Antimicrobial treatment: Early intravenous to oral switch - Paediatric Guideline

**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-01035 Antimicrobial Restrictions
- CHQ Antimicrobial restrictions list

**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 (diluents, 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

Child receiving Intravenous Antibiotic(s) Therapy

Does the child have any of the following exclusion conditions? ***
- Complex bone/joint infections
- Deep abscesses
- Cystic fibrosis
- Endocarditis or intravascular infection
- Central nervous system infection
- Bacterial meningitis
- Central venous device infection
- Immunocompromised infection
- S. aureus bacteraemia
- Gram negative blood stream infections
- Necrotising enterocolitis
- Malabsorption, severe diarrhoea and/or uncontrolled nausea and vomiting
- Neonate (discuss with Paediatric SMO)

*** Some conditions require a prolonged course of IV antibiotics OR high tissue concentration, so are not suitable for early switch.

Yes

Continue current management

No

Is patient afebrile?
Temperature <38°C for >24hrs

Yes

Is the patient tolerating oral (or NG) food/fluids?
(including no vomiting/diarrhoea)

Yes

Are signs and symptoms improving?
If available, are sepsis markers decreasing?
Note: For bone and joint infections is CRP < 20 or CRP <1/3 of highest value

No

Yes

Is an appropriate oral antibiotic available?

No

Yes

Patient is suitable to switch to oral antibiotics (See Table 1)

Continue IV antibiotics with daily review. Seek Paediatric SMO advice

If required, seek ID advice
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.

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

*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.

* Ensure patient does not have penicillin hypersensitivity.

*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:

- Information for parents and carers: Making the switch – changing from Intravenous to oral antibiotics.

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 antibiotics 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:
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 oral...](#)

   **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: ____________
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:

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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
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**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)
- Pharmacist Advanced - Antimicrobial Stewardship (CHQ)
References and suggested reading


Guideline revision and approval history

<table>
<thead>
<tr>
<th>Version No.</th>
<th>Modified by</th>
<th>Amendments authorised by</th>
<th>Approved by</th>
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<tr>
<td>1.0</td>
<td>Antimicrobial Stewardship Pharmacist (CHQ)</td>
<td>Medicines Advisory Committee</td>
<td>General Manager Operations</td>
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<tr>
<td>2.0</td>
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<td>3.0</td>
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<td>Executive Director Clinical Services (QCH)</td>
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Keywords

Early switch IV to Oral, intravenous to oral switch, antimicrobial, antibiotic, conversion, antimicrobial stewardship, 01057

Accreditation references

NSQHS Standards (1-8) – Standard 3: Preventing and Controlling Healthcare-Associated Infection
Standard 4: Medication Safety