Guideline Title	*Surgical Antimicrobial Prophylaxis Guideline*
Target Population:	Patients within the UK Healthcare Enterprise who are undergoing an operative surgical intervention. This includes all cases occurring within Chandler Main OR, the Center for Advanced Surgery (CAS) and Good Samaritan OR
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Guideline Overview	This document is intended to guide surgeons, anesthesiologists, pharmacists, nurse practitioners, physician assistants, and nurses in the selection of surgical antimicrobial prophylaxis (SAP), for the prevention of surgical site infections
Committee(s) Reviewed/Date	Perioperative subcommittee – January 2023 Antimicrobial Stewardship subcommittee- January 2023 Pharmacy & Therapeutics Committee- January 2023
Original Approval Date	June 2016
Current Version / Approval Date	January 2023
Schedule for Periodic Review	Every 2 years
Implementation Strategy	Education to providers, pharmacists and nurses
Primary Outcome	Standardize the selection and use of surgical antimicrobial prophylaxis
Information Technology Needs	• Placement on CareWeb under Perioperative Medication Guidelines and Protocols and Antimicrobial Stewardship website • Epic order set changes (working group in progress) • Circulate with internal communication via The Loop

Surgical Antimicrobial Prophylaxis Guidelines
Adult and Pediatric Populations

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I. Executive Summary

This document is intended to guide surgeons, anesthesiologists, pharmacists, nurse practitioners, physician assistants, and nurses in the selection of surgical antimicrobial prophylaxis (SAP), for the prevention of surgical site infections (SSI). Recommendations apply to all surgical areas within the UK HealthCare Enterprise including Chandler Main OR, the Center for Advanced Surgery (CAS), and Good Samaritan OR. These guidelines contain adult, pediatric, and neonatal recommendations where relevant.

II. Introduction

Surgical site infections are a costly and morbid occurrence for both patients and healthcare systems. SAP is an important tool for reducing the risk of postoperative SSI but is not the sole line of defense. Other factors such as basic infection-control strategies, instrument sterilization, blood loss, temperature control, glycemic control and the patient's underlying medical condition contribute to the risk of SSI and should be scrutinized accordingly.

The decision to use SAP must be weighed against; **(1)** the risk of toxic and allergic reactions, **(2)** emergence of resistant bacteria or super-infection, **(3)** potential drug interactions, **(4)** costs of use. SAP should be administered if there is a risk of infection *in the absence* of a prophylactic agent. In the case of clean surgical procedures, SAP is often unnecessary.

III. Pharmacokinetic Considerations

SAP administration should be timed such that a bactericidal concentration of the drug is established in the serum and the tissues at the time of the incision and for the duration of the operation. This concentration should exceed the minimum inhibitory concentration (MIC) of organisms which may be encountered during the procedure.

Many, but not all SAP agents are able to be rapidly administered and achieve desired concentrations within 10 -15 minutes. Notable exceptions include vancomycin, clindamycin, gentamicin, fluconazole, and levofloxacin which require longer administration times to achieve their clinical benefit. Timely ordering and the use of sign/held orders greatly increases the appropriate use of these agents.

IV. Considerations for Patients with Reported β- Lactam Allergies or Intolerances

"Patient-reported" penicillin or β- lactam allergies are frequently encountered in the medical history of hospitalized and surgical patients. However, upon review, many of these antibiotic reactions documented as allergies are unknown to the patient, were a cutaneous reaction caused by an unrelated drug hypersensitivity, or simply a drug intolerance. While seemingly benign, these reported reactions represent a significant threat to the patient, the hospital and public health. A penicillin allergy is associated with the increased use of broad-spectrum and non- β- lactam antibiotics, increasing antibiotic resistance and adverse events. Within the surgical population, one study found that patients with a reported penicillin allergy had a 50% increased odds of SSI, attributable to the use of second-line SAP. Every effort should be made to use first-line antibiotics, knowing second-line agent are inherently inferior and increase the risks of poor surgical outcomes.

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Navigating a Perioperative Penicillin Allergy

Shown below are considerations and actions that can be taken when selecting an antibiotic for surgical prophylaxis in a patient with a reported penicillin allergy:

1. **Confirm reported allergy** with patient.
    i. Profiles may be outdated or incorrect
2. **Clarify the reported reaction to penicillin** with the patient.
    i. If the reaction was exclusively a gastrointestinal symptom (nausea, vomiting, diarrhea), this is more consistent with a common adverse effect of antibiotics, and not an allergy, and first-line antibiotics should not be avoided
3. **Consider cross-reactivity** if first-line antibiotic is a cephalosporin
    i. Studies show earlier reports of cross-reactivity (CR) between penicillin and cephalosporins were incorrectly high. Actual CR between PCN and CEPH is ~2-5%
    ii. The CR between cefazolin and penicillin is possibly even lower due to the unique R-group found on cefazolin
    iii. In the absence of an IgE-mediated allergic reaction to penicillin (anaphylaxis, angioedema, bronchospasm), cephalosporins should be considered first line.
4. **Contact a perioperative pharmacist**
    i. May provide further insight into the appropriate SAP with use of the. PenFAST Allergy Assessment Tool

V. MRSA Screening and Decolonization

Screening and eradication for nasal carriage of MSSA and MRSA reduces the incidence of postoperative surgical site infections (SSI) in numerous surgical populations. Studies show a bundled decontamination approach that combines nasal decolonization, antiseptic showers, and appropriately targeted antimicrobial prophylaxis shows the greatest risk reduction.
This targeted approach may provide the greatest benefit for the following surgical procedures:

- Cardiac operations, including heart transplant and ventricular assist device insertion
- Endovascular graft placement
- Orthopedic surgery involving placement of prosthetic hardware
- Spine surgery with instrumentation

For elective procedures, pre-hospital MRSA PCR screening should be performed within 30 to 5 days preoperatively. In patients with a (+) PCR test during this interval of time, one version of a bundled approach shown below is recommended:

Nasal Decolonization	Antiseptic shower	Antimicrobial prophylaxis
Mupirocin 2% intranasal gel BID x 5 days If non-compliant or window of time insufficient: **Povidone 3M Iodine** nasal swaps, one-hour before surgery	**Chlorhexidine** baths daily x5 days and **SAGE** chlorhexidine wipe in preoperative holding	**Vancomycin** 15-20mg/kg ONCE preoperative

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VI. Antibiotic Dosing Recommendations: Adults and Pediatrics

Adult Patients			
Antimicrobial Agent	**Preoperative Dose**	**Redosing Interval while Intraoperative[±]**	**Recommended rate of administration**
Ampicillin/sulbactam	3g	Every 2 hours	IVP 3-5 min
Aztreonam	2g	Every 4 hours	IVP 3-5 min
Azithromycin	500mg	Not recommended	60 min infusion
Cefazolin	2g if <120 kg **or** 3g if >120 kg	Every 4 hours	IVP 3-5 min
Cefoxitin	2g	Every 2 hours	IVP 3-5 min
Cefepime	2g	Every 4 hours	IVP 3-5 min
Clindamycin	900mg	Every 6 hours	30 min infusion (IVP **not** recommended)
Fluconazole	400mg	Not recommended	90 min infusion
Gentamicin	5mg/kg DBW[(&)]	Not recommended	30 min infusion **only**
Levofloxacin	750mg	Not recommended	90 min infusion
Meropenem	1g	Every 2 hours	IVP 3-5 min
Metronidazole	500mg	Not recommended	30 min infusion (IVP **not** recommended)
Piperacillin/tazobactam	4.5g	Every 2 hours	30 min infusion (IVP **not** recommended)
Vancomycin	15-20mg/kg	Not recommended	60 min infusion for every 1000mg administered
Pediatric Patients (<50kg)			
Antimicrobial Agent	**Preoperative Dose**	**Redosing Interval while Intraoperative[±]**	**Recommended rate of administration**
Ampicillin	50mg/kg/dose	Every 2 hours	≤500mg : 3 -5 min IVP **or** >500mg: 10 -15min[(%)]
Ampicillin/sulbactam	50mg/kg/dose[#]	Every 2 hours	IVP 10 – 15min
Aztreonam	30 mg/kg/dose	Every 4 hours	IVP 3 – 5 min
Cefazolin	30mg/kg/dose	Every 4 hours	IVP 3 – 5 min
Cefoxitin	40mg/kg/dose	Every 2 hours	IVP 3 – 5 min
Clindamycin	10mg/kg/dose	Every 6 hours	Max rate: 30mg/min
Piperacillin/tazobactam	100mg/kg/dose	Every 2 hours	30 min infusion (IVP **not** recommended)
Metronidazole	15mg/kg/dose	Not recommended	30 min infusion (IVP **not** recommended)
Gentamicin	2.5mg/kg/dose	Not recommended	30 min infusion (IVP **not** recommended)
Vancomycin	15mg/kg/dose	Not recommended	60min infusion for every 1000mg administered
Fluconazole	6mg/kg/dose	Not recommended	Max rate: 200mg/hr

IVP: Intravenous push [(&)] DBW: dosing body weight. Consider 3mg/kg for urologic surgery patients; [(%)] Faster administration rates associated with seizures; [(#)] Dose based on ampicillin component. [(±)] Intraoperative redosing based on guideline recommendation of every 2 drug half-lives. Recommendations are based on patients with normal renal function. No clinical studies have evaluated required redosing in patients with renal dysfunction or impaired clearance. Redosing should also occur with >1500 mL blood loss or 20% of blood volume [56]

VII. Recommendations for Surgical Antimicrobial Prophylaxis

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CARDIAC and THORACIC PROCEDURES

Preoperative evaluation for *S. aureus* carrier status (MRSA and MSSA) is highly recommended
If carrier status identified recommend mupirocin 2% intranasally 2-3x daily for 5 days prior to surgery
If patient is noncompliant or carrier status is unknown, recommend the use of povidone-iodine nasal swab in holding room prior to surgery (see MRSA screening section)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Cardiac Surgery without the use of prosthetic material - CABG	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin * If patient is colonized with MRSA or has documented history of MRSA add vancomycin to IV cefazolin	**Adult:** Clindamycin or Vancomycin *Recommend vancomycin as the preferred alternative regimen.
		Pediatric: Cefazolin * If patient is colonized with MRSA or has documented history of MRSA add vancomycin to IV cefazolin	**Pediatric:** Clindamycin or Vancomycin
Cardiac Surgery with the use of prosthetic material - Prosthetic valves - Aortic grafts	*S. aureus* *S. epidermidis* Gram-negative bacilli	**Adult:** Cefazolin+ Vancomycin	**Adult:** Vancomycin
		Pediatric: Cefazolin + Vancomycin	**Pediatric:** Vancomycin
Ventricular Assist Device (VAD) Placement	*S. aureus* *S. epidermidis* enteric Gram-*negatives*	**Adult:** ***Updates pending**	**Adult:** ***Updates pending**
Transplant; - Heart (+ or - prior VAD), Lung, Heart – Lung	*S. aureus* *S. epidermidis* Gram-negative *bacilli*	**Heart:** ***Updates pending**	**Heart:** ***Updates pending**
		Lung: ***Updates pending**	
Debridement of sternal wound infections	polymicrobial	**Adult:** Cefazolin + Vancomycin	**Adult:** Vancomycin

CARDIAC and THORACIC PROCEDURES (Page 2)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Esophageal resection	*S. aureus* *S. epidermidis* Rarely: *Streptococcus* spp *Enteric gram-negative*	**Adult:** Cefazolin or Ampicillin/sulbactam *Consider **amp/sulbactam** for patients with Hx of COPD, >75yrs of age, or stage III/IV esophageal cancer	**Adult:** Clindamycin *Consider **adding gentamicin** for patients with Hx of COPD, >75yrs of age, or stage III/IV esophageal cancer
Pneumonectomy **Lobectomy** **Thoracotomy** **Thoracoscopy,** video assisted thoracoscopic surgery **(VATS)**	*S. aureus* *S. epidermidis* *Streptococcus* spp *Enteric Gram-negative* *Oral anaerobes*	**Adult:** Cefazolin	**Adult:** Clindamycin

Section References: [1, 2, 3, 4, 5]

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: Cardiothoracic surgical procedures may be continued for up to 24h postoperatively. Benefit beyond 24h is unclear, and may increase risk of resistance

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OBSTETRICS and GYNECOLOGICAL PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Cesarean section	Enteric Gram-negative bacilli Anaerobes Group B Streptococci *Enterococcus* spp	**Adult, NOT in Labor** Cefazolin ^ If patient is colonized with MRSA or has documented history of MRSA add vancomycin to IV cefazolin	**Adult, NOT in Labor** Clindamycin + Gentamicin
		Adult, with Signs of Active Labor* Cefazolin + Azithromycin * active labor or premature rupture of membranes ^ If patient is colonized with MRSA or has documented history of MRSA add vancomycin to IV cefazolin	**Adult, with Signs of Active Labor** Clindamycin + Azithromycin + Gentamicin * active labor or premature rupture of membranes
Hysterectomy - Vaginal - Abdominal - Laparoscopic - Robotic	Enteric Gram-negative *bacilli* Anaerobes Group B *Streptococci* *Enterococcus* spp	**Adult / Adolescent:** Cefazolin	**Adult / Adolescent:** Clindamycin
Uterine evacuation - D&E - Suction D&C		**Adult / Adolescent:** Doxycycline 200mg ORAL once Administer 1 – 12 hours prior to procedure	**Adult / Adolescent:** Azithromycin 500mg ORAL once Administer 1 hour prior to procedure
Cervical tissue excision procedures - LEEP - biopsy - endocervical curettage	Clean Procedures	No antibiotic prophylaxis indicated	
Hysteroscopy / Cystoscopy			
Tubal ligation **Intrauterine device insertion**			
Laparoscopic procedures without **entry to vagina or bowel**			

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: Consider oral antibiotics (cephalexin) for 48h post cesarean section in patients with BMI >30

Section References [6, 7, 8, 9]

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ORTHOPEDIC SURGERY PROCEDURES

Preoperative evaluation for *S. aureus* carrier status (MRSA and MSSA) is highly recommended
If carrier status identified recommend mupirocin 2% intranasally TID for 3 – 5 days prior to surgery
If patient is noncompliant or carrier status is unknown, recommend the use of povidone-iodine nasal swab in holding room prior to surgery. (see MRSA screening section)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Lower Extremity Joint Replacement or Arthroplasty - Total Knee (TKA) - Total Hip (THA) - Uni-compartmental Knee (UKA) **Hardware removal**	*S. aureus* *S. epidermidis* Gram negative *bacilli*	**Adult:** Cefazolin + Vancomycin *Vancomycin is empirically included in all procedures due to internal data indicating a high incidence of MRSA postop infections	**Adult:** Aztreonam + Vancomycin
		Pediatric: Cefazolin * If patient is colonized with MRSA or has documented history of MRSA add vancomycin to IV cefazolin	**Pediatric:** Clindamycin or Vancomycin * If patient is colonized with MRSA or has documented history of MRSA use vancomycin **instead of clindamycin**
Spinal Procedures with or without instrumentation - Arthrodesis - Scoliosis correction	*S. aureus* *S. epidermidis* Gram negative *bacilli*	**Adult:** Cefazolin * If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin to IV cefazolin procedures with **instrumentation only**	**Adult:** Vancomycin
		Pediatric: Cefazolin * If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin to IV cefazolin procedures with **instrumentation only**	**Pediatric:** Clindamycin or Vancomycin * If patient is colonized with MRSA or has documented history of MRSA use **vancomycin instead of clindamycin**

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ORTHOPEDIC SURGERY PROCEDURES (page 2)

Procedure / Operation		Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Open Fracture Repair	**See Enterprise Guidelines** **Adults**: http://uktraumaprotocol.blogspot.com/2013/05/open-fracture-antibiotic-and-tetanus.html **Pediatrics**: https://antimicrobial.ukhc.org/wp-content/uploads/sites/170/2021/07/Openfrx-protocol2021_FINAL-with-coversheet.pdf		
Open reduction internal fixation (ORIF) **Transforaminal lumbar interbody fusion (TLIF)** **Hip fracture repair**	*S. aureus* *Streptococcus* *Gram-negative bacilli*	**Adult:** Cefazolin ***** If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin to IV cefazolin procedures with **instrumentation only**	**Adult:** Vancomycin
		Pediatric: Cefazolin ***** If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin to IV cefazolin procedures with **instrumentation only**	**Pediatric:** Clindamycin or Vancomycin ***** If patient is colonized with MRSA or has documented history of MRSA use **vancomycin instead of clindamycin**
Osteotomy **Bunionectomy**	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Clean operations with no foreign material	Clean procedure	No antibiotic prophylaxis indicated	

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: Antibiotics may be continued for <24 in joint arthroplasty. In all other procedures national guidelines recommend discontinuing antibiotics at wound closure for clean and clean-contaminated procedures

Section References: [10, 11, 12, 13, 14, 15]

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OTOLARYNGOLOGIC / HEAD & NECK SURGICAL PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Rhinoplasty, simple • primary, without grafting	*S. aureus* *S. epidermidis* Gram negative *bacilli*	Preoperative antibiotic use is not supported by guideline recommendations.	
Rhinoplasty, complex • revision, + / - grafting **Endoscopic sinus surgery**	*S. aureus* *S. epidermidis* Gram negative *bacilli*	**Adult:** Ampicillin/sulbactam	**Adult:** Clindamycin + Gentamicin
		Pediatric: Ampicillin/sulbactam	**Pediatric:** Clindamycin
Skull base surgery • posterior and lateral	*S. aureus* *S. epidermidis* *S. pneumoniae*	**Adult:** Ampicillin/sulbactam	**Adult:** Clindamycin
		Pediatric: Ampicillin/sulbactam	**Pediatric:** Clindamycin
Skull base surgery • anterior *includes transsphenoidal for pituitary tumors	*S. aureus* *S. epidermidis* Gram-negative *bacilli*	**Adult:** Ampicillin/sulbactam * If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin to amp/sulbactam	**Adult:** Aztreonam + Metronidazole * If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin t
		Pediatric: Ampicillin/sulbactam	**Pediatric:** Clindamycin
Tonsillectomy **Clean otologic procedures** **Myringoplasty** **Tympanoplasty** **Laryngoscopy** (+/- bronchoscopy) **Thyroidectomy** **Thyroid lobectomy** **Septoplasty**	Clean or Clean-Contamined Procedures	Preoperative antibiotic use is not supported by guideline recommendations. *Consider antibiotics in the setting of draining ears or cholesteatoma (cefazolin / clindamycin)	
Cochlear implant		**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Head & neck surgery **Clean / clean – contaminated** *incision through oral, pharyngeal, or nasal mucosa	Oral anaerobes Gram-negative *bacilli* *S. aureus* *S. epidermidis* *viridans streptococci*	**Adult:** Ampicillin/sulbactam	**Adult:** Clindamycin + Gentamicin
		Pediatric: Ampicillin/sulbactam	**Pediatric:** Clindamycin

RECOMMENDATION ON POSTOP ANTIBIOTICS: Based on clinical judgement. National guidelines [16] recommend antibiotic prophylaxis should not extend beyond 24 hours postoperatively **except** in cases clean-contaminated (anterior) skull base surgery, microvascular free flap surgery, and nasal packing / splint use >48 hours

Section References: [16, 17, 18, 19, 20, 21, 22, 23, 24]

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GASTROINTESTINAL and BILIARY TRACT PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Pancreatic procedures - Whipple - Pancreatectomy	Enteric Gram-negative bacilli Enterococci *S. aureus* Anaerobic orgs (*Bacteroides spp.*, *Clostridia*)	**Adult:** Piperacillin/tazobactam * If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin	**Adult:** - *non-anaphylactic PCN allergy, but tolerant of cephalosporins*: Cefoxitin - *anaphylactic PCN allergy or cephalosporin allergy*: Levofloxacin/metronidazole or meropenem * If patient is colonized with MRSA or has documented history of MRSA **add** vancomycin
Hepatic resection **Hepatic artery infusion pump placement**	Enteric Gram-negative bacilli *S. aureus* Anaerobes	**Adult:** Cefoxitin **Pediatrics:** Cefoxitin	**Adult:** Clindamycin + Gentamicin **Pediatrics:** Clindamycin + Gentamicin
HIPEC - **without** bowel transection - **with** bowel transection	Enteric Gram-negative bacilli Enterococci *S. aureus* Anaerobic orgs (*Bacteroides, Clostridia*)	**Adult:** Cefoxitin* * May consider **adding metronidazole** in cases with bowel transection	**Adult:** Clindamycin + Gentamicin
Laparoscopic pyloromyotomy	Clean	Antimicrobial prophylaxis not indicated	
Biliary tract reconstruction with preop biliary drainage culture	Polymicrobial	Antibiotic therapy based on culture results and sensitivities	
Congenital Intestinal procedures - Choledochal cyst - Duodenal atresia - Small bowel atresia - NEC repair	Enteric Gram-negative bacilli Enterococci *S. aureus* Anaerobic orgs (*Bacteroides, Clostridia*)	**Pediatric:** - Choledochal / Duodenal: Cefazolin - Small bowel: Cefazolin - NEC: Piperacillin/Tazobactam	**Pediatric:** - Choledochal/Duodenal: Clindamycin + Gentamicin - Small bowel: Clindamycin + Gentamicin - NEC: Ampicillin + Gentamicin+ Metronidazole
Cholecystectomy - Elective - Acute	*Enteric Gram-negative* *Enterococci* *Streptococcus* *S. aureus* *Anaerobes* (rare)	**Adult:** Elective: Cefazolin Acute: Cefoxitin **Pediatric:** Elective: Cefazolin Acute: Cefoxitin	**Adult:** Elective: Clindamycin Acute: Clindamycin + Gentamicin **Pediatric:** Clindamycin + Gentamicin

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GASTROINTESTINAL and BILIARY TRACT PROCEDURES (Page 2)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Gastrectomy **Gastric sleeve or bypass**	Enteric Gram-negative bacilli Enterococci *S. aureus* Anaerobic orgs (*Bacteroides, Clostridia*)	**Adult:** Cefoxitin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefoxitin	**Pediatric:** Clindamycin + Gentamicin
Gastroschisis silo placement	Enteric Gram-negative bacilli *S. aureus* Anaerobic orgs (*Bacteroides, Clostridia*)	**Pediatric:** Cefazolin (clean procedure) *If procedure classified at complicated, use **Cefoxitin**	**Pediatric:** Clindamycin + Gentamicin
Nissen fundoplication	*S. aureus* *S. epidermidis* *S. pneumoniae*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
PEG tube placement +/- EGD	*S. aureus* *S. epidermidis* *S. pneumoniae*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: In the absence of known or suspected infection, antimicrobial prophylaxis should be discontinued at wound closure

Section References: [25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35]

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COLON, RECTAL and ABDOMINAL SURGICAL PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Colon or Rectal resection or Surgical Manipulation - Abdominoperineal resection - Colectomy, partial or total - Lower anterior resection - Hirschsprung disease - Colostomy creation/repair - Fistulectomy / Fistulotomy - Hemorrhoidectomy - I&D of abscess - Enterostomy - Excision of condyloma	Enteric Gram-negative *bacilli* *Enterococci* anaerobes *(Bacteroides* spp.*, Clostridia)* *S. aureus*	**Adult:** Cefoxitin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefoxitin	**Pediatric:** Clindamycin + Gentamicin
Hernia Repair - Ventral - Inguinal - Umbilical - Paraoesophageal - Hiatal	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin ***Add** vancomycin in hernia repair involving **mesh** or **complex ventral repair** in patient with colonization or Hx of MRSA infection	**Adult:** Clindamycin ***Substitute** for vancomycin in hernia repair involving **mesh** or in **complex ventral hernia repair** in patient with colonization or Hx of MRSA infection
		Pediatric: Cefazolin *Antibiotic **not** indicated in pediatric inguinal, ventral and hernia	**Pediatric:** Clindamycin *Antibiotic **not** indicated in pediatric inguinal, ventral and hernia
Appendectomy (non-perforated)	Enteric Gram-negative *bacilli* *Enterococci* Anaerobes *S. aureus*	**Adult:** Cefoxitin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefoxitin For **emergent** see UKHC protocol	**Pediatric:** Clindamycin + Gentamicin
Exploratory (diagnostic) laparoSCOPY	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin

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COLON, RECTAL and ABDOMINAL SURGICAL PROCEDURES (Page 2)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Laparotomy, - Exploratory - Reopening	Polymicrobial Active infection	If patient is currently receiving targeted or broad-spectrum antibiotics, doses should be continued, and timing optimized to coincide with intraoperative period.	
Splenectomy	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Kidney Transplant Recipient	*S. aureus* *S. epidermidis*	**Adult:** ***Updates pending**	**Adult:**
Living Kidney Donor	*S. aureus* *S. epidermidis*	**Adult:** ***Updates pending**	**Adult:**
Pancreas Transplant Recipient	*S. aureus* *S. epidermidis* Gram negative *bacilli* *Enterococci* *Candida* Anaerobes	**Adult:** ***Updates pending**	**Adult:**
Liver Transplant Recipient	*S. aureus* *S. epidermidis* Gram-negative *bacilli* *Enterococci* *Candida* Anaerobes	**Adult:** ***Updates pending**	**Adult:**

Section References: [36, 37, 38, 39, 40, 41]

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: In the absence of known or suspected infection, antimicrobial prophylaxis should be discontinued at wound closure

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GENITOURINARY SURGICAL PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Lower Tract Instrumentation - Cystourethroscopy - Transurethral surgery (TURP, TURBT, etc) - Prostate brachytherapy or cryotherapy	Gram-negative *bacilli* *Enterococci* (rare)	**Adult:** Cefazolin	**Adult:** Gentamicin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Transrectal prostate biopsy (contaminated)	Gram-negative *bacilli* Anaerobes	**Adult:** Cefoxitin	**Adult:** Aztreonam + metronidazole
		*Consider adding **gentamicin** for MDR coverage if patient has received systemic antibiotics within 6-months or international travel	
Upper Tract Instrumentation - Percutaneous renal surgery - Ureteroscopy	Gram-negative *bacilli* *Enterococci* (rare) *S. aureus*	**Adult:** Cefazolin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefazolin	**Pediatric:** Gentamicin
Penile surgery (non-invasive) - Circumcision - Biopsy	*S. aureus*	Antibiotics not indicated	
Open, Laparoscopic or Robotic *Not entering urinary tract - Adrenalectomy - Lymphadenectomy - Retroperitoneal - Pelvic, clean	*S. aureus* *Streptococci*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Implanted prosthetic devices - Penile - Artificial urinary sphincter - Sacral neuromodulators	Gram-negative *bacilli* *Pseudomonas* spp *S. aureus* Anaerobic *Candida* spp	**Adult:** Vancomycin + Gentamicin *Consider **adding** **fluconazole** in obese patients (BMI>32), history of DM, or surgical procedures in summer months	**Adult:** Cefoxitin + Gentamicin *Consider **adding** **fluconazole** in obese patients (BMI>32), history of DM, or surgical procedures in summer months. *Add **vancomycin** if MRSA colonization present
		Pediatric: Vancomycin + Gentamicin	**Pediatric:** Cefoxitin + Gentamicin *Add **vancomycin** if MRSA colonization present

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GENITOURINARY SURGICAL PROCEDURES (Page 2)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Urethral surgical procedures - Urethroplasty - Reconstruction of urethra - Stricture repair - Nephrectomy - Urethrectomy - Prostatectomy - Cystectomy	Gram-negative *bacilli* *Enterococci* *S. aureus*	**Adult:** Cefazolin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin + Gentamicin
Inguinal and scrotal procedures - Orchiectomy - Vasectomy / reversal - Varicocelectomy - Hydrocelectomy	Gram-negative *bacilli* *S. aureus*	**Adult:** Cefazolin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin + Gentamicin
Involving small bowel - Urinary diversions - Cystectomy with small bowel conduit - Ureteropelvic junction repair	*S. aureus* *Streptococci* Gram-negative *bacilli* *Enterococci* (rare)	**Adult:** Cefazolin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin + Gentamicin
Involving large bowel - Colon conduit	Gram-negative *bacilli* Anaerobes	**Adult:** Cefoxitin	**Adult** Clindamycin + Gentamicin
Vaginal surgery - Urethral sling procedure - Fistulae repair - Urethral diverticulectomy	*S. aureus* *Streptococci* *Enterococci* Vaginal anaerobes	**Adult:** Cefoxitin	**Adult:** Clindamycin + Gentamicin
		Pediatric: Cefoxitin	**Pediatric:** Clindamycin + Gentamicin
Cystoscopy **Lithotripsy**	Clean procedures	**Antibiotic prophylaxis not empirically indicated** *May consider in high risk populations such as neutropenia	

- In patients with poor renal function (CKDIII/IV or ESRD), aztreonam may be substituted for gentamicin
- In patients with an **active UTI** who require urgent and semi-urgent urologic procedures, current urine microscopy is highly recommended to guide treatment antibiotics
- Perioperative antibiotics should be tailored to microbiologic cultures with antimicrobial sensitivities.
- With the exception of parturient patients, **asymptomatic bacturia or funguria** is not a sole indication for antimicrobial prophylaxis
- Fungal prophylaxis is recommended in **asymptomatic fungal UTIs** in patients undergoing intermediate or high-risk GU procedures (otherwise requiring abx ppx)

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS Antimicrobial prophylaxis should be limited to intraoperative dosing only, even in patients with a drain. Postoperative prophylaxis (<24hrs) may be considered for prosthetic device placement and PCNL only

Section References [42, 43]

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NEUROSURGICAL PROCEDURES

SPINAL SURGERY:
Preoperative evaluation for *S. aureus* carrier status (MRSA and MSSA) is highly recommended
If carrier status identified recommend mupirocin 2% intranasally TID for 3 – 5 days prior to surgery
If patient is noncompliant or carrier status is unknown, recommend the use of **povidone-iodine nasal swab** in holding room prior to surgery

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Craniotomy **Stereotactic brain biopsy / procedure**	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin *May consider topical vancomycin powder intraop	**Adult:** Clindamycin *May consider topical vancomycin powder intraop
		Pediatric: Cefazolin	**Pediatric:** Vancomycin
Fluid shunting procedure	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin ***Add** vancomycin for colonized or recent Hx of MRSA	**Adult:** Vancomycin
		Pediatric: Cefazolin *Add **vancomycin** for colonized or recent Hx of MRSA	**Pediatric:** Vancomycin
Spinal Procedures with or without instrumentation	*S. aureus* *S. epidermidis* Gram negative *bacilli*	**Adult:** Cefazolin *** Add** vancomycin if MRSA colonization or Hx of MRSA infxn procedures with **instrumentation only**	**Adult:** Vancomycin
		Pediatric: Cefazolin ***** Add vancomycin if MRSA colonization or Hx of MRSA infxn procedures with **instrumentation only**	**Pediatric:** Clindamycin or Vancomycin ***** If patient is colonized with MRSA or has documented history of MRSA use **vancomycin instead of clindamycin**
Implantation of Intrathecal Pump	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin ***Add** vancomycin for colonized or recent Hx of MRSA	**Adult:** Vancomycin
		Pediatric: Cefazolin ***Add vancomycin** for colonized or recent Hx of MRSA	**Pediatric:** Vancomycin

Section References: [44, 45, 46, 47, 48, 49, 50, 51]

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: Postoperative antibiotic prophylaxis is not recommended in decompression-only or lumbar spine fusion (only) surgery, even in the presence of a drain. Procedures involving placement of EVD or ICP monitor may consider a single dose

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PLASTICS SURGICAL PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Abdominoplasty / panniculectomy	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Breast reconstruction (+/- implants) **TRAM flaps** **Mastectomy** **Breast reduction surgery**	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin *Consider **adding** vancomycin for implant-based reconstruction with Hx or colonization of MRSA	**Adult:** Clindamycin
		Pediatric: Cefazolin *Consider **adding** **vancomycin** for implant-based reconstruction with Hx or colonization of MRSA	**Pediatric:** Clindamycin
Hand and arm dissections	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Reconstructive procedures - Phalloplasty - Vaginoplasty - Tissue expanders	*S. aureus* *S. epidermidis*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin
Cleft lip and **palate repair** **Facial procedures** that transect oropharyngeal mucosa	*S. aureus* *Streptococcus spp* Gram-neg *oral flora*	**Adult:** Cefazolin	**Adult:** Clindamycin
		Pediatric: Cefazolin	**Pediatric:** Clindamycin + Gentamicin
Craniosynostosis	*S. aureus* *S. epidermidis* *P. aeruginosa* Oral flora	**Pediatric:** Cefazolin	**Pediatric:** Clindamycin
Endoscopic craniofacial procedures	*S. aureus* *S. epidermidis*	**Pediatric:** Cefazolin	**Pediatric:** Clindamycin

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: In the absence of known or suspected infection, antimicrobial prophylaxis should be discontinued at wound closure. Procedures involving implant-based breast reconstruction may consider <24 hours of postoperative antibiotics

Section References: [52, 53, 54, 55, 56]

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VASCULAR SURGERY PROCEDURES

Recommendations include both pediatric and adult when relevant, including use of vancomycin

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Amputation of lower extremity / toe **Debridement of wound**	*S. aureus* *S. epidermidis*	Cefazolin	Clindamycin
Temporal artery ligation **AV fistula creation or revision**	*S. aureus* *S. epidermidis*	Cefazolin	Clindamycin
Bypass Procedure - Axillary to femoral - Aorta to femoral / iliac - Carotid to subclavian - Femoral to popliteal - femoral to posterior tibial	*S. aureus* *S. epidermidis*	Cefazolin *__Add__ vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion	Clindamycin *__Substitute__ for vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion
AV fistula creation or revision	*S. aureus* *S. epidermidis*	Cefazolin + Vancomycin	Vancomycin
Embolectomy **Thrombectomy** **Thromboembolectomy** **Endarterectomy**	*S. aureus* *S. epidermidis*	Cefazolin *__Add__ vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion	Clindamycin *__Substitute__ for vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion
Endovascular aortic repair	*S. aureus* *S. epidermidis*	Cefazolin *__Add__ vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion	Clindamycin *__Substitute__ for vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion

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VASCULAR SURGERY PROCEDURES (page 2)

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Alternative Antimicrobial Regimen
Open aortic repair	*S. aureus* *S. epidermidis*	Cefazolin ***Add** vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion	Clindamycin ***Substitute** for vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion
Carotid endarterectomy **Carotid artery stent**	*S. aureus* *S. epidermidis*	Cefazolin ***Add** vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion	Clindamycin ***Substitute** for vancomycin for colonization/history of MRSA, ESRD for HD access, groin access, or prosthetic material insertion
Carotid endarterectomy **Carotid artery stent**	*S. aureus* *S. epidermidis*	Cefazolin	Clindamycin
Placement of thrombolysis catheters	*S. aureus* *S. epidermidis*	Cefazolin	Clindamycin
		***Thrombolysis **re-look** with advancement of lysis catheter alone does not warrant the use of antimicrobial prophylaxis agents	
Fistula without vein transposition **Fistula without prosthetic material** **Vein ablation** **IVC filter placement**	*None*	Antimicrobial prophylaxis not indicated	

RECOMMENDATIONS ON POSTOPERATIVE ANTIBIOTICS: In the absence of known or suspected infection, antimicrobial prophylaxis should be discontinued at wound closure

Section References: [52, 53, 54, 55, 56]

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NEONATAL SURGICAL PROCEDURES

Procedure / Operation	Infectious Org	Recommended Antimicrobial Regimen	Postoperative Antimicrobial Duration
Surgical NEC Repair or Spontaneous Intestinal Perforation	*Enteric Gram-negative bacilli* *Enterococci* *Anaerobes* *S. aureus*	Piperacillin/Tazobactam *Contact antimicrobial stewardship for guidance in patients with history of MDRO**	Typical duration: 7-10 days Patients requiring serial explorations warrant 4-5 days from final operation
Congenital diaphragmatic hernia	*S. aureus* *S. epidermidis*	Cefazolin *Contact antimicrobial stewardship for guidance in patients with history of MDRO**	Limited to intraoperative only
Gastroschisis silo placement or abdominal closure	*S. aureus* *S. epidermidis*	Cefazolin	Limited to intraoperative only
Tracheotomy [FIRST tracheotomy BPD infants with mechanical ventilation for >4 weeks] (*Does NOT apply to neonates receiving tracheostomy for airway or neurological issues)*	*S. aureus* *S. epidermidis*	Cefazolin *Contact antimicrobial stewardship for guidance in patients with history of MDRO** If patient is colonized with MRSA or has documented history of MRSA consider **adding** vancomycin	Postoperative prophylaxis (<48h) may be considered
Tracheotomy [in all other infants not meeting above criteria]	*None*	Routine antimicrobial prophylaxis **NOT** recommended	
TEF Repair	*S. aureus* *S. epidermidis*	Cefazolin *Contact antimicrobial stewardship for guidance in patients with history of MDRO** If patient is colonized with MRSA or has documented history of MRSA consider addition of IV vancomycin	Limited to intraoperative only
Small Bowel Atresia Repair • NON-perforated	*S. aureus* *S. epidermidis*	Cefazolin	Limited to intraoperative only
Small Bowel Atresia Repair, • Perforated	*Enteric Gram-negative bacilli* *Enterococci* *Anaerobes* *S. aureus*	Piperacillin/Tazobactam *Contact antimicrobial stewardship for guidance in patients with history of MDRO**	In the case of perforation, may consider postoperative antibiotics for 4 -5 days

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VIII. Best Practices with the use of Adjuvant Interventions for Surgical Site Reduction

Preoperative Urine Cultures

The presence of a urinary tract infection (UTI) preoperatively is associated with an increased risk for postoperative SSI. Patients with symptoms consistent with a UTI preoperative should be screened via urine microscopy. If a UTI is diagnosed, surgery should be considered for postponement of surgery until treatment is complete. The presence of asymptomatic bactruia (a positive urine study in the absence of symptoms) is not associated with an increased risk for SSI. With the exception of parturient patients, asymptomatic bacturia should not be an indication for targeted treatment or additional prophylaxis

Mechanical Bowel Preparation for Colon Procedures

Studies support the use of combined oral antibiotics and mechanical bowel preparation (MBP) for elective procedures that transect colon. MBP alone does not decrease surgical site infections and should be used in conjunction with standard IV antimicrobial prophylaxis. The combination has been shown to lower the incidence of SSI, anastomotic leaks, Clostridium difficile infection and post-operative ileus. Current UKHC MBP regimen includes:

- Neomycin 1000mg oral + metronidazole 500mg oral at 1300, 1400, and 2300 the day before surgery ± polyethylene glycol

IX. Surgical Wound Classification

- Clean – An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow non-penetrating (blunt) trauma should be included in this category if they meet the criteria.

- Clean-contaminated – Operative wounds in which the respiratory, alimentary, genital (male or female), or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.

- Contaminated – Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, non-purulent inflammation is encountered including necrotic tissue without evidence of purulent drainage (e.g., dry gangrene) are included in this category.

- Dirty (or infected) – Includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation

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XI. Enterprise Committee Review and Approval

Perioperative subcommittee	1/9/23
Antimicrobial stewardship subcommittee	1/10/23
Enterprise P&T Committee	1/28/23

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