Guideline

Children's Health Queensland Paediatric Antibiocard: Empirical Antibiotic Guidelines

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Author/custodian	Director, Infection Management and Prevention Services Medical Lead, Antimicrobial Stewardship (QCH)			**Review date**	03/09/2023
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Applicable to	All Children's Health Queensland staff				
Authorisation	Executive Director Clinical Services				

Purpose

The recommendations of this guideline are for the initial treatment of presumptive infections in patients cared for by Children's Health Queensland (CHQ). These guidelines are to be used only before the results of microbiological investigations are available or finalized.

Scope

This guideline provides information for all Queensland Health employees (permanent, temporary and casual) and all organisations and individuals acting as its agents (including Visiting Medical Officers and other partners, contractors, consultants and volunteers).

Related documents

Procedures, guidelines, protocols and useful resources

- CHQ-PROC-01036 Antimicrobial: Prescribing and Management
- CHQ Antimicrobial restrictions
- CHQ-GDL-01076 Paediatric antibiotic allergy assessment, testing and de-labelling
- Pathology Queensland – Queensland Children's Hospital Antibiograms
- Pathology Queensland – All children at Queensland Public Hospitals Antibiograms

Guideline

Introduction

Standards of Antimicrobial Stewardship in Children's Health Queensland

- Take cultures before starting antibiotics
- Cease antibiotics if cultures negative at 48 hours **except if**:
  - the child has signs of severe sepsis.
  - cultures were taken after antibiotic treatment was started, discuss with Infectious Diseases (ID) team.
  - ongoing infection is likely.
- Change to narrow spectrum antibiotics once sensitivities are known.
- Consult Infection specialist.
  - if patient has a previous (or new onset) severe antimicrobial hypersensitivity reaction (include the following information: type of antimicrobial, type of reaction and severity, onset of reaction in relation to commencing antimicrobial, treatment required to treat symptoms).
  - to confirm appropriate treatment and duration for positive blood culture results.
  - when escalation to broader antibiotic treatment is considered for ongoing infection.
  - for recommendations for treatment duration in confirmed infections.
- Document indication, Infectious Diseases (ID) approval number (where applicable) and planned duration/review date on the electronic Medication order in the integrated electronic medical record (ieMR) or the Paediatric National Inpatient Medication Chart (P-NIMC) when prescribing antimicrobials.
- Daily review of antibiotic plan (stop/continue antibiotics) should occur during ward round, review is to include:
  - Consideration of Early Intravenous (IV) to Oral Switch Therapy - Patients should be reviewed at 24 to 48 hours to consider whether early IV to oral switch would be appropriate. Refer to CHQ-GDL-01057 Antimicrobial treatment: Early intravenous to oral switch – Paediatric Guideline for further information. Exercise caution when considering a switch to oral in neonates and infants because of the relatively high incidence of bacteraemia and the possibility of variable oral absorption.
  - Review of pathology results and appropriate antimicrobial dosing and choice based on these results.
- Seek Pharmacist / ID advice on appropriate therapeutic drug monitoring (TDM) and appropriate dosing for patients in renal failure
  - Paediatric Tobramycin/Gentamicin Therapeutic Drug Monitoring
  - Paediatric Vancomycin Therapeutic Drug Monitoring
- Patients labelled with an antibiotic allergy have longer hospital stays and increased exposure to suboptimal antibiotics. Take a comprehensive antimicrobial allergy history and assess the risk as per the CHQ-GDL-01076 Paediatric antibiotic allergy assessment, testing and de-labelling

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
SEPTICAEMIA		
Febrile neutropenia (Oncology / Haematology)	**Over 1 month of age:** **Piperacillin- Tazobactam IV** 100 mg/kg/dose every 6 hours (maximum 4 g/dose Piperacillin component) and seek ID review within 72 hours. **If critically ill add both:** **Gentamicin IV** (dose based on ideal body weight. Perform** TDM**)**: Less than 10 years: 7.5 mg/kg once daily (maximum 320 mg/day); More than 10 years: 6 mg/kg once daily (maximum 640 mg/day). (Consider risk factors for renal impairment. Discuss with Oncologist) **AND** **Vancomycin IV** 15 mg/kg (maximum initial dose of dose 750 mg) every 6 hours. **If gram positive bacteraemia with resistance to Piperacillin/Tazobactam proven or suspected clinically (e.g. line or post-surgical)**: Add **IV Vancomycin** 15 mg/kg (maximum initial dose of 750 mg) every 6 hours (Perform TDM for Gentamicin and Vancomycin). **Refer to** CHQ-GDL-01249 Management of Fever in a Paediatric Oncology Patient (Febrile Neutropaenia and Febrile Non-neutropaenia).	**Delayed type hypersensitivity,** **Ceftazidime IV** 50 mg/kg/dose every 8 hours (maximum 2 g/dose). **PLUS** **Gentamicin IV** (single dose then review). **Immediate type hypersensitivity,** Meropenem IV 40 mg/kg/dose IV every 8 hourly (maximum 2 g/dose) **and seek ID advice.**
Febrile non-neutropenia (Oncology)	**Over 1 month of age:** **Ceftriaxone IV** 100 mg/kg once daily (maximum 4 g/day) **and discuss with Paediatric Oncologist.** **Refer to** CHQ-GDL-01249 Management of Fever in a Paediatric Oncology Patient (Febrile Neutropaenia and Febrile Non-neutropaenia).	**Immediate type hypersensitivity, seek ID advice.**

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
SEPTICAEMIA		
COMMUNITY ACQUIRED SEPSIS (non PICU) **(Meningitis excluded)** ***(For neonates and infants less than or equal to 2 months old)*** **Note: If Meningitis has not been excluded treat as stated under MENINGITIS**	**Ampicillin IV (or Amoxicillin IV)** **Less than 1 month old:** Refer to neonatal dosing section. **1 month or older:** 50 mg/kg/dose IV every 6 hours (maximum 2 g/dose). **PLUS** **Gentamicin IV** (Dose based on ideal body weight. Perform TDM)** **If less than 1 month old:** Age dependent - Refer to Gentamicin neonatal dosing section. **If 1 month or older:** 7.5 mg/kg IV once daily (maximum 320 mg/day).	**Immediate type hypersensitivity,** **Cefotaxime IV**
	If at risk of non multi-resistant MRSA (nmMRSA): **If less than 1 month old:** Refer to neonatal dosing section. Ampicillin (or Amoxycillin) IV **PLUS** Gentamicin IV PLUS Clindamycin IV. **If more than 1 month old:** Ampicillin (or Amoxycillin) IV **PLUS** Gentamicin IV **PLUS** Lincomycin IV 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose).	
	If at risk of multi-resistant MRSA: Ampicillin (or Amoxycillin) IV PLUS Gentamicin IV PLUS Vancomycin IV. **If less than 1 month old:** Refer to neonatal dosing section.	
COMMUNITY ACQUIRED SEPSIS (non PICU) **(Meningitis excluded)** ***(For infants and children more than 2 months old)***	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose); **OR Ceftriaxone IV** 100 mg/kg once daily (maximum 4 g/day). **Note: If Meningitis clinically or by LP treat as below under MENINGITIS.**	**Immediate type hypersensitivity** **Ciprofloxacin IV** 10 mg/kg/dose 12-hourly (maximum 400 mg/dose) **PLUS** **Vancomycin IV** Seek ID advice within 24 hours.
	If at risk of nmMRSA: **Cefotaxime IV PLUS** **Lincomycin IV** 15 mg/kg/dose every 8 hourly (maximum 1.2 g/dose).	
	If at risk of multi-resistant MRSA **Cefotaxime IV PLUS Vancomycin IV** 15 mg/kg every 6 hours (maximum initial Vancomycin dose of 750 mg) (Perform TDM)**.**	
	In North Queensland during wet season (November to May) **Replace Cefotaxime with Meropenem IV** 40 mg/kg/dose every 8 hours (maximum 2 g/dose of Meropenem) to cover Melioidosis.	**Immediate type hypersensitivity**, seek ID advice.

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
CARDIAC		
Endocarditis **(Note: For directed therapy, seek ID advice)**	**Benzylpenicillin IV** 50 mg/kg/dose every 4 hours (maximum 1.8 g/dose) **PLUS Flucloxacillin IV** 50 mg/kg/dose every 4 hours (maximum 2 g/dose) **PLUS Gentamicin IV** (Dose based on ideal body weight. Perform** TDM**).** • **If more than 1 month and less than 10 years old:** 7.5 mg/kg once daily (maximum 320 mg/day). • **If more than 10 years old:** 6 mg/kg once daily (maximum 560 mg/day).	**Delayed type hypersensitivity** **Cephazolin IV** 50 mg/kg every 8 hours (maximum 2 g/dose) **PLUS Gentamicin IV** **PLUS Vancomycin IV.** **Immediate type hypersensitivity,** **Gentamicin IV** **PLUS Vancomycin IV** and seek ID advice within 24 hours.
	Note: If less than 1 month old, refer to Benzylpenicillin, Flucloxacillin and Gentamicin neonatal dosing section**.**	
Endocarditis (prosthetic valve, nosocomial infection or community acquired MRSA is suspected) **(Note: For directed therapy, seek ID advice)**	**Vancomycin IV** # **(**see TDM section**)** • **If more than 1 month old:** 15 mg/kg/dose IV every 6 hours (maximum initial dose of 750 mg). **PLUS Flucloxacillin IV** • **If more than 1 month old:** 50 mg/kg/dose IV every 4 hours (maximum 2 g/dose) **PLUS Gentamicin IV** (Dose based on ideal body weight. Perform** TDM**)** • **If more than 1 month and less than 10 years old:** 7.5 mg/kg once daily (maximum 320 mg/day) • **If more than 10 years old:** 6 mg/kg once daily (maximum 560 mg/day)	
	Note: If less than 1 month old, refer to Vancomycin, Flucloxacillin and Gentamicin neonatal dosing section**.** Perform TDM for Gentamicin and Vancomycin.	

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
CENTRAL NERVOUS SYSTEM		
Meningitis (less than or equal to 2 months old)	**Ampicillin IV (or Amoxicillin IV) Plus Cefotaxime IV** Refer to Ampicillin/Amoxicillin & Cefotaxime neonatal dosing section. **(Comment: For Gram negative meningitis/sepsis – Consult ID.)**	**Immediate type hypersensitivity, seek ID advice.**
If Encephalitis suspected (less than or equal to 2 months old)	**Add Aciclovir IV -** Refer to Aciclovir neonatal dosing section. **(Comment: Duration of 3 weeks or till PCR negative.)**	
Meningitis (more than 2 months old)	**Cefotaxime IV** 50 mg/kg/dose IV every 6 hours (maximum 2 g/dose) **OR** **Ceftriaxone IV** 50 mg/kg/dose (maximum 2 g/dose) every 12 hours. Discuss with ID within 24 to 48 hours with cerebrospinal fluid (CSF) culture and susceptibility results.	**Immediate type hypersensitivity, Ciprofloxacin IV** 10 mg/kg/dose 12-hourly (maximum 400 mg/dose) **PLUS Vancomycin IV** and seek ID advice within 24 hours.
	If Gram positive cocci in CSF: **Add Vancomycin# IV (see** TDM section**)** and discuss with ID. **If more than 1 month old:** 15 mg/kg/dose IV every 6 hours (maximum 750 mg/dose starting dose). Perform TDM.	
If Encephalitis suspected (more than 2 months old)	**Add Aciclovir IV** **(Comment: Duration of 3 weeks or till PCR negative.)** • **If more than 2 months old or less than 12 years old:** 500 mg/m^2/dose IV every 8 hours (maximum 1000 mg/dose). • **If more than 12 years old:** 10 mg/kg/dose IV every 8 hours (maximum 1000 mg/dose).	
Prophylaxis for *N. meningitidis*	**Ciprofloxacin oral:** **Child 1 to 5 years old:** 30 mg/kg (up to 125 mg) orally as a single dose. **Child 5 to 12 years old:** 250 mg orally, as a single dose. **Adolescents more than 12 years old:** 500 mg orally, as a single dose.	
	OR Rifampicin oral: **Less than 1 month old:** 5 mg/kg/dose orally twice daily for 2 days. **More than 1 month old:** 10 mg/kg/dose orally twice daily (maximum 600 mg/dose) for 2 days.	

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
CENTRAL NERVOUS SYSTEM		
CSF shunt infection	**Neonates: Seek ID advice.** **If more than 1 month old:** **Cefotaxime IV** 50 mg/kg/dose IV every 6 hours (Maximum 2g/dose) **AND** **Vancomycin# IV (see** TDM section**)** 15 mg/kg/dose IV every 6 hours (maximum initial dose of 750 mg) Perform TDM for Vancomycin. Discuss with ID within 48 hours.	**Immediate type hypersensitivity, seek ID advice.**
RESPIRATORY		
Community acquired Pneumonia Neonate (less than or equal to 1 month old)	**Ampicillin IV (or Amoxicillin IV) PLUS Gentamicin IV**** Age dependent dosing - Refer to Ampicillin/Amoxicillin and Gentamicin neonatal section. Perform TDM for Gentamicin. (Comment: Consider adding azithromycin if pertussis / chlamydia likely.)	**Immediate type hypersensitivity, seek ID advice.**
Community acquired Pneumonia (CAP) (more than 1 month old)	**Amoxicillin orally** 25 mg/kg/dose every 8 hours (maximum 1 g/dose). Comment: Oral antibiotics are sufficient in most children with CAP unless unable to tolerate oral or severe/complicated disease.	**Immediate type hypersensitivity, Roxithromycin orally** 4 mg/kg/dose twice daily (maximum 150 mg/dose)
Community acquired Pneumonia (more than 1 month old) (unable to tolerate oral)	**Benzylpenicillin IV** 60 mg/kg/dose every 6 hours (maximum 2.4 g/dose).	**Delayed type hypersensitivity, Cefotaxime IV.** **Immediate type hypersensitivity, seek ID advice.**

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
RESPIRATORY		
Empyema	**Benzylpenicillin IV** 60 mg/kg/dose every 6 hours (maximum 2.4 g/dose) **PLUS Lincomycin IV** 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose) **Consult respiratory team regarding pleural drainage.** **Seek ID advice within 72 hours.**	**Delayed type hypersensitivity, Lincomycin IV PLUS Cefotaxime IV**
Severe Pneumonia (Less than or equal to 5 years old) (Paediatric intensive care (PICU))	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose). **Discuss with ID within 48 hours.**	**Immediate type hypersensitivity, seek ID advice**.
	If S. aureus (including nmMRSA) pneumonia suspected: **Cefotaxime IV PLUS Lincomycin IV and seek ID advice within 24 hours.**	
	If life threatening pneumonia OR multi-resistant MRSA suspected: **Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) **PLUS Lincomycin IV** 15 mg/kg/dose every 6 hours (maximum 1.2 g/dose) **PLUS Vancomycin IV** 15 mg/kg/dose IV every 6 hours (maximum initial dose of 750 mg) (Perform therapeutic drug monitoring for Vancomycin.) **PLUS consider Azithromycin IV** 10 mg/kg once daily (maximum 500 mg/day). **Seek ID advice within 24 hours**	
Severe Pneumonia (More than 5 years old) (PICU)	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose). **+/- Azithromycin IV** 10mg/kg once daily (maximum 500mg/day). (Swap to oral Roxithromycin 4 mg/kg/dose (maximum 150 mg/dose) twice daily, after 24 hours if possible). **Seek ID advice within 24 hours.**	
	If S. aureus (including nmMRSA) pneumonia suspected: **Cefotaxime IV PLUS Lincomycin IV and seek ID advice within 24 hours.**	
	If life threatening pneumonia OR multi-resistant MRSA suspected: **Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) **PLUS Lincomycin IV** 15 mg/kg/dose every 6 hours (maximum 1.2 g/dose) **PLUS Vancomycin IV** 15 mg/kg/dose IV every 6 hours (maximum initial dose of 750 mg) (Perform therapeutic drug monitoring for Vancomycin.) **PLUS consider Azithromycin IV** 10 mg/kg once daily (maximum 500 mg/day). **Seek ID advice within 24 hours.**	

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
RESPIRATORY		
Tracheitis/Epiglottitis	**Cefotaxime IV** 50 mg/kg/dose IV every 6 hours (maximum 2 g/dose) and seek ID review within 24 hours.	**Immediate type hypersensitivity, seek ID advice.**
Pertussis	**Azithromycin oral** **Less than or equal to 6 months old:** 10 mg/kg orally once daily (maximum 500 mg/day) for 5 days. **More than 6 months old:** 10 mg/kg orally once daily on Day 1 (maximum 500 mg), then 5 mg/kg daily on Day 2 to 5 (maximum 250 mg/day).	
EAR, NOSE AND THROAT (ENT)		
Tonsillitis	**Phenoxymethylpenicillin** 15 mg/kg/dose orally twice daily (maximum 500 mg/dose) for 10 days.	**Delayed type hypersensitivity** Roxithromycin orally.
Acute Otitis Media	**Amoxicillin** 25 mg/kg/dose orally every 8 hours (maximum 1 g/dose) for 5 days.	**Delayed type hypersensitivity, Cephalexin orally** 30 mg/kg/dose every 8 hourly (maximum 1 g/dose).
Mastoiditis	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) and seek ID review within 72 hours.	**Immediate type hypersensitivity,** seek ID advice
Retropharyngeal abscess	**IV Amoxicillin-Clavulanic acid** **Neonates and Infants (0 to 3 months old):** If less than or equal to 4 kg: 25 mg/kg/dose (amoxicillin component) every 12 hours. If more than 4 kg: 25 mg/kg/dose (amoxicillin component) every 8 hours. **Infants and children (more than 3 months old):** **Severe infection:** 25 mg/kg/dose (amoxicillin component) every 6 hourly (maximum 1 g/dose Amoxicillin component). **Adolescents older than 12 years old (and more than 40 kg):** **Severe infection:** 25 mg/kg/dose (amoxicillin component) every 6 hourly (maximum 1 g/dose Amoxicillin component; maximum 200 mg/dose clavulanate component). **Seek ID review within 24 hours.**	**Delayed type hypersensitivity, Cefotaxime IV.**

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
GASTRO-INTESTINAL		
Appendicitis **SURGICAL PROPHYLAXIS**	**Cefoxitin** 40 mg/kg (up to 2 g maximum) IV preoperatively at time of induction (knife to skin) **as single dose only.** No further antibiotics usually required.	**Immediate type hypersensitivity,** Substitute with **single dose of Metronidazole IV 7.5 mg/kg** (maximum 500 mg) **PLUS Gentamicin 5 mg/kg IV** **(1 month to 10 years old:** maximum 320 mg) **(More than 10 years old**: maximum 560 mg)
Appendicitis **UNCOMPLICATED** **(e.g. no perforation)**	**IV antibiotics are not usually required for postoperative treatment of uncomplicated appendicitis.** **If required a short course (e.g. 72 hours) is usually sufficient:** **Ampicillin IV (or Amoxicillin IV)** • **More than 1 month old:** 50 mg/kg/dose IV every 6 hours (maximum 2 g/dose). **PLUS Metronidazole IV** 7.5 mg/kg/dose every 8 hours (maximum 500 mg/dose). **PLUS Gentamicin IV** (Dose based on ideal body weight. See** TDM section**)** • **If more than 1 month and less than (or equal to) 10 years old**: 7.5 mg/kg once daily (maximum 320 mg/day). • **If more than 10 years old:** 6mg/kg once daily (maximum 560 mg/day). Perform therapeutic drug monitoring for Gentamicin as advised by pharmacy. **If IV gentamicin required for more than 72 hours, direct treatment based on microbiology results and seek ID advice.**	**Delayed type hypersensitivity,** **Ceftriaxone IV** 50 mg/kg once daily (Maximum 2 g/day) **PLUS Metronidazole IV.** **Immediate type hypersensitivity,** **Gentamicin IV** **PLUS Lincomycin IV** 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose).

<table>
<tr><th>INFECTION</th><th colspan="2">FIRST CHOICE ANTIMICROBIAL</th><th>Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial</th></tr>
<tr><td rowspan="5">Appendicitis COMPLICATED (e.g. perforation, appendiceal collection / abscess)

Peritonitis

NEC (for neonates - Age dependent dosing - Refer to Ampicillin/Amoxicillin, Metronidazole and Gentamicin neonatal section).</td><td colspan="2">EMPIRICAL ANTIBIOTICS FOR FIRST 72 HOURS, CHOOSE EITHER:</td><td rowspan="3">Delayed type hypersensitivity,
Ceftriaxone IV 50 mg/kg once daily (Maximum 2 g/day)
<u>PLUS</u> Metronidazole IV.

If associated sepsis, give Ceftriaxone IV 50mg/kg every 12 hours (maximum 2 g/dose)
<u>PLUS</u> Metronidazole IV.

Immediate type hypersensitivity,
Gentamicin IV
<u>PLUS</u> Lincomycin IV
15 mg/kg/dose every 8 hours (maximum of 1.2 g/dose).</td></tr>
<tr><td>Ampicillin IV (or Amoxicillin IV)
If more than 1 month old: 50 mg/kg/dose every 6 hours (maximum 2 g/dose)
<u>PLUS</u> Metronidazole IV 7.5 mg/kg/dose every 8 hours (Maximum 500 mg/dose)
<u>PLUS</u> Gentamicin IV** (Dose based on IBW. Perform TDM)
If more than 1 month and less than (or equal to) 10 years old: 7.5 mg/kg once daily (maximum 320 mg/day).
If more than 10 years old: 6mg/kg once daily (maximum 560 mg/day).</td><td>Piperacillin/ Tazobactam 100mg/kg/dose IV every 6 hours (maximum 4 g/dose Piperacillin component).</td></tr>
<tr><td colspan="2">IF ANTIBIOTICS REQUIRED BEYOND 72 HOURS, CHANGE TO EITHER:</td></tr>
<tr><td>Amoxicillin-Clavulanic acid IV (for up to 4 days)
Neonates and Infants (0 to 3 months old):
If less than or equal to 4 kg:
25 mg/kg/dose (amoxicillin component) every 12 hours.
If more than 4 kg:
25 mg/kg/dose (amoxicillin component) every 8 hours.
Infants and children (more than 3 months old):
Severe infection: 25 mg/kg/dose (amoxicillin component) every 6 hours (maximum 1 g/dose Amoxicillin component).
Adolescents older than 12 years (and more than 40kg):
Severe infection: 25 mg/kg/dose (amoxicillin component) every 6 hours (maximum 1 g/dose Amoxicillin component; maximum 200 mg/dose clavulanate component).</td><td>Piperacillin/ Tazobactam 100mg/kg/dose IV every 6 hours (maximum 4 g/dose Piperacillin component) (for up to 4 days).</td></tr>
<tr><td colspan="2">Oral option to complete course: Amoxicillin/ Clavulanic acid
22.5 mg/kg/dose orally twice daily (maximum 875 mg/dose Amoxicillin component).
Early oral switch can take place if patient clinically improving.</td><td>Immediate type hypersensitivity,
seek ID advice.</td></tr>
<tr><td colspan="3">If poor clinical response, antibiotic regimens may be modified based upon the results of cultures of blood, peritoneal fluid, or surgical specimens - seek ID advice. Antibiotic therapy is generally required for 4 to 7 days, the duration may need to be further prolonged if there are deep undrained collections.</td></tr>
</table>

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
GASTRO-INTESTINAL		
Cholangitis	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) **PLUS Metronidazole IV** 7.5 mg/kg/dose every 8 hours (maximum 500 mg/dose) Seek ID advice within 72 hours. **OR if more than one month old:** **Ceftriaxone IV** 50 mg/kg once daily (maximum 2 g/day). **PLUS Metronidazole IV** 7.5 mg/kg/dose every 8 hours (maximum 500 mg/dose). Seek ID advice within 72 hours. **If associated sepsis,** give Ceftriaxone IV 100 mg/kg once daily (maximum 4 g/day) **PLUS** Metronidazole IV 7.5 mg/kg/dose every 8 hours (maximum 500 mg/dose). Seek ID advice within 72 hours.	**Immediate type hypersensitivity** seek ID advice
Giardiasis	**Metronidazole** 30 mg/kg/dose orally once daily (maximum 2 g/dose) for 3 days.	
Pinworms **(Treat all family members)**	**Mebendazole:** **If less than or equal to 1 year old:** 50 mg orally as a single dose. **If more than 1 year old:** 100 mg orally as a single dose.	
URINARY TRACT		
Uncomplicated Urinary Tract Infection (UTI)	**Trimethoprim/ Sulfamethoxazole** 4 mg/kg/dose orally twice daily (maximum 160 mg/dose Trimethoprim component) for 5 days. **OR Cefalexin** 25 mg/kg/dose orally four times a day (maximum 500 mg/dose) **UTI and less than 3 months old - Treat as for Pyelonephritis.** Refer to Ampicillin / Amoxicillin & Gentamicin neonatal dosing section. Perform TDM.	
Pyelonephritis	**Ampicillin IV (or Amoxicillin IV) - If more than 1 month old:** 50 mg/kg/dose IV every 6 hours (maximum 2 g/dose) **PLUS Gentamicin IV** (Dose based on ideal body weight. See TDM section)** **If more than 1 month old and less than (or equal to) 10 years old:** 7.5 mg/kg once daily (maximum 320 mg/day). **If more than 10 years old:** 6 mg/kg IV once daily (maximum 560 mg/day). Seek ID advice within 72 hours. Perform TDM. **Note: Less than 1 month old, refer to Ampicillin/Amoxicillin and Gentamicin neonatal section. If Gram negative/resistant to Ampicillin-Consult ID.**	**Immediate or delayed hypersensitivity,** use **Gentamicin IV** as single agent initially then seek ID advice within 72 hours.

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
SKELETAL / SOFT TISSUE / SKIN		
Mild Cellulitis **Mild Periorbital cellulitis** **Impetigo** **Cervical lymphadenitis** **(Outpatient)**	**Cefalexin** 25 mg/kg/dose orally four times a day (maximum 1 g/dose) **OR** **Flucloxacillin** 25 mg/kg/dose orally four times a day (maximum 1 g/dose) (For children who can swallow capsules). **If at risk of nmMRSA or if family/personal history of boils** (Previous nmMRSA, History of boils or Aboriginal or Pacific islander descent) **Clindamycin** 7.5 mg/kg/dose orally four times a day (maximum 450 mg/dose) **OR** **Trimethoprim/ Sulfamethoxazole** 4 mg/kg/dose orally twice daily (maximum 160 mg/dose Trimethoprim component).	**Immediate type hypersensitivity Trimethoprim / Sulfamethoxazole orally.**
Osteomyelitis **Septic Arthritis** **Moderate to Severe Periorbital cellulitis** **Severe Cellulitis**	**Flucloxacillin IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) Refer to CHQ-GDL-01067 Paediatric Bone and Joint Infection Management for further information. **If at risk of nmMRSA or if family/personal history of boils** (Previous nmMRSA, History of boils or Aboriginal or Pacific islander descent) **ADD Lincomycin IV** 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose).	**Delayed type hypersensitivity, Cefazolin IV.** **Immediate type hypersensitivity, Lincomycin IV** and seek ID advice.
If less than or equal to 5 years old and not HIB immune, WITH Osteomyelitis / Septic Arthritis / Moderate to Severe Periorbital cellulitis OR Orbital Cellulitis (ALL ages)	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) Refer to CHQ-GDL-01067 Paediatric Bone and Joint Infection Management for further information. **If nmMRSA:** **Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose). **PLUS Lincomycin IV** 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose). **If at risk of multi-resistant MRSA:** **Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose) **PLUS Vancomycin IV** 15 mg/kg/dose every 6 hours (maximum initial dose of 750 mg). (Perform therapeutic drug monitoring for Vancomycin).	**Immediate type hypersensitivity,** seek ID advice.

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
SKELETAL / SOFT TISSUE / SKIN		
Suspected necrotising fasciitis	**Cefotaxime IV** 50 mg/kg/dose every 6 hours (maximum 2 g/dose). **PLUS Lincomycin IV** 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose) **PLUS Vancomycin IV**15 mg/kg/dose every 6 hours (maximum initial dose of 750 mg). (Perform therapeutic drug monitoring for Vancomycin). **Seek ID advice within 24 hours.**	**Immediate type hypersensitivity** seek ID advice.
	If external wound / inoculation associated with necrotising fasciitis: **Meropenem IV** 40 mg/kg/dose every 8 hours (maximum 2 g/dose) **PLUS Lincomycin IV** 15 mg/kg/dose every 8 hours (maximum 1.2 g/dose) **PLUS Vancomycin IV** 15 mg/kg/dose every 6 hours (maximum initial dose of 750 mg). (Perform therapeutic drug monitoring for Vancomycin). **Seek ID advice within 24 hours.**	
Compound fractures	**For open fractures with no clinical evidence of skin or soft tissue infection or severe tissue damage, give systemic antibiotic prophylaxis:** **Cefazolin IV** 50mg/kg/dose (maximum 2 g/dose) every 8 hourly and **seek ID advice within 24 hours.**	**Immediate type hypersensitivity** **Lincomycin IV** and seek ID advice.
	For open fractures with severe tissue damage or clinical evidence of skin or soft tissue infection: **Piperacillin - Tazobactam IV** 100 mg/kg/dose every 6 hours (maximum 4 g/dose Piperacillin component) and **seek ID advice within 24 hours.**	**Immediate type hypersensitivity** **Ciprofloxacin IV** (10 mg/kg/dose 12-hourly (maximum 400 mg/dose) **PLUS Lincomycin IV** and seek ID advice within 24 hours.

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
SKELETAL / SOFT TISSUE / SKIN		
Animal Bites	**Amoxicillin/ Clavulanic acid** 22.5 mg/kg/dose orally twice daily (maximum 875mg/dose Amoxycillin component).	**Delayed type <u>OR</u> immediate type hypersensitivity,** **Trimethoprim/ Sulfamethoxazole orally** (4 mg/kg/dose twice daily (maximum 160 mg/dose trimethoprim component) **<u>PLUS</u>** **Metronidazole orally** 7.5 mg/kg/dose every 8 hours (maximum 400 mg/dose).
	For Severe infection: **Amoxicillin-Clavulanic acid IV** (for up to 4 days). **Neonates and Infants (0 to 3 months old):** **If less than or equal to 4 kg:** 25 mg/kg/dose (amoxicillin component) every 12 hours. **If more than 4 kg:** 25 mg/kg/dose (amoxicillin component) every 8 hours. **Infants and children (more than 3 months old):** **Severe infection:** 25 mg/kg/dose (amoxicillin component) every 6 hourly (maximum 1 g/dose amoxicillin component). **Adolescents older than 12 years old (and more than 40kg):** **Severe infection:** 25 mg/kg/dose (amoxicillin component) every 6 hourly (maximum 1 g/dose amoxicillin component; note: maximum 200 mg/dose clavulanate component).	**Delayed type hypersensitivity,** **IV Ceftriaxone** (100 mg/kg once daily (maximum 4 g/day)) **<u>PLUS</u>** **Metronidazole orally** 7.5 mg/kg/dose every 8 hours (maximum 400 mg/dose).

INFECTION	FIRST CHOICE ANTIMICROBIAL	Alternative antibiotic in the event of immediate type (e.g. anaphylaxis) or delayed type (e.g. rash) hypersensitivity to 1st line antimicrobial
SKELETAL / SOFT TISSUE / SKIN		
Antibiotic prophylaxis for wounds **(excluding fractures, wounds sustained in water and animal bites)**	Antibiotic prophylaxis is not routinely required for traumatic wounds that do not require surgical management and are not significantly contaminated. If concerned about infection, send swabs from base of wound for M/C/S. **Severe wounds** **Cefazolin IV** 50mg/kg/dose (maximum 2 g/dose) every 8 hourly **PLUS** **Metronidazole IV** 7.5 mg/kg/dose (maximum 500 mg/dose) every 8 hourly Discontinue at wound closure (Maximum 24 hours IV antibiotics). If severe seek ID advice (may require continuation 24 hours after definitive wound closure). **Less severe wounds** **Flucloxacillin orally** 25 mg/kg (Maximum 500mg/dose) 6-hourly for 24 hours. OR **Cefalexin orally** 30 mg/kg (Maximum 500mg/dose) 8-hourly for 24 hours. Maximum duration 72 hours. Seek ID advice.	**Delayed type OR immediate type hypersensitivity,** seek ID advice.

THERAPEUTIC DRUG MONITORING, as advised by pharmacy			
****Gentamicin**	**<u>Uncomplicated infection (UTI)</u>** **Levels:** True trough level (30 minutes pre-dose) on day 2 or 3 of treatment, if planning to continue for more than 72 hours.	**Repeat once / twice a week.**	**Consult your Ward Pharmacist or ID for further assistance with interpretation of gentamicin trough levels.** **Refer to** CHQ Aminoglycoside Therapeutic Drug Monitoring guideline.
	<u>Complicated infection (sepsis, appendicitis, febrile neutropenia, endocarditis)</u> **Levels:** 2 and 6 hours post first or second dose (to calculate Area Under the Curve (AUC)).	**Repeat every 48 to 72 hours.**	**Consult your Ward Pharmacist or ID for further assistance with interpretation of gentamicin levels and AUC.** **Refer to** CHQ Aminoglycoside Therapeutic Drug Monitoring guideline.
#Vancomycin	**Level:** **<u>For 6-hourly dosing:</u>** **Pre 3rd or 4th dose (trough level).**	**Repeat every 48 to 72 hours.**	**Consult your Ward Pharmacist or ID for further assistance with interpretation of vancomycin levels.** **Refer to** CHQ Vancomycin Therapeutic drug monitoring Guideline.
For Paediatric Infectious Diseases Consults: **Page ID-QCH Registrar/Fellow via Switch**			**After hours:** **Contact ID Consultant-QCH via Switch**

SPECIFIC NEONATAL ANTIBIOTIC DOSING			
Drug	**Gestational Age**	**Postnatal age**	**Starting dose (use actual body weight)**
Aciclovir IV	Neonates younger than 30 weeks post menstrual age		20 mg/kg/dose every 12 hours
	Neonates 30 weeks post menstrual age or older		20 mg/kg/dose every 8 hours
Ampicillin IV (or Amoxicillin IV)	Neonates ≤ 29 weeks post menstrual age	Postnatal age 0 to 28 days	50 mg/kg/dose every 12 hours
		Postnatal age more than 28 days	50 mg/kg/dose every 8 hours
	Neonates 30 to 36 weeks post menstrual age	Postnatal age 0 to 14 days	50 mg/kg/dose every 12 hours
		Postnatal age 15 to 28 days	50 mg/kg/dose every 8 hours
	Neonates 37 to 44 weeks post menstrual age	Postnatal age 0 to 7 days	50 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	50 mg/kg/dose every 8 hours
	Neonates ≥ 45 weeks post menstrual age	ALL	50 mg/kg/dose every 6 hours
Benzylpenicillin IV	Neonates ≤ 29 weeks post menstrual age	Postnatal age 0 to 28 days	60 mg/kg/dose every 12 hours
		Postnatal age more than 28 days	60 mg/kg/dose every 8 hours
	Neonates 30 to 36 weeks post menstrual age	Postnatal age 0 to 14 days	60 mg/kg/dose every 12 hours
		Postnatal age 15 to 28 days	60 mg/kg/dose every 8 hours
	Neonates 37 to 44 weeks post menstrual age	Postnatal age 0 to 7 days	60 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	60 mg/kg/dose every 8 hours
	Neonates ≥ 45 weeks post menstrual age	ALL	60 mg/kg/dose every 6 hours
Cefotaxime IV	Neonates more than 35 weeks post menstrual age	Postnatal age 0 to 7 days	50 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	50 mg/kg/dose every 8 hours
Clindamycin IV	Neonates ≤ 29 weeks post menstrual age	Postnatal age 0 to 28 days	5 mg/kg/dose every 12 hours
		Postnatal age more than 28 days	5 mg/kg/dose every 8 hours
	Neonates 30 to 36 weeks post menstrual age	Postnatal age 0 to 14 days	5 mg/kg/dose every 12 hours
		Postnatal age 15 to 28 days	5 mg/kg/dose every 8 hours
	Neonates 37 to 44 weeks post menstrual age	Postnatal age 0 to 7 days	5 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	5 mg/kg/dose every 8 hours
	Neonates ≥ 45 weeks post menstrual age	ALL	5 mg/kg/dose every 6 hours
Flucloxacillin IV	Term/Premature neonates	Postnatal age 0 to 7 days	50 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	50 mg/kg/dose every 8 hours
Gentamicin IV (Perform TDM) (dose based on ideal body weight)**	Neonates younger ≤29 weeks post menstrual age	Postnatal age 0 to 14 days	5 mg/kg/dose every 48 hours**
		Postnatal age 15 to 28 days	5 mg/kg/dose every 36 hours**
	Neonates 30 to 34 weeks post menstrual age	Postnatal age 0 to 28 days	5 mg/kg/dose every 36 hours**
	Neonates 35 weeks post menstrual age or older	Postnatal age 0 to 28 days	5 mg/kg/dose every 24 hours**
Meropenem IV (severe/CNS infection)	Neonates – ALL gestational ages	Postnatal age 0 to 7 days	40 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	40 mg/kg/dose every 8 hours

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SPECIFIC NEONATAL ANTIBIOTIC DOSING (continued)			
Drug	**Gestational age**	**Postnatal age**	**Starting dose (use actual body weight)**
Metronidazole IV	Neonates ≤ 29 weeks post menstrual age	Postnatal age 0 to 28 days	15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 24 hours
		Postnatal age more than 28 days	15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 12 hours
	Neonates 30 to 36 weeks post menstrual age	Postnatal age 0 to 14 days	15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 12 hours
		Postnatal age 15 to 28 days	15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 8 hours
	Neonates 37 to 44 weeks post menstrual age	Postnatal age 0 to 7 days	15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 12 hours
		Postnatal age 8 to 28 days	15mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 8 hours
	Neonates ≥ 45 weeks post menstrual age	ALL	15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 8 hours
Vancomycin IV (Perform TDM#)	Neonates ≤ 29 weeks post menstrual age	Postnatal age 0 to 14 days	15 mg/kg/dose IV 18 hourly#
		Postnatal age 15 to 28 days	15 mg/kg/dose IV 12 hourly#
	Neonates 30 to 36 weeks post menstrual age	Postnatal age 0 to 14 days	15 mg/kg/dose IV 12 hourly#
		Postnatal age 15 to 28 days	15 mg/kg/dose IV 8 hourly#
	Neonates 37 to 44 weeks post menstrual age	Postnatal age 0 to 7 days	15 mg/kg/dose IV 12 hourly#
		Postnatal age 8 to 28 days	15 mg/kg/dose IV 8 hourly#
	Neonates ≥ 45 weeks post menstrual age	ALL	15 mg/kg/dose IV 6 hourly#

Postmenstrual age: The time elapsed between the first day of the last menstrual period and birth (gestational age) plus the time elapsed after birth (postnatal age).

Renal function and drug elimination are most strongly correlated with Postmenstrual Age.

Definitions

Term	Definition
IgE-mediated (allergic) immediate hypersensitivity	Characterised by the development of urticaria, angioedema, bronchospasm or anaphylaxis (with objectively demonstrated hypotension, hypoxia or elevated mast-cell tryptase concentration) within 1 to 2 hours of exposure to a drug. Anaphylaxis is more likely with parenteral rather than oral administration. For penicillin, anaphylaxis occurs at an estimated frequency of 1 to 4 cases per 10 000 courses, with up to 10% of these reactions being fatal. A clear history of an IgE-mediated reaction means the drug should not be administered again without appropriate precautions (eg desensitisation).
IgE-independent (non-allergic) immediate hypersensitivity	Refers to any acute or immediate reaction that does not involve an IgE-mediated mechanism, usually caused by direct mast-cell degranulation (eg vancomycin infusion–related reactions such as 'red-man' syndrome). The reaction may be ameliorated by prophylactic antihistamines and slowing the infusion rate.
Delayed-type (non-immediate) hypersensitivity reactions	Characterised by macular, papular or morbilliform rash, occurring several days after starting treatment. They are more common than immediate reactions, and may be caused by the infection or its treatment. Such reactions are usually T-cell (not IgE) mediated. Delayed-type reactions commonly occur in patients with intercurrent infection, and such reactions may not be reproducible upon a supervised challenge when the patient is well. Delayed rash due to penicillins, especially amoxy/ampicillin, is not strongly predictive of a future reaction, and repeat exposure to beta lactams is not necessarily contraindicated.
Three kinds of delayed-type reaction warrant special mention:	
Serum sickness	Characterised by vasculitic rash, arthralgia/arthritis, influenza-like symptoms, and sometimes fever and proteinuria. Serum sickness is triggered more commonly with cefaclor than other cephalosporins, and also by sulfonamides, and commences several days after starting treatment
Drug rash with eosinophilia and systemic symptoms (DRESS)	Characterised by peripheral blood eosinophilia, desquamative dermatitis and liver dysfunction
Stevens–Johnson syndrome / toxic epidermal necrolysis (SJS/TEN)	A very rare, acute and potentially fatal skin reaction characterised by sheet-like skin and mucosal loss. DRESS and SJS/TEN are contraindications to further drug exposure (including desensitisation) because this can be fatal. Patients with a known severe hypersensitivity should be strongly advised to wear an alert bracelet or necklace.

Abbreviations

ABW	Actual body weight
AMS	Antimicrobial stewardship
CHQ	Children's Health Queensland
CNS	Central nervous system
CSF	Cerebral spinal fluid
IBW	Ideal body weight
iEMR	Integrated electronic medical record
ID	Infectious diseases team
IV	Intravenous
LP	Lumbar puncture
MRSA	Multi-resistant staphylococcus aureus
nmMRSA	Non multi-resistant staphylococcus aureus
QCH	Queensland Children's hospital
TDM	Therapeutic drug monitoring

Consultation

Key stakeholders who reviewed this version:

- Pharmacist Advanced - Antimicrobial Stewardship

Key stakeholders who reviewed the previous version:

- Service Group Director - Infection Management and Prevention service, Rheumatology and Immunology
- Paediatric Surgeon
- Paediatric Infection Specialist
- Pharmacist Advanced - Antimicrobial Stewardship

References and suggested reading

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Guideline revision and approval history

Version No.	Modified by	Amendments authorised by	Approved by
2.0	Infectious Diseases Consultant-Antimicrobial Stewardship (Infection Management and Prevention Service)	Medicines Advisory Committee (CHQ)	General Manager Operations
3.0 (04/08/2016)	Infectious Diseases Consultants (Infection Management and Prevention Service) Antimicrobial Stewardship Pharmacist (CHQ)	Medicines Advisory Committee (CHQ) Infectious Diseases Consultant team and Medical Lead - Antimicrobial Stewardship (Infection Management and Prevention Service)	General Manager Operations
4.0 (30/11/2016)	Infectious Diseases Consultants (Infection Management and Prevention Service) Antimicrobial Stewardship Pharmacist (CHQ)	Medicines Advisory Committee (CHQ) Infectious Diseases Consultant team and Medical Lead - Antimicrobial Stewardship (Infection Management and Prevention Service)	Executive Director Hospital Services
5.0 (11/10/2017)	Infectious Diseases Consultants (Infection Management and Prevention Service) Antimicrobial Stewardship Pharmacist (CHQ)	Medicines Advisory Committee (CHQ) Infectious Diseases Consultant team and Medical Lead - Antimicrobial Stewardship (Infection Management and Prevention Service)	Executive Director Hospital Services
6.0 (12/03/2019)	Infectious Diseases Consultants (Infection Management and Prevention Service) Antimicrobial Stewardship Pharmacist (CHQ)	Medicines Advisory Committee (CHQ)	Executive Director Clinical Services (QCH)
7.0 (20/06/2019)	Director, Infection Management and Prevention Services Medical Lead, Antimicrobial Stewardship (QCH)	Medicines Advisory Committee (CHQ)	Executive Director Clinical Services (QCH)
8.0 (10/06/2021)	Director, Infection Management and Prevention Services Clinical Pharmacist Lead, Antimicrobial Stewardship (QCH)	Medicines Advisory Committee (CHQ)	Executive Director Clinical Services (QCH)
8.1 (21/09/2021)	Medical Lead, Paediatric Sepsis program Clinical Pharmacist Lead, Antimicrobial Stewardship (QCH)		

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Accreditation references	National Safety and Quality Health Service Standards (1-8): 3 Preventing and Controlling Healthcare-Associated Infection, 4 Medication Safety ISO 9001:2015 Quality Management Systems: (4-10)