DAILY INTEGRATION OF ANTIMICROBIAL STEWARDSHIP **(DIAMS)**

IV to PO Switch & OPAT Quick Guide

" SAFE Antibiotics, SAFE Recovery, SAFE Return Home"

LAUNCHED: NOVEMBER 2022. UPDATED: MAY 2025

GENERAL CONSIDERATIONS

Optimal time to switch from IV to PO antibiotic: **48 - 96 hours** after IV antibiotic initiation.

If patient **deteriorate** clinically after the conversion from IV to PO, IV therapy should be **reinitiated.**

If patient fulfill S A F E criteria, make an IV to PO switch!

S — Showing clinical improvement?

- **Afebrile** (36 - 38°C) for 48 hours
- **C-reactive protein (CRP)** in decreasing trend
- **White cell count (WCC)** within 4-12* x 10^9/L or trending towards normal range
  **Review patient's medications for potential causes of increase/sustained high WCC, e.g., steroids*
- No unexplained **tachycardia** (HR < 90 bpm)
- No unexplained **hypotension** (BP > 90/60 mmHg) and NOT **vasopressor**-dependent
- No **tachypnoea** (RR < 20 bpm)

NO → Reassess in 24 hours

YES

A — Antibiotic route and duration match it's indication?

Conditions suitable for IV to PO switch:

- Pneumonia
- Skin and soft tissue infections
- Urinary tract infection
- Uncomplicated GNR bacteremia
- Intraabdominal infection without deep seated collections

YES

Conditions that may require prolonged antibiotic treatment
***Refer to ID for input**

- Osteomyelitis
- Septic arthritis
- Infected implant or prostesis
- Necrotising soft tissue infection
- Melioidosis
- Deep-seated infection (abscesses, emphyema)
- Complicated orbital cellulitis
- Endocarditis
- Central nervous system infections (eg. meningitis, brain abscess
- MSSA bacteremia or fungemia

This list is NOT exhaustive, additional indications may apply

NOT REQUIRING PROLONGED IV

REQUIRING PROLONGED IV → Refer to Outpatient Parenteral Antimicrobial Therapy (OPAT)

F — Food/feeding tolerated and orally not compromised?

- Not nil by mouth (NBM)
- Tolerating oral food or enteral feeding
- Oral absorption is not compromised by gastrointestinal conditions
- Good compliance, able to comply to oral medications

NO → Refer to Outpatient Parenteral Antimicrobial Therapy (OPAT)

YES

E — Effective oral antibiotic options available?

NO → Refer to Outpatient Parenteral Antimicrobial Therapy (OPAT)

YES

Make an IV to PO switch!

By AMS *team (Izyana Munirah Idham, Hannah Md Mahir, Adam Ashraf Jaafer, Fong Siew Li, Syazwan Husori & Khairun Azwani).*
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ANTIBIOTICS WITH EQUIVALENT ORAL OPTIONS (SEQUENTIAL THERAPY)

Drug	For adults with normal renal function		Bioavailability (BA)	Remarks
	IV dose	Equivalent oral dose		
Amoxicillin / Clavulanate	1.2 g q8h	625 mg TDS	Amoxicillin: 80% Clavulanate: 30-98%	-
Ampicillin / Sulbactam	1.5 g q8h 3 g q8h 3 g q6h	375 mg BD 375 - 750 mg BD 750 mg BD	80%	-
Azithromycin	500 mg q24h	500 mg OD	34 - 52%	Bioavailability compensated by **good tissue penetration**
Cefuroxime	750 mg q8h 1500 mg q8h	250-500 mg BD 500 mg BD	~52%	250 mg for sinusitis/ pharyngitis, superficial SSTI and uncomplicated UTI
Ciprofloxacin*	400 mg q12h 400 mg q8h	500 mg BD 750 mg BD	~70%	Check for drug-drug & drug-food interaction. Refer to the footnote.
Clindamycin	600 mg q8h 600 mg q6h 900 mg q8h	300 mg QID/ 600 mg TDS 600 mg QID 600 mg QID	~ 90%	
Cloxacillin	500 mg q6h 1000 mg q6h 2000 mg q6h	250-500 mg QID 500 mg QID 1000 mg QID	~ 50%	Alternatively, consider oralize to **PO Cephalexin** 500-1000 mg QID (Cephalexin bioavailability: 90%)
Fluconazole	200 mg q24h 400 mg q24h 800 mg q24h	200 mg OD 400 mg OD 400 mg BD	> 90%	For opportunistic infections, dose may go up to 1200 mg/day
Levofloxacin	500 mg q24h 750 mg q24h	500 mg OD 750 mg OD	~ 99%	Check for drug-drug & drug-food interaction. Refer to the footnote.
Linezolid	600 mg q12h	600 mg BD	~ 100%	-
Metronidazole	500 mg q12h 500 mg q8h 750 mg q8h	400 mg BD 400 mg TDS 800 mg TDS	100%	Abstain from alcohol to avoid disulfiram-like reaction
Minocycline*	200 mg BD	200 mg BD	90-100%	Check for drug-drug & drug-food interaction. Refer to the footnote.
Moxifloxacin*	400 mg OD	400 mg OD	90%	Check for drug-drug & drug-food interaction. Refer to the footnote.
Trimethoprim / Sulfamethoxazole	**For PCP treatment:** 15 mg/kg/day q8-12h (TMP) **Other infections:** 8-12 mg/kg/day q8-12h (TMP)	**For PCP treatment:** 15 mg/kg/day q8-12h (TMP) **Other infections:** 8-12 mg/kg/day q8-12h (TMP)	90-100%	-
Voriconazole*	3-4 mg/kg q12h	200-300 mg BD	Adult: 96% Pediatric: 45-64%	-

Allow a 2-hour gap between taking FQ or Tetracyclines and consuming dairy products, multivitamins, antacids, or NG tube feeds to avoid concurrent exposure to multivalent cations (e.g., Ca, Fe, Al, Mg, Zn). Hold tube feeds 1H before & 2H after FQ or Tetracyclines given. Cations can bind to the drug and prevent absorption.

Fluoroquinolones (FQ): *Ciprofloxacin / Levofloxacin / Moxifloxacin.* ***Tetracyclines:*** *Doxycycline / Minocycline / Tetracycline*

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ANTIBIOTICS FOR SWITCH / OPTIMIZATION THERAPY

For definitive pathogens, kindly check with microbiology lab regarding **oral option susceptibility before switching to oral therapy*

For adults with normal renal function		Bioavailability
IV dose	**Optimized oral dose/OPAT option**	
Benzylpenicillin 1 - 2 mega units q6h 3 - 4 mega units q4h-q6h	**PO Phenoxymethylpenicillin** 250 mg QID / 500 mg BD 500 mg QID or **PO Amoxicillin** 500 mg TDS	Phenoxymethylpenicillin: 60-73% Amoxicillin: 80%%
	For Leptospirosis: **PO Doxycycline*** 100mg BD	Doxycycline: 90% **Check for drug-drug or drug-food interaction. Refer to the footnote.*
Cefazolin 1g q8h 2 g q8h	**For non-bacteremia infection:** **PO Cephalexin** 500 mg QID 1000 mg QID	Cephalexin: 90%
	For MSSA bacteremia: Refer ID (for oral options) *or* ***IV Cefazolin*** (refer to OPAT, *click here*)	-
Cefepime 2 g q8h-12h	**PO Amoxicillin / Clavulanate** 625 mg TDS or **PO Ampicillin / Sulbactam** 750 mg BD	Amoxicillin: 80% Clavulanate: 30-98% Ampicillin/Sulbactam: 80%
	For definitive Pseudomonas infection: **PO Ciprofloxacin*** 500 - 750 mg BD	Ciprofloxacin: ~70% **Check for drug-drug or drug-food interaction. Refer to the footnote.*
	For AmpC-E infection ***(Citrobacter freundii / Enterobacter cloacae complex / Klebsiella aerogenes):*** **PO Trimethoprim/Sulfamethoxazole** *Refer to **HSgB Treatment Algorithm for GNR Infection** for TMP dosing* or **PO Ciprofloxacin*** 500 - 750 mg BD or **IV Cefepime** (refer to OPAT, *click here*)	TMP/SMZ: 90-100% Ciprofloxacin: ~70% **Check for drug-drug or drug-food interaction. Refer to the footnote.*
Cefoperazone 1-2 g q12h	**PO Amoxicillin / Clavulanate** 625 mg TDS or **PO Ampicillin / Sulbactam** 375 - 750 mg BD or **PO Cefuroxime axetil** 500 mg BD	Amoxicillin: 80% Clavulanate: 30-98% Ampicillin/Sulbactam: 80% Cefuroxime axetil: 37-52%

* *Allow a 2-hour gap between taking FQ or Tetracyclines and consuming dairy products, multivitamins, antacids, or NG tube feeds to avoid concurrent exposure to multivalent cations (e.g., Ca, Fe, Al, Mg, Zn). Hold tube feeds 1H before & 2H after FQ or Tetracyclines given. Cations can bind to the drug and prevent absorption.*

Fluoroquinolones (FQ): *Ciprofloxacin / Levofloxacin / Moxifloxacin.* ***Tetracyclines****: Doxycycline / Minocycline / Tetracycline*

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For definitive pathogens, kindly check with microbiology lab regarding **oral option susceptibility before switching to oral therapy*

For adults with normal renal function		Bioavailability
IV dose	**Optimized oral dose/OPAT option**	
Ceftazidime 2 g q6h-8h	**PO Amoxicillin / Clavulanate** 625 mg TDS or **PO Ampicillin / Sulbactam** 750 mg BD	Amoxicillin: 80% Clavulanate: 30-98% Ampicillin / Sulbactam: 80%
	For definitive Pseudomonas infection: **PO Ciprofloxacin*** 500 - 750 mg BD	Ciprofloxacin: ~70% **Check for drug-drug or drug-food interaction. Refer to the footnote.*
	For melioidosis: **PO Trimethoprim/Sulphamethoxazole** or **PO Amoxicillin/Clavulanate** or **IV Ceftazidime** (refer to OPAT, *click here*) Refer to **HSgB Antibiotic Guideline 2019** for weight-based dosing & duration of antibiotic	TMP/SMZ: 90-100% Amoxicillin: 80% Clavulanate: 30-98%
Ceftriaxone 1-2 g q24h	**PO Amoxicillin / Clavulanate** 625 mg TDS or **PO Cefuroxime axetil** 500 mg BD or **IV Ceftriaxone** (refer to OPAT, *click here*)	Amoxicillin: 80% Clavulanate: 30-98% Cefuroxime axetil: 37-52%
	For Leptospirosis: **PO Doxycycline* 100mg BD**	Doxycycline: 90% **Check for drug-drug or drug-food interaction. Refer to the footnote.*
Erythromycin Lactobionate 500 mg q6h 1000 mg q6h	**PO Erythromycin Ethylsuccinate** 400 mg QID 800 mg QID	Erythromycin: 18-45%
Meropenem 1-2g TDS	**For AmpC-E or ESBL-E infections:** **PO Trimethoprim / Sulfamethoxazole** Refer to **HSgB Treatment Algorithm for GNR Infection** for TMP dosing or **PO Ciprofloxacin*** 500 - 750 mg BD or **IV Ertapenem** 1g q24h (refer to OPAT, *click here*)	TMP/SMZ: 90-100% Ciprofloxacin: ~70% **Check for drug-drug or drug-food interaction. Refer to the footnote.*
Piperacillin/Tazobactam 4.5 g q6h-8h	**PO Amoxicillin / Clavulanate** 625 mg TDS or **PO Ampicillin / Sulbactam** 750 mg BD	Amoxicillin: 80% Clavulanate: 30-98% Ampicillin / Sulbactam: 80%
	For definitive Pseudomonas infection: **PO Ciprofloxacin*** 500 - 750 mg BD	Ciprofloxacin: ~70%
Vancomycin 15-20 mg/kg/dose q8-12h	**For MRSA bacteremia, non-bacteremia infection and Enterococcus faecium infections:** Refer ID	-

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OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY (OPAT)

LAUNCHED: APRIL 2024. UPDATED: MAY 2025

What is OPAT?

OPAT services offer intravenous (IV) antimicrobial treatment to patients outside the confines of usual hospital in-patient setting. This option allows medically stable and ambulatory patients, who would otherwise need a hospital bed, to be discharged sooner while still receiving necessary IV antimicrobial therapy as out-patients.

Common OPAT-able antimicrobials:

- Ceftriaxone
- Ertapenem
- Ceftazidime
- Cefazolin

- *Note that this list is not exhaustive, other antimicrobials may be referred to OPAT as needed.*
- *OPAT team accepts referrals for all antimicrobials and will evaluate each case individually for suitability.*

How to refer OPAT cases

To refer patients for Outpatient Parenteral Antimicrobial Therapy (OPAT), simply contact any of the following:

OPAT Clinic	Via operator > PKKN Operator > MOPD 3
ID Specialist	On-call Phone: 012-3010577
OPAT Pharmacist	En. Zulhafiz (via operator)
AMS Pharmacy Team	Ext 4114/4113/4123

OPAT referrals can be made by anyone, including doctors, pharmacists, medical assistants (MA) and nurses

It is important to manage patient expectations regarding discharge after review by OPAT, particularly for those requiring an elastomeric infuser.
Please refrain from making any promises of immediate discharge, as this may not be feasible.

Screen all patients currently on IV Antibiotics

Inclusion criteria for OPAT

- Haemodynamically stable
- Medically stable
  - Not on **oxygen support** or able to wean off oxygen
  - Not on **IV Drip** or able to off IV Drip
  - Not on **inotropic support**
  - Not on any **intravenous drug infusion** or able to oralize medication

Able to oralize → Consider for **IV to Oral switch**

Not able to oralize → Consider for **OPAT**

Examples of infections suitable for OPAT	Requirements before OPAT
• Osteomyelitis, Septic arthritis, Prosthetic joint infection, Cellulitis	• Adequate surgical treatment received
• Clinically stable endocarditis	• After 2 weeks of inpatient treatment without complications
• Urinary tract infection • Chest infections / Bronchiectasis	• Caused by organisms where appropriate oral antimicrobial therapy is not available
• Diabetic foot ulcer • Melioidosis • Other infections requiring prolonged IV antimicrobial therapy	• After acute in-patient management is not needed

Exclusion criteria for OPAT

- Patients **< 12 years old**
- Co-existing morbidity requiring hospitalization

References

1. Protocol on Antimicrobial Stewardship Program in Healthcare Facilities, MOH latest edition
2. Hospital Sungai Buloh Antibiotic Guideline 2019
3. National Antibiotic Guideline 2019
4. Hospital Sungai Buloh Outpatient Parenteral Antimicrobial Therapy (OPAT) Service Guidelines

By: AMS *team (Izyana Munirah Idham, Hannah Md Mahir, Adam Ashraf Jaafer, Fong Siew Li, Khairun Azwani & Syazwan Husori) & OPAT Pharmacist (Afra Nahdia Marizan Nor).*

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