1. Introduction

This guideline provides recommendations on the choice, and administration of antimicrobial prophylaxis for patients undergoing surgery and other invasive procedures at UHL. It also provides advice on procedures that don't routinely require prophylaxis to be administered.

The aim of antibiotic prophylaxis in these circumstances is to reduce the incidence of surgical site infection, while minimising adverse effects, and limiting the effect of antibiotics on the patients normal microbiome.

2. Scope

This guideline applies to all staff that prescribe or administer antimicrobials as part of surgical and other procedures for the prevention of infection.

The guideline does **not** cover the following:

- prevention of endocarditis after surgery or instrumentation
- use of antiseptics for the prevention of wound infection after elective surgery
- administration of oral antibiotics for bowel preparation or to achieve selective decontamination of the gut
- topical antibiotic administration, for example, in wounds or for perineal lavage
- use of antibiotics for prophylaxis in patients with prosthetic implants undergoing dental surgery or other surgery that may cause bacteraemia
- transplant surgery.

3. Recommendations, Standards and Procedural Statements

Do not use antibiotic prophylaxis routinely for clean non-prosthetic uncomplicated surgery.

Give antibiotic prophylaxis to patients undergoing the following types of surgery (see Table 1):

- clean surgery involving the placement of a prosthesis or implant
- clean-contaminated surgery
- contaminated surgery

Give antibiotic treatment (in addition to prophylaxis) to patients having surgery on a dirty or infected wound. Follow the relevant antimicrobial guideline to determine the recommended choice of empirical treatment for that infection

Table 1: Surgical wound classification

Clean	An incision in which no inflammation is encountered in a surgical procedure, without a break in sterile technique, and during which the respiratory, alimentary or genitourinary tracts are not entered.
Clean-contaminated	An incision through which the respiratory, alimentary, or genitourinary tract is entered under controlled conditions but with no contamination encountered.
Contaminated	An incision undertaken during an operation in which there is a major break in sterile technique or gross spillage from the gastrointestinal tract, or an incision in which acute, non-purulent inflammation is encountered. Open traumatic wounds that are more than 12 to 24 hours old also fall into this category.
Dirty or infected	An incision undertaken during an operation in which the viscera are perforated or when acute inflammation with pus is encountered (for example, emergency surgery for faecal peritonitis), and for traumatic wounds if treatment is delayed, there is faecal contamination, or devitalised tissue is present

Give the antibiotics as recommended in Table 3, unless there is a clear reason to give an alternative. If an alternative choice, dose or frequency/number of doses of antibiotic is prescribed, the reason for departure from this guideline should be documented in the patient's medical notes.

Unless otherwise stated in Table 3, give a single dose of antibiotic prophylaxis intravenously on induction of anaesthesia. However, give prophylaxis earlier for operations in which a tourniquet is used.

Extended surgical prophylaxis is of limited benefit and for some procedures is proven not to benefit; do not prescribe extended surgical prophylaxis post procedure unless recommended by guideline. (If evidence of infection is seen during the procedure prescribe antibiotics as treatment rather than prophylaxis if needed).

Inform patients before the operation, whenever possible, if they will need antibiotic prophylaxis, and afterwards if an antibiotic has been given.

Antibiotics may require re-dosing in prolonged procedures (greater than four hours) or where there is intraoperative blood loss of greater than 1500ml. In cases of extensive blood loss (>3000ml), decisions around re-dosing should be made on an individual patient basis taking account of the risks and benefits of repeat dosing. It is not recommended to give a repeat dose after every subsequent 1500ml blood loss.

Table 2: Re-dosing of antibiotics

Drug	**Procedure duration**		**Blood loss above1500ml (give after fluid replacement)**
	Over 4 hours	**Over 8 hours**	
Ciprofloxacin	-	Repeat original dose	Repeat original dose
Co-amoxiclav	Repeat original dose	Repeat original dose again	Repeat original dose
Flucloxacillin	Repeat original dose	Repeat original dose again	Repeat original dose
Gentamicin	-	Consider repeating original dose (ensure total daily dose doesn't exceed 7mg/kg based on ideal bodyweight)	Repeat original dose
Meropenem	Repeat original dose	Repeat original dose	Repeat original dose
Metronidazole	-	Repeat original dose	Repeat original dose
Teicoplanin	-	-	Give half original dose if greater than 1500ml blood loss within first hour of the operation

Table 3: Antibiotic recommendations

Doses recommended for adult patients with normal renal and liver function.

- Metronidazole IV 500mg may be substituted with 1g PR (rectally) 2hrs pre-op

Surgical procedure	Standard Prophylaxis Regimens (all single dose and given at induction, unless stated)		Prophylaxis regimens for **penicillin allergic** patients (all single dose and given at induction, unless stated)	
	Standard regimen	**For known or previously known MRSA positive patients**	**Penicillin-allergic regimen**	**For known or previously known MRSA positive patients**
Abdominal				
ERCP and Endoscopy	Antibiotic prophylaxis not routinely recommended if low risk of bacteraemia. For high risk of bacteraemia (refer to Table 4), see row below.			
ERCP and Endoscopy prophylaxis (ONLY indicated if high risk of bacteraemia)	Co-amoxiclav IV 1.2g (30 minute prior to the procedure)	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
Hepatobiliary and Lower GI surgery including colorectal	Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg	Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg
Hernia repair (inguinal, femoral, incisional, with or without mesh)	Antibiotic prophylaxis not routinely recommended			
Laparoscopic cholecystectomy	Antibiotic prophylaxis not routinely recommended. If high risk, manage as Upper GI surgery High risk: intra-operative cholangiogram, bile spillage, conversion to laparotomy, acute cholecystitis or pancreatitis, jaundice, pregnancy, immunosuppression, insertion of prosthetic device			
Open or laparoscopic surgery with mesh (e.g. gastric band, rectopexy)	Antibiotic prophylaxis not routinely recommended. Consider prophylaxis in high risk patients, following Upper/Lower GI surgery guidelines, depending on site			
Pancreatectomy, and Upper GI surgery	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg

Surgical procedure	Standard Prophylaxis Regimens (all single dose and given at induction, unless stated)		Prophylaxis regimens for **penicillin allergic** patients (all single dose and given at induction, unless stated)	
	Standard regimen	**For known or previously known MRSA positive patients**	**Penicillin-allergic regimen**	**For known or previously known MRSA positive patients**
Abdominal (cont)				
Splenectomy (not immunosuppressed)	Antibiotic prophylaxis not routinely recommended			
Splenectomy (high risk: immunosuppressed)	Co-amoxiclav IV 600mg	Teicoplanin IV 400mg and Co-amoxiclav IV 600mg	Teicoplanin IV 400 mg and Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg
Breast surgery				
Breast Reconstruction Surgery with or without tissue expander	Co-amoxiclav IV 1.2g followed by two further doses of Co-amoxiclav IV 600mg at 8 hourly intervals	Teicoplanin IV 400mg plus Co-amoxiclav IV 1.2g followed by two further doses of Co-amoxiclav IV 600mg at 8 hourly intervals	Teicoplanin IV 400mg plus Gentamicin IV 120mg	Teicoplanin IV 400mg plus Gentamicin IV 120mg
Mastectomy Wide local excision Axillary clearance Breast reduction	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg	Teicoplanin IV 400mg	Teicoplanin IV 400mg
Cardiac and thoracic				
Cardiac surgery	Gentamicin IV 120mg and Flucloxacillin IV 1g and 3 further doses of Flucloxacillin at 6 hourly intervals	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
Thoracic surgery	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
Implantable loop recorder	Flucloxacillin PO 1g	Based on reported MRSA sensitivities (If tetracycline-sensitive, or unknown sensitivity use Doxycycline PO 200mg)	Doxycycline PO 200mg	Based on reported MRSA sensitivities (If tetracycline-sensitive, or unknown sensitivity use Doxycycline PO 200mg

Surgical procedure	Standard Prophylaxis Regimens (all single dose and given at induction, unless stated)		Prophylaxis regimens for **penicillin allergic** patients (all single dose and given at induction, unless stated)	
	Standard regimen	**For known or previously known MRSA positive patients**	**Penicillin-allergic regimen**	**For known or previously known MRSA positive patients**
Cardiac and thoracic (cont)				
Pacemaker Insertion	Flucloxacillin 1g IV and Gentamicin IV 120mg followed by three further doses of Flucloxacillin PO 500mg at 6 hourly intervals	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
Head and neck; Plastics				
Adenoidectomy	Antibiotic prophylaxis not routinely recommended: if by curettage			
Ear surgery	Antibiotic prophylaxis not routinely recommended: if clean/clean-contaminated			
Facial surgery	Antibiotic prophylaxis not routinely recommended: if clean			
Head and neck surgery	Antibiotic prophylaxis not routinely recommended: if clean, benign			
Nose, sinus and endoscopic sinus surgery	Antibiotic prophylaxis not routinely recommended: if routine, (including grafts)			
Tonsillectomy	Antibiotic prophylaxis not routinely recommended			
Ear Nose and Throat surgery (not listed above)	Co-amoxiclav IV 600mg	Teicoplanin IV 400mg and Co-amoxiclav IV 600mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg
Maxillo-facial surgery	Co-amoxiclav IV 600mg	Teicoplanin IV 400mg and Co-amoxiclav IV 600mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg
Oculoplastics	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Meropenem IV 500mg	Teicoplanin IV and Meropenem 500mg
Plastic surgery	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg

Surgical procedure	Standard Prophylaxis Regimens (all single dose and given at induction, unless stated)		Prophylaxis regimens for **penicillin allergic** patients (all single dose and given at induction, unless stated)	
	Standard regimen	**For known or previously known MRSA positive patients**	**Penicillin-allergic regimen**	**For known or previously known MRSA positive patients**
Obstetrics and Gynaecology				
	Refer to Women's Antimicrobial Guideline http://insitetogether.xuhl-tr.nhs.uk/pag/pagdocuments/Antimicrobial%20Summary%20UHL%20Womens%20Guideline.pdf			
Orthopaedic and Vascular				
Amputation	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg and Metronidazole IV 500mg
Clean surgery without prosthetic implants	Antibiotic prophylaxis not routinely recommended			
Massive Endoprosthetic replacement	Teicoplanin IV 400mg and Gentamicin IV 240mg	Teicoplanin IV 400mg and Gentamicin IV 240mg	Teicoplanin IV 400mg and Gentamicin IV 240mg	Teicoplanin IV 400mg and Gentamicin IV 240mg
Orthopaedic surgery (trauma and elective)	Co-amoxiclav IV 1.2g followed by two further doses of Co-amoxiclav IV 600mg at 8 hourly intervals (For trauma patients with unknown MRSA status on arrival at theatre add Teicoplanin IV 400mg)	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g followed by two further doses of Co-amoxiclav IV 600mg at 8 hourly intervals	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
Open fractures	Refer to "UHL Adult Orthopaedic Infection Guidelines" (trust reference B40/2021)		Refer to "UHL Adult Orthopaedic Infection Guidelines" (trust reference B40/2021)	
Vascular surgery	Co-amoxiclav IV 1.2g followed by two further doses of Co-amoxiclav IV 600mg at 8 hourly intervals	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g followed by two further doses of Co-amoxiclav IV 600mg at 8 hourly intervals	Teicoplanin IV 400mg and and Gentamicin IV 120mg	Teicoplanin IV 400mg and and Gentamicin IV 120mg

Surgical procedure	Standard Prophylaxis Regimens (all single dose and given at induction, unless stated)		Prophylaxis regimens for **penicillin allergic** patients (all single dose and given at induction, unless stated)	
	Standard regimen	**For known or previously known MRSA positive patients**	**Penicillin-allergic regimen**	**For known or previously known MRSA positive patients**
Radiology (interventional)				
Prostate artery embolization	Ciprofloxacin enterally 750mg 60minutes before procedure followed by ciprofloxacin enterally 750mg BD for 3 days	Ciprofloxacin enterally 750mg 60minutes before procedure followed by ciprofloxacin enterally 750mg BD for 3 days	Ciprofloxacin enterally 750mg 60minutes before procedure followed by ciprofloxacin enterally 750mg BD for 3 days	Ciprofloxacin enterally 750mg 60minutes before procedure followed by ciprofloxacin enterally 750mg BD for 3 days
Trans-catheter arterial Chemoembolisation (Hepatic)	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Gentamicin IV 120mg (30 minutes prior to procedure)	Teicoplanin IV 400mg and Gentamicin IV 120mg (30 minutes prior to procedure)	Teicoplanin IV 400mg and Gentamicin IV 120mg (30 minutes prior to procedure)
Intravascular catheter insertion	Antibiotic prophylaxis not routinely recommended for non-tunnelled, tunnelled or antimicrobial impregnated central venous catheters. Consider prophylaxis if rate of infection is high			
Renal / Urology				
Nephrostomy tube insertion	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
PD tube insertion	Teicoplanin IV 400mg	Teicoplanin IV 400mg	Teicoplanin IV 400mg	Teicoplanin IV 400mg
Percutaneous nephrolithotomy (PCNL)	Amoxicillin IV 1g and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Gentamicin IV 120mg
Prostatic biopsy (trans-rectal)	Ciprofloxacin oral 750mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Ciprofloxacin oral 750mg and Gentamicin IV 120mg	Ciprofloxacin oral 750mg and Gentamicin IV 120mg	Teicoplanin IV 400mg and Ciprofloxacin oral 750mg and Gentamicin IV 120mg
Renal transplant	Co-amoxiclav IV 1.2g	Teicoplanin IV 400mg and Co-amoxiclav IV 1.2g	Ciprofloxacin IV 400mg	Teicoplanin IV 400mg and Ciprofloxacin IV 400mg
Urology (endoscopic operations on urinary tract) – include metronidazole if bowel breach likely	Gentamicin IV 120mg ± Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg ± Metronidazole IV 500mg	Gentamicin IV 120mg ± Metronidazole IV 500mg	Teicoplanin IV 400mg and Gentamicin IV 120mg ± Metronidazole IV 500mg

Urinary catheterisation	No routine antibiotic cover is required for the insertion, removal or changing of urinary catheters Consider antibiotic prophylaxis for urine catheter insertions if the patient: Has UTI with signs of sepsis Has undergone a recent urological procedure Has a newly confirmed urinary tract infection, and not yet received antibiotic therapy Is neutropenic (i.e. neutrophil count <500/mm3) If antibiotic prophylaxis is indicated: Prescribe Gentamicin IV 120 mg stat. This must not be repeated within a 24 hour period, irrelevant of number of catheter insertions.

Table 4.

ERCP and Endoscopy – factors indicating high risk of bacteraemia
Percutaneous endoscopic gastrostomy (PEG) or jejunostomy
Patients with a history of liver transplantation
Patients with Biliary disorders such as primary sclerosing cholangitis or hilar cholangiocarcinoma, in whom it can be anticipated that complete biliary drainage will be difficult or impossible to achieve during one procedure.
Patient with pancreatic pseudocyst, EUS-FNA of mediastinal or pancreatic cyst
Bile spillage or leak
Presence of acute cholecystitis
Presence of acute pancreatitis
Presence of prosthetic heart valve
Patient with severe neutropenia (<0.5 x 10^9/l) and/or advanced haematological malignancy.
Other indications deemed as high risk after careful risk assessment

4. Education and Training

No new sills are required to implement this guideline.

5. Monitoring and Audit Criteria

All guidelines should include key performance indicators or audit criteria for auditing compliance,

if this template is being used for associated documents (such as procedures or processes) that support a Policy then this section is not required as all audit and monitoring arrangements will be documented in section 8 of the Policy.

Key Performance Indicator	Method of Assessment	Frequency	Lead
Compliance with recommendations	Trust wide antimicrobial prescribing audit	Annually	Lead Antimicrobial Pharmacist

6. Supporting Documents and Key References

1. National Institute for Health and Care Excellence. (2019). *Surgical site infections: prevention and treatment.* [NICE Guideline No. 125] https://www.nice.org.uk/guidance/ng125
2. Healthcare Improvement Scotland – SAPG (2018) Recommendations for redosing antibiotics for surgical prophylaxis (https://www.sapg.scot/media/3880/good-practice-recommendations-for-re-dosing-surgical-prophylaxis-final.pdf
3. Scottish Intercollegiate Guidelines Network: Antibiotic Prophylaxis in surgery (update) draft. March 2007.
4. Antimicrobial Prophylaxis for Surgery: An advisory statement from the national surgical infection prevention project. Bratzler et al. *Clin Infect Dis* 2004;38:1706-15.
5. Guidelines for the prophylaxis and treatment of methicillin-resistant *Staphylococcus aureus* (MRSA) Infection in the UK. Gemmell et al. J. *Antimicrobial Chemo* 2006;57:589-608
6. Pharmacokinetics and bioavailability of a new formulation of teicoplanin following intravenous and intramuscular administration to humans. Kally K. A. et al. J Pharm Sci 2990;80:605-607

7. Key Words

Adult surgical prophylaxis; antibiotic; antimicrobial

List of words, phrases that may be used by staff searching for the Policy on SharePoint

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This table is used to track the development and approval and dissemination of the document and any changes made on revised / reviewed versions

DEVELOPMENT AND APPROVAL RECORD FOR THIS DOCUMENT			
Author / Lead Officer:	Dr R Saunders	**Job Title:** Consultant Microbiologist	
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REVIEW RECORD			
Date	**Issue Number**	**Reviewed By**	**Description Of Changes (If Any)**
May 2024	10	J Veater	Open fracture antibiotic advice replaced with comment to review trust guideline B40/2021 -
Oct 21	10	R.Saunders, C.Ashton	Amended introduction Redosing information added Added Table 1 (surgical wound classification) Added Table 2 (redosing of antibiotics) Reordered main table by broad surgical area Merged appendicectomy and colorectal surgery into Lower GI surgery. Inserted non-prophylaxed procedures into main table Added Table 4: ERCP/endoscopy risk factors Updated Ciprofloxacin doses to current BNF/EUCAST recommendations. Urology – clarified procedure names and standardised gentamicin dosing. Aligned penicillin-allergic regimens with/without MRSA cover for surgery where Gram positive cover important. Clarified MRSA options for implantable loop recorders Deleted regimens for Women's and referred to separate guideline Inserted existing guidance on urinary catheterisation
July 16	9.1	C.Ashton	Updated recommendation to TACE regimen
Dec 14	9	K. Dawson	Addition of implantable loop recorders

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