (which inhibit endothelialisation)

Prophylaxis ALWAYS REQUIRED FOR PATIENTS WITH high-risk lesions for infective endocarditis.

The procedures that require prophylaxis for prevention of infective endocarditis are indicated in the table 14

Table 14: Prevention of Infective Endocarditis

Procedure	Common organisms	Recommended Prophylaxis
Dental procedure That involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa including: • **Extractions** • **Periodontal procedures including surgery, subgingival scaling, and root planning** • **Replanting avulsed teeth** Other surgical procedures (e.g. implant placement, apicoectomy)	*Viridans Streptococcus (Alpha- hemolytic streptococci*)	**Single dose amoxicillin 2g PO** 30-60 minutes prior to procedure Child: **50 mg/kg PO**; not to exceed 2 g/ dose **If unable to take oral medication:** **Amoxicillin + clavulanic acid 1.2g IV** (Child: 25mg/kg) **OR** **Cefazolin 1g IM or IV** (child: 50mg/kg IM or IV)
Infected Skin, Skin Structures, or Musculoskeletal Tissue Procedures	*Staphylococci and beta-hemolytic streptococci*	**Amoxicillin + clavulanic acid 1.2g or Cefazolin 1g**

PROPHYLAXIS NOT RECOMMENDED

Bronchoscopy unless incision or biopsy of respiratory mucosa

Gastrointestinal and genitourinary procedures unless indicate for surgical reasons

The following dental procedures do **not** require endocarditis prophylaxis:

- Routine anesthetic injections through noninfected tissue
- Taking dental radiographs
- Placement of removable prosthodontic or orthodontic appliances
- Adjustment of orthodontic appliances
- Placement of orthodontic brackets
- Shedding of deciduous teeth
- Bleeding from trauma to the lips or oral mucosa

H. Special Surgery

Table 15: Ophthalmologic Surgery

Procedure	Common organisms	Recommended Prophylaxis
All procedures	*Cutibacterium acnes* *Coagulase negative Staphylococcus* *Corynebacterium* *Streptococcus spp.* *Enterococcus spp.*	Pre-operatively: Immediately prior to surgical incision, apply sterile povidone-iodine 5% swab to conjunctival cul de sac, lid margins and periorbital skin and dry for 2 minutes. In patients with a povidone iodine allergy, use a sterile product containing chlorhexidine acetate 0.05% for 5 minutes
Extra-ocular procedures • Conjunctival procedures • Rectus / oblique muscle **Procedures where infection may be present** (e.g. Dacryocystorhinostomy)	*Cutibacterium acnes* *Coagulase negative Staphylococcus* *Corynebacterium* *Streptococcus spp.* *Enterococcus spp.*	**Cefazolin 2g IV** (child: 30mg/kg upto 2g) High risk of MRSA infection: REPLACE **Cefazolin** with **Clindamycin 600mg IV** infusion No strong evidence for IV prophylaxis (Follow pre-operative procedure as above) **Chloramphenicol 0.5%** eye drops 4 times a day post-operatively for 7 days.

Procedure	Common organisms	Recommended Prophylaxis
Intra-ocular procedures **Anterior procedures** • Phacoemulsification/lens implant • Keratoplasty • Trabeculectomy/tube implant • Corneal graft	*Cutibacterium acnes, coagulase-negative Staphylococcus, Corynebacterium Streptococcus spp. Enterococcus spp.*	**Cefazolin 1mg/0.1ml of balanced salt solution** intracameral injection at the end of the procedure **PLUS** **Chloramphenicol 0.5%** eye drops four times a day post-operatively for one week OR, if chloramphenicol contraindicated then: **Tobramycin 0.3%** eye drops four times a day post-operatively for one week
Vitreous procedures • Retinal detachment repair • Scleral buckle **Cryotherapy**	*Cutibacterium acnes* *Coagulase-negative Staphylococcus* *Corynebacterium* *Streptococcus spp.* *Enterococcus spp.*	**Ceftazidime 2.25 mg/0.1 mL of balanced salt solution** subconjunctival injection at the end of the procedure **PLUS** **Chloramphenicol 0.5%** eye drops four times a day post-operatively for one week OR if chloramphenicol contraindicated then: Tobramycin 0.3% eye drops four times a day post-operatively for one week

Post-Operative Care

There is a lack of strong evidence to support the use of post-operative topical antibiotics. Prolonged treatment with antibiotic ointment or drops is not indicated unless there is confirmed or suspected infection.

For patients who are treated with extended periods of topical steroids or who have been treated with systemic steroids preoperatively, immunological defenses may be reduced and the risk of infection may be increased. If post-operative topical antibiotics are considered necessary due to higher risk of infection, Chloramphenicol 0.5% eye drops can be used four times daily for 7 days. Tobramycin eye drops should only be used in patients hypersensitive to chloramphenicol due to an increased risk of resistance.

If infection is suspected, consider modification of antibiotic regimen according to clinical condition and microbiology results.

Table 16: Oral and Maxillofacial Surgery

Procedure	Common organisms	Recommended Prophylaxis
Minor Oral & Maxillofacial Surgical Procedures	Routine minor oral and maxillofacial surgical procedures under local anesthesia do not routinely require prophylactic antibiotics. Where there is no pre-existing infection and no risks as discussed below, no antibiotics should be administered and this includes surgical extractions in otherwise healthy persons, unless the surgery is prolonged and contaminated. Where there are clinical signs of infection such as abscess or pericoronitis, then full treatment dose of the applicable antibiotic should be administered.	
Antibiotic prophylaxis during dental treatment of patients with prosthetic joint implants	**Prophylactic antibiotics are NOT RECOMMENDED** prior to dental procedures to prevent prosthetic joint infection. The practitioner and patient should consider possible clinical circumstances that may suggest the presence of a significant medical risk in providing care without antibiotic prophylaxis against the known risks of frequent or widespread antibiotic use.	
Orthognathic surgery	*Oropharyngeal flora* *Streptococci spp.* *Staphylococcus aureus* *Anaerobes* *Corynebacteria*	**Benzylpenicillin 1.2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/kg up to 1.2g) THEN (for procedures greater than 2 hours duration) **Repeat** dose 2- hourly intra-operatively Penicillin allergy: **Clindamycin 600mg IV** infusion (child: 15mg/kg up to 600mg)
Skin approach procedures (oral cavity not involved)	*Streptococci spp.* *Staphylococcus aureus* *Anaerobes* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/kg up to 2g) Penicillin allergy: **Clindamycin 600mg** (child: 15mg/kg up to 600mg) by IV infusion, then 8-hourly for 24 hours
Skin approach procedures (with concurrent oral cavity involvement)	*Oropharyngeal flora* *Streptococci spp.* *Staphylococcus aureus* *Anaerobes* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/kg up to 2g) **PLUS Metronidazole 500mg IV** infusion (child < 12 years: 12.5mg/kg up to 500mg) before incision, then 12- hourly

Procedure	Common organisms	Recommended Prophylaxis
		for 24 hours Penicillin allergy: **Clindamycin 600mg** (child: 15mg/kg up to 600mg) by IV infusion, then 8-hourly for 24 hours
Implants (1st stage)	*Streptococci spp.* *Staphylococcus aureus* *Anaerobes* *Corynebacteria*	**Benzylpenicillin 1.2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/kg up to 1.2g) THEN 2-hourly intra- operatively (for procedures greater than 2 hours duration) Penicillin allergy: **Clindamycin 600mg** (child: 15mg/kg up to 600mg) by IV infusion
Trauma Intraoral compound operation (injury of any age, compound to nose/ skin/sinuses)	*Oropharyngeal flora* *Streptococci spp.* *Staphylococcus aureus* *Anaerobes* *Corynebacteria*	**Benzylpenicillin 1.2g IV** infusion (child < 12 years: 30mg/kg up to 1.2g) at presentation, then 4-hourly for 48 hours **PLUS** **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg) at presentation, then 12-hourly for 48 hours Penicillin allergy: **Clindamycin 600mg** (child: 15mg/kg up to 600mg) by IV infusion, then 8-hourly for 48 hours
Skin approach with concurrent oral cavity involvement (reconstructive surgery with ORIF or bone graft placement)	*Oropharyngeal flora* *Streptococci spp.* *Staphylococcus aureus* *Anaerobes* *Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child < 12 years: 30mg/kg up to 1g), then 8-hourly for 24 hours **PLUS** **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg), then 12- hourly for 24 hours Penicillin allergy: **Clindamycin 600mg** (child: 15mg/kg up to 600mg) by IV infusion, then 8-hourly for 24 hours

Table 17: Otorhinolaryngology / Head & Neck Surgery

Procedure	Common organisms	Recommended Prophylaxis
No incision through mucosal (oral, nasal, pharyngeal) surface	*Oropharyngeal flora Streptococci spp. Staphylococcus aureus Anaerobes, Corynobacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/ kg up to 2g)
With incision through mucosal (oral, nasal, pharyngeal, oesophageal) surface	*Oropharyngeal flora Streptococci spp. Staphylococcus aureus, Anaerobes, Corynebacteria*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/ kg up to 2g) PLUS **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg)
Other uncomplicated or minor clean procedures (e.g., tonsillectomy, adenoidectomy, tympanostomy, nasal septoplasty, endoscopic sinus surgery, uncontaminated neck dissection)	**Prophylaxis NOT recommended**	

Prophylaxis is not indicated for intra-oral procedures: dentoalveolar surgery (extractions, impactions, exposures); minor pathology (soft tissue, cysts).

For patients with cardiac conditions refer to Antibiotic Prophylaxis Guidelines for Prevention of Endocarditis

High risk penicillin/cephalosporin allergy

Clindamycin 600mg IV infusion (child: 15mg/kg up to 600mg)

H. Urology

Table 18: Urology

Procedure	Common organisms	Recommended Prophylaxis
Open/laparoscopicprocedures when: • **urinary tract entered** • **urinary tract not entered but:** • patient is at risk of post-operative infection (e.g. urinary tract obstruction/ abnormalities); • prosthetic material is inserted; OR **bacteriuria cannot be excluded**	*Coliforms, Enterococci, Staphylococcus aureus*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) PLUS **Gentamicin 2mg/kg IV** (adults and children) If risk of entry into bowel lumen, **then ADD: Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg)
Open/laparoscopic procedures when urinary tract not entered and urine is sterile (e.g. vasectomy, scrotal surgery, varicocele ligation)	**Prophylaxis NOT recommended**	
Open prostatectomy / Robotic prostatectomy	*Coliforms, Enterococci, Staphylococcus aureus*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) PLUS **Gentamicin 2mg/kg IV** If risk of entry into bowel lumen, then **ADD**: **Metronidazole 500mg IV** infusion (child: 12.5mg/kg up to 500mg)
Endoscopic procedures • **Removal of calculi** • **Extracorporeal Shock Wave Lithotripsy only if high risk ofinfection** **Specific risk for postoperative infection**	*Coliforms* *Enterococci* *Staphylococcus aureus*	**Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) Known urinary MRSA colonisation: **ADD vancomycin 1g IV** infusion (1.5g for patients **> 80kg actual body weight**

Procedure	Common organisms	Recommended Prophylaxis
Removal of calculi **Transurethral resection of prostate** (TURP) **Stent insertion** **Ureteroscopy/instrumentation of upper tract** (including retrograde pyelogram)	*Coliforms* *Enterococci* *Staphylococcus aureus*	**Gentamicin 2mg/kg IV** (adults and children) initiated 30 to 60 minutes before skin incision **OR (if gentamicin contraindicated) Cefazolin 2g IV** initiated 30 to 60 minutes before skin incision (child: 30mg/kg up to 2g) Known urinary MRSA colonization: **ADD vancomycin 1g IV** infusion (1.5g for patients **> 80kg actual body weight)**

Table 19: Appendix 1 - Dosing

The table below provides dosing and re-dosing intervals for patients with normal and reduced renal function.

Antimicrobial	Pre-op Dose	Half-life, h	Half-life in ESRD	Normal Renal function Re-dose after (hours)[1]	Reduced renal function Re-dose based on CrCl after (hours)[2]	Administration
Cefazolin	2g, 3g if >120kg	1.1-2.2	40-70	468	CrCl>35:4 CrCl 10-35:6 CrCl <10:8	IV push over 3-5 min
Ceftriaxone	2g	5.4-10.9		12	N/A	IV push over 3-5 min
Clindamycin	900mg	2.0-4.0	3.0-5.0	6	6	Infusion
Gentamicin	5mg/kg, max 400mg	2.0-3.0	50-70	No re-dose	No re-dose	Infusion
Metronidazole	500mg	6.0-8.0	7.0-21	8	8	Infusion
Vancomycin	15mg/kg	4.0-8.0	44.1-406.4	12	N/A	Infusion should not exceed 1g in 60min
Cefuroxime	1.5g	1.0-2.0	3.5	8	24	IV push over 3-5 min

1. For long procedures, the prophylactic dose should be repeated after the number of hours indicated on the table.
2. For long procedures in patients with renal insufficiency, the dose should be repeated after the duration indicated.

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