

# Guideline

## Antimicrobial treatment: Early intravenous to oral switch - Paediatric Guideline

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Applicable to	All Children's Health Queensland staff				
Authorisation	Executive Director Clinical Services				

### Purpose

This guideline is aimed to help facilitate prudent prescribing practices and appropriate intravenous to oral conversion of antimicrobial therapy. The standards included in the guideline should be followed whenever possible. They should be used as a source for audit standards and education to promote good practice.

### Scope

This guideline provides information for Children's Health Queensland staff caring for patients receiving antimicrobial therapy.

### Related documents

#### Procedures, Guidelines, Protocols

- [CHQ-PROC-01036 Antimicrobial: Prescribing and Management](#)
- [CHQ Antimicrobial restrictions list](#)
- [ACSQHC 2020 Antimicrobial Stewardship Clinical Care Standard](#)

## Guideline for early intravenous to oral antimicrobial switch

### Introduction

Initially, giving antimicrobials by the intravenous (IV) route may be preferable in severe infection. However, in the majority of patients who are clinically improved and adequately absorbing oral drugs, administration can be switched to the oral route after 48 hours of IV therapy. This is known as the IV to oral switch.

## Advantages of early IV to oral switch

The oral route of administration for antimicrobials is preferred to the IV route wherever possible as oral administration is associated with:

- Decreased risk of infection from IV lines.
- Decreased risk of thrombophlebitis.
- Significantly less cost than IV therapy.
- Reduction in hidden costs (diluent, equipment, needles, nursing time).
- More patient friendly.
- May lead to earlier discharge.

A recent paediatric study found that patients commenced on oral antibiotics had a mean shorter length of stay in hospital, compared to patients commenced on IV antibiotics.

## Criteria for considering IV to oral switch

Patients should be reviewed at 24 to 48 hours. The following criteria are helpful when deciding if oral therapy is appropriate.

- Antibiotic treatment is still indicated.
- Oral fluids/foods are tolerated and no reason to believe that poor oral absorption may be a problem (e.g. vomiting, diarrhoea, short gut syndrome, active gastro-intestinal bleeding).
- Temperature less than 38°C for 24 to 48 hours.
- No signs of sepsis.
- An appropriate oral antibiotic is available.
- Extra high tissue antibiotic concentrations or a prolonged course of IV antibiotics are not essential.

## When should IV to oral switch be considered

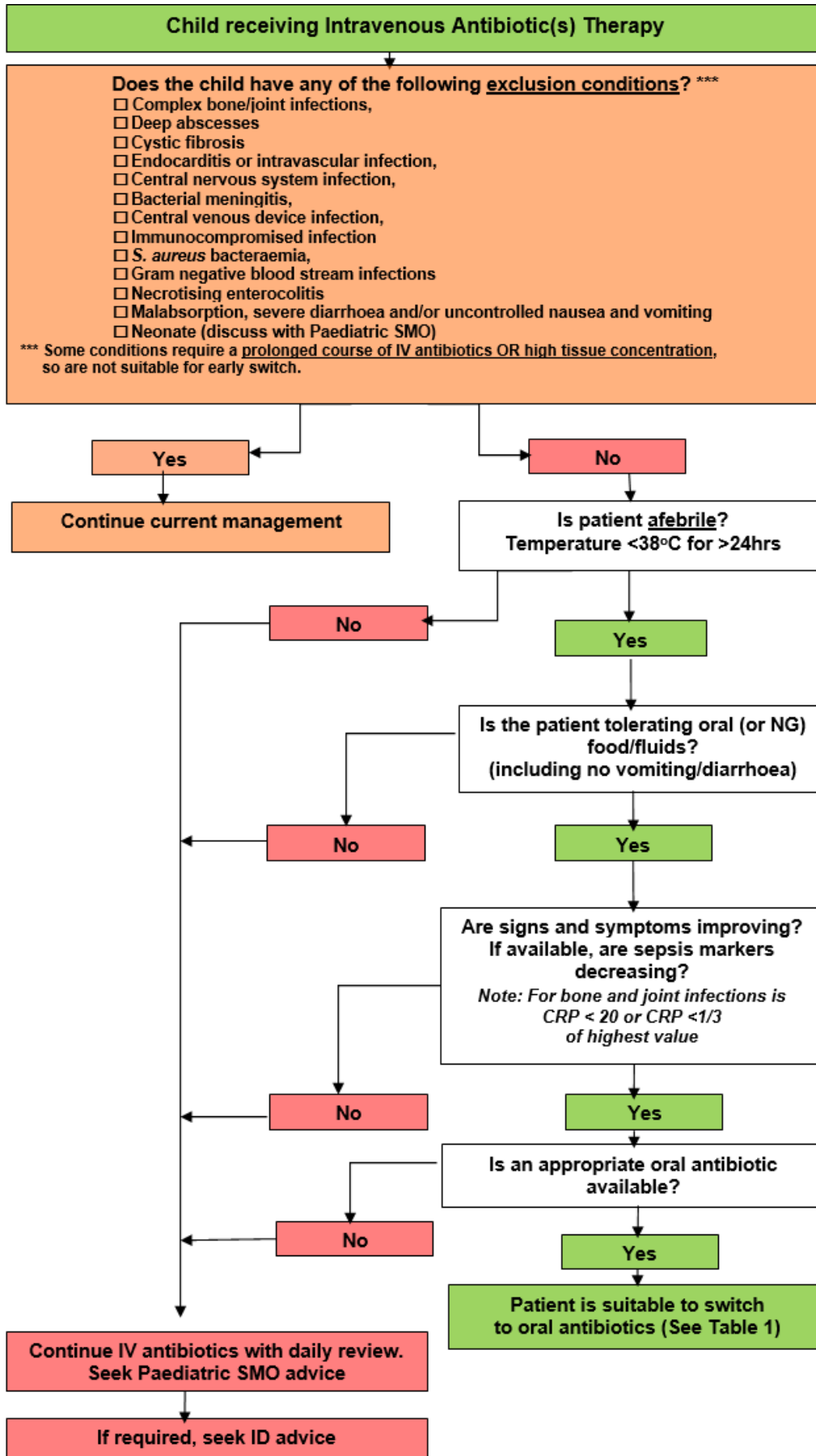
- Hospital acquired infections.
- Intra-abdominal infections.
- Pneumonia.
- Skin and soft tissue infections.
- Cervical lymphadenopathy.
- Sinusitis.
- Urinary tract infections.
- Some gram positive blood stream infections.

**When is early IV to Oral switch not appropriate**

Some conditions require a prolonged course of intravenous antibiotics or very high tissue concentrations. Early IV to oral switch is **not** considered appropriate in the following conditions:

- Bacterial meningitis.
- Gram negative blood stream infections.
- *S. aureus* blood stream infections
- Central Nervous System (CNS) infections.
- Cystic fibrosis.
- Deep abscesses.
- Endocarditis or intravascular infection.
- Central venous device infection.
- Necrotising enterocolitis.
- Immunosuppressed patients (may be considered on advice of Paediatric Infectious Diseases team).
- Malabsorption, severe diarrhoea and/or uncontrolled nausea and vomiting.
- Neonate (not an absolute contraindication, discuss with Paediatric Infectious Diseases team).

Flowchart 1. Identification of children suitable for early switch to oral antibiotics



**Table 1. Oral antibiotics considered suitable and equivalent for IV to oral switch**

Please refer to [CHQ Antimicrobial prescribing guidelines](#) for dosing in specific indications. If no equivalent oral formulation available, the choice of antimicrobial should be based on advice from Paediatric Infectious Diseases Specialist.

If on intravenous antibiotic and dose	Suggested ORAL antibiotic conversion	ID approval required
Ampicillin or Amoxicillin <sup>#</sup> 50 mg/kg/dose IV 6-hourly (Maximum 2 g/dose)	Amoxicillin <sup>#</sup> 30 mg/kg/dose oral three times daily (Maximum 1 g/dose)	No
Benzylpenicillin <sup>#</sup> 60 mg/kg/dose IV 6-hourly (Maximum 1.8 g/ dose)	Amoxicillin <sup>#</sup> 30 mg/kg/dose oral three times daily (Maximum 1 g/dose)	No
Azithromycin 10 mg/kg IV 24-hourly (Maximum 500 mg/day)	Azithromycin 10 mg/kg oral once daily (Maximum 500 mg/day)	Yes
	<b>OR</b> Roxithromycin 4 mg/kg/dose oral twice daily (Maximum 150 mg/dose)	No
Ceftriaxone 100 mg/kg IV 24-hourly (Maximum 4 g/day) <b>OR</b> Cefotaxime 50 mg/kg/dose IV 6-hourly (Maximum 2 g/dose)	Amoxicillin/Clavulanic acid <sup>#</sup> 22.5 mg/kg/dose oral twice daily (Maximum 875 mg Amoxicillin component per dose) If treating a resistant Gram negative infection, seek ID advice.	No (if treating a resistant Gram negative infection, seek ID advice)
	<b>OR</b> Cefalexin 30 mg/kg/dose orally three times daily (Maximum 1 g/dose)	No
Ampicillin (Amoxicillin) IV 50 mg/kg/dose 6-hourly (Maximum 2 g/dose) <b>PLUS</b> Gentamicin (see <a href="#">TDM guideline</a> for dosing) <b>PLUS</b> Metronidazole <sup>^</sup> 7.5 mg/kg/dose IV 8-hourly (Maximum 500 mg/dose)	Amoxicillin/ clavulanic acid <sup>#</sup> 22.5 mg/kg/dose oral twice daily (Maximum 875 mg Amoxicillin component per dose)  If treating a Pseudomonas or resistant Gram negative infection, seek ID advice.	No (if treating a Pseudomonas or resistant Gram negative infection, seek ID advice.)
Amoxicillin-clavulanate IV 25 mg/kg/dose 8-hourly to 6-hourly (Maximum 2 g/dose amoxicillin component)		
Piperacillin/tazobactam <sup>#</sup> IV 100 mg/kg/dose 6-hourly (Maximum 4 g/dose Piperacillin component)		
Flucloxacillin <sup>#</sup> 50 mg/kg/dose IV 6-hourly (Maximum 2 g/dose)	Flucloxacillin <sup>#</sup> 25 mg/kg/dose orally four times daily (Maximum 1 g/dose) (Use capsules. Note: suspension – poor oral palatability)	No
	<b>OR</b> Cefalexin 30 mg/kg/dose orally three times daily (Maximum 1g/dose)	No
Cefazolin 50 mg/kg/dose IV 8-hourly (Maximum 2 g/dose)	Cefalexin 30 mg/kg/dose orally three times daily (Maximum 1 g/dose)	No
Lincomycin 15 mg/kg/dose IV 8-hourly (Maximum 1.2 g/dose)	Clindamycin <sup>^</sup> 10 mg/kg/dose oral three to four times daily (Maximum 450 mg/dose)	Yes
Ciprofloxacin 10 mg/kg/dose IV 12-hourly (Maximum 400 mg/dose)	Ciprofloxacin <sup>^</sup> 10 mg/kg/dose oral twice daily (Maximum 750 mg/dose)	Yes

\*Usual dose for children with normal renal function. Do **not** use suggested doses for **neonates**. Dose adjustment may be required based on type of infection/organ dysfunction.

<sup>#</sup> Ensure patient does not have penicillin hypersensitivity.

<sup>^</sup>Antimicrobials with excellent oral bioavailability.

## Clinical guidance for antibiotic duration and early IV to oral switch in children

The ANZPID-ASAP group recently published a systematic review on antibiotic duration and timing of the switch from intravenous to oral route for bacterial infections in children (McMullan et al. 2016).

For more information:

- [ANZPID-ASAP Guidelines for Antibiotic Duration and IV-Oral Switch in Children – Quick Reference guide.](#)
- [Consumer education video](#) (password: ivtopo)
- [Patient information brochure \(PDF 905 kB\)](#)

## Role of the health care team

The successful implementation of the IV to oral switch program will rely on proactive discussion between the medical staff, nursing staff and ward pharmacist.

## Steps to follow:

1. Annotate all IV antibiotic orders with the following:
  - Indication.
  - Day one (1) of therapy.
  - Review date.
  - ID approval number (see [CHQ Antimicrobial restrictions list](#)).
2. Assess all IV antibiotic orders for appropriateness of switching to oral therapy (during daily electronic medication order review) – refer to [Flowchart 1](#) on page 4.
  - Example:

Details for **amoxicillin-clavulanate (Amoxiclav Juno 1000 mg-200 mg Injection)**

Details | Order Comments | Diagnoses

[Review Schedule](#) Remaining Administrations: (Unknown)

*Dose: 1,000 mg	Drug form: Injection
*Route of administration: IV	*Frequency: FOUR times a day (even inter...
First dose priority: NOW	First dose date/time: 04-Jan-2019 18:36 AEST
Stop date/time: **..**..** AEST	PRN:
Infuse over:	Infuse over unit:
Duration:	*Indication: Appendicitis
Restricted antimicrobial approved by (name or code): MND1914100005	Special instructions: Dose calculated on amoxicillin component. Day 1 = 4/1, Review day 6/1
Use patient's own med: <input type="radio"/> Yes <input checked="" type="radio"/> No	
Nurse Witness:	

3. If appropriate to switch:

a. **Medical staff:**

- (i) Assess all IV antibiotic orders for appropriateness of switching to oral therapy (during daily electronic medication chart review) – refer to [Flowchart 1 on page 4](#).
- (ii) Convert eligible patients to appropriate oral antibiotic therapy based on microbiology culture and susceptibility results and clinical picture ([Table 1](#)).
- (iii) Ensure that [CHQ Antimicrobial Prescribing Restrictions](#) are met (e.g. ID approval numbers).

b. **Pharmacists:**

- (i) Alert the treating clinician / team that their patient meets the criteria to convert from IV to oral antimicrobials
  - Communicate this information with the treating consultant / medical officer (e.g. page, verbally).
  - Written communication in the electronic medical record as a progress note or a clinical pharmacist intervention.
  - Example:

**Pharmacist review: IV to ora...** X List

Tahoma Size [Rich Text Editor Icons]

Pharmacist review note: Early IV to oral antibiotic switch

This patient has been on IV \_\_\_\_\_ since \_\_\_/\_\_\_/\_\_\_ (\_\_\_ days).

IV to oral switch criteria met (specify):

- Tolerating oral/enteral diet and medications
- Stable vital signs for 24 hours
- No specific indication for continuing IV antibiotic therapy (see conversion criteria for details)
- Suitable oral antibiotic available (see IV to oral switch suggestions in Table 1 for details)

Patient may now be suitable for conversion from IV to oral antibiotics.

Treating team notified (Name: \_\_\_\_\_) - will kindly review. With thanks.

Signed:

Name: \_\_\_\_\_

Pharmacist

Contact nr: ~~xxxx~~

c. **Nursing staff:**

- (i) Alert the treating clinician / team that their patient meets the criteria to convert from IV to oral antimicrobials
- Communicate this information with the treating consultant / medical officer (e.g. page, verbally).
  - Written communication in the electronic medical record as a progress note.
  - Example:

The screenshot shows a web-based form titled "Nursing note: Early IV to oral..." with a "List" button. The form includes a rich text editor with a toolbar (font: Tahoma, size, bold, italic, underline, link, unlink, list, indent, outdent, print). The text of the note is as follows:

Nursing note: Early IV to oral antibiotic switch

This patient has been on IV \_\_\_\_\_ since \_\_\_/\_\_\_/\_\_\_ (\_\_\_ days).

IV to oral switch criteria met (specify):

- Tolerating oral/enteral diet and medications
- Stable vital signs for 24 hours
- No specific indication for continuing IV antibiotic therapy (see conversion criteria for details)
- Suitable oral antibiotic available (see IV to oral switch suggestions in Table 1 for details)

Patient may now be suitable for conversion from IV to oral antibiotics.

Treating team notified (Name: \_\_\_\_\_) - will kindly review. With thanks.

Signed:  
Name: \_\_\_\_\_  
Clinical Nurse

**Helpful contacts**

- Paediatric ID team – contactable via QCH Switchboard
- Antimicrobial Stewardship Pharmacist – contactable via QCH Switchboard

**Consultation**

Key stakeholders who reviewed this version:

- Director - Infection Management and Prevention Service, Immunology and Rheumatology (CHQ)
- Paediatric Infection Specialist Consultant and Fellow Team (CHQ)
- Clinical Pharmacist Lead - Antimicrobial Stewardship (CHQ)
- Medications Advisory Committee – Endorsed 24/6/2021



## References and suggested reading

1. Duguid M, Cruikshank M, eds. Antimicrobial Stewardship in Australian Hospitals. 2nd edition. Sydney: Australian Commission on Safety and Quality in Healthcare 2018.
2. Hatch D et al. Intravenous to Oral Conversion of Antimicrobials- State-wide drug use evaluation program. Safe and Quality Use of Medicines. Medication Services Queensland. 2012.
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4. Lorgelly P.K et al. Oral versus Intravenous antibiotics for community acquired pneumonia in children: a cost minimisation analysis. European Respiratory Journal 2010; 35(4): 858-864.
5. McLaughlin CM et al. Pharmacy-implemented guidelines on switching from intravenous to oral antibiotics: an intervention study. QJM : monthly journal of the Association of Physicians. 2005;98(10):745.
6. Dunn K et al. Implementing a pharmacist-led sequential antimicrobial therapy strategy: a controlled before-and-after study. Int J Clin Pharm. 2011 Apr; 33(2):208-14.
7. McMullan, BJ, Andresen, D, Blyth, C, Avent, M, Bowen, A & Britton, P 2016, 'Antibiotic duration and timing of the switch from intravenous to oral route for bacterial infections in children: systematic review and guidelines', Lancet Infectious Diseases, vol. 16, no. 8, pp. 139-152.
8. Quality use of antimicrobials in healthcare program. [pamphlet] Sydney: NSW Clinical Excellence Commission; 2018. Making the switch – changing from Intravenous to oral antibiotics. Information for parents and carers.

## Guideline revision and approval history

Version No.	Modified by	Amendments authorised by	Approved by
1.0	Antimicrobial Stewardship Pharmacist (CHQ)	Medicines Advisory Committee	General Manager Operations
2.0 (14/01/2016)	Antimicrobial Stewardship Pharmacist (CHQ)	Medicines Advisory Committee	Executive Director Hospital Services
3.0 (25/02/2019)	Director – Infection Management and Prevention service, Immunology and Rheumatology Pharmacist Advanced-Antimicrobial Stewardship (CHQ)	Medicines Advisory Committee	Executive Director Clinical Services (QCH)
4.0 (10/06/2021)	Clinical Pharmacist Lead-Antimicrobial Stewardship (CHQ)	Director – Infection Management and Prevention service, Immunology and Rheumatology	Divisional Director Medicine

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<b>Accreditation references</b>	NSQHS Standards (1-8): 3 Preventing and Controlling Healthcare-Associated Infection and 4 Medication Safety ISO 9001:2015 Quality Management Systems: (4-10)