HOSPITAL SUNGAI BULOH ANTIMICROBIAL POLICY

Date Approved: June 2019 (Ver 1.0)

Date Revised: May 2024 (Ver 3.0)

		Antimicrobial Prescribing Policy, Hospital Sungai Buloh
No.	**Subject**	**Description**
1.	Executive summary:	This policy provides guidance to all health professionals working in Hospital Sungai Buloh whom involved in the prescribing and administering of antibiotics regarding the prudent prescribing of antibiotics.
2.	Reviewed by:	Antimicrobial Stewardship Team, HSgB
3.	Endorsed by:	Drugs and Therapeutics Committee (JKUT) & Hospital Infection and Antibiotic Control Committee (HIACC)
4.	Date Approved:	June 2019 (Ver 1.0)
5.	Version:	May 2024 (Ver 3.0) [Replaces Previous Policy Ver 2.0]
6.	Date Ratified:	15th May 2024
7.	Summary of Changes from Previous Version:	May 2021 (Ver 1.0): 1. Revised Red Category Antibiotic Algorithm & Workflow 2. Revised Red Category Antibiotic (Colistin & Polymyxin B) to be under Anaes & ID
		Apr 2022 (Ver 2.0): 1. Revised Antimcrobial Traffic Light List 2. Added Roles & Responsibilities 3. Added Virtual AMS Round Workflow 4. Revised Antimicrobial Prescribing Principles
		May 2024 (Ver 3.0): 1. Revised Antimcrobial Traffic Light List 2. Revised Carbapenem Supply Workflow 3. Revised IV to PO Switch and Added OPAT Guide
8.	Target audience:	All healthcare professionals involved in the prescribing, dispensing and administering of antibiotics in Hospital Sungai Buloh
9.	Authors:	Izyana Munirah binti Idham, AMS Pharmacist (Clinical) Hannah binti Md Mahir, AMS Pharmacist (Clinical) Fong Siew Li, AMS Pharmacist (Clinical) Tan Wai Leong, AMS Pharmacist (PRIC)
10.	Advisors:	Dr Benedict Sim Lim Heng, ID Consultant (AMS Team Leader) Dr Syamhanin Adnan, Senior Clinical Pharmacist

Table of Contents

1. INTRODUCTION – VISION, MISSION, GOALS & OBJECTIVES

The judicious use of antibiotics is an important strategy for preserving the efficacy of antimicrobial agents in the treatment of infectious diseases. Thus, this policy was developed to provide practical recommendations & to guide healthcare professionals in Hospital Sungai Buloh to improve the quality of antibiotic usage and prescribing as well as improve patient clinical outcomes.

While all antibiotic usage should be tailored to each individual patient and their specific situation and circumstances, all staff should refer to this Antibiotic Policy and prescribe according to these recommendations and restrictions.

This policy will be reviewed 3 yearly by the Antimicrobial Stewardship Team and endorsed by the hospital administration. Compliance with the policy will be monitored as part of AMS team activities.

The Antimicrobial Stewardship (AMS) Team has the right to review all cases regarding the usage of antimicrobials and their appropriateness.

All units and departments within this facility are strongly encouraged to ensure full co-operation with the Antimicrobial Stewardship Team if reviews on antibiotic use in their directorate are conducted.

1.1 VISION

We will provide high-quality and patient-centred antimicrobial services through excellence in clinical research, training, education, innovation, and appropriate technology by a team of caring and committed healthcare professionals from various disciplines.

1.2 MISSION

We are committed to:

1. Ensure that every patient in Hospital Sungai Buloh who needs antimicrobial therapy gets optimal drug choice, dose, duration and route of administration while minimizing resistance development and toxicity
2. To be a centre of excellence in the management of Infectious Diseases & Antimicrobial Therapy
3. Improve awareness and understanding of antimicrobial resistance among the healthcare workers as well as the public
4. Strengthen knowledge through surveillance and research
5. Reduce the incidence of infection
6. Optimize the use of antimicrobial agents
7. Work as a team in partnership with the other healthcare workers to promote optimal antimicrobial therapy & create a work culture where all input & feedbacks are valued and respected.

1.3 GOALS

Antimicrobial Stewardship (AMS) Team aims to coordinate a systematic approach to improving the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen; suitable choice of antimicrobial, correct route of administration, right dose, right time, appropriate duration and minimize harm to the patient and future patients.

1.4 OBJECTIVES

The main objectives of this antibiotic policy are:

i. To improve safety and quality of patient care (e.g., reduce morbidity and mortality from infection).

ii. To optimise antimicrobial therapy by promoting judicious use of antimicrobials, optimising antimicrobials selection, dosing route and duration of treatment in order to maximise clinical cure or prevent infections.

iii. To limit the unintended consequences such as the emergence and spread of antimicrobial-resistant organisms and adverse drug events.

2. ANTIMICROBIAL PRESCRIBING PRINCIPLES

Basic Antimicrobial Stewardship principles are as follows:

1. Do not start antimicrobial therapy without **clear clinical justification** - Patients who receive antimicrobial therapy are at increased risk of colonisation and infection with multi-resistant pathogens. Patients should not be subjected to this increased risk without reasonable evidence of infection or established prophylactic benefit.

2. Confirm the **allergy status** of the person BEFORE prescribing - Antimicrobial therapy should not be prescribed until the allergy status of the patient has been documented in eHIS.

3. When prescribing antimicrobial, **Indications** and site of infection for antimicrobials are to be explicitly spelt out at the time of prescribing. The indication is to be written on the clinical note and/or the medication chart.

4. Take **appropriate Microbiology investigations** (culture or serology) prior to initiation of antimicrobial therapy.

5. Clinicians to prescribe antimicrobials guided by the Hospital Sungai Buloh **Antibiotic Guidelines** where applicable.

   Hospital Sungai Buloh has formulated its own Antibiotic Guidelines, which are accessible from the desktop of all computers in the hospital.

6. For **restricted antibiotics**, follow the procedures for obtaining approval where applicable.

7. Patient's antimicrobial therapy is to be **reviewed regularly** based on microbiology results and the patient's progress. The antibiotic should be deescalated to the narrowest effective spectrum as per culture and sensitivity results and patients' clinical conditions.

8. The administration of **antibiotics must not be missed** unless under unavoidable circumstances.

3. ROLES & RESPONSIBILITIES

3.1. GENERAL ROLE OF ANTIMICROBIAL STEWARDSHIP TEAM:

1. Strengthens formulary restriction and approval systems.
2. Regularly reviews antimicrobial prescribing with intervention and direct feedback to the prescribers.
3. Educates prescribers, pharmacists and nurses about good antimicrobial prescribing practice and antimicrobial resistance.
4. Evaluates compliance to clinical guidelines and reports on process measures, outcomes measures (e.g. clinical and financial) and antimicrobial resistance patterns to Hospital Infection and Antibiotic Control Committee (HIACC) and Hospital Director.

3.2. INFECTIOUS DISEASE PHYSICIAN:

1. Leads the technical component of the Antimicrobial Stewardship team.
2. Consults and advice on specific stewardship related cases and issues.

3.3. AMS PHARMACIST:

1. Clinical role in conjunction with other members of the AMS Team:
    - Gives technical input on finer aspects of antimicrobials.
    - Identifies potential patients for stewardship interventions (e.g. de-escalation etc.)
    - Enforces the approval system of restricted antimicrobials.
2. Perform surveillance of antimicrobial use:
    - Collection and analysis of local consumption and expenditure.
    - Provision of data to regional /national surveillance programmes.
3. Audit and feedback
    - Leads and conducts appropriate antimicrobial audits
    - Provides timely feedback for future improvement

3.4. CLINICAL MICROBIOLOGIST:

1. Provision of guidance in the pre-analytic phase on appropriate diagnostic tests & specimen collection (types, time, date taken and documentation) and sample quality.
2. Provision of timely and accurate reporting of culture and antimicrobial susceptibility reports.
3. Ensures selective reporting of antimicrobial susceptibilities and interpretative reporting of microbiology results.
4. Provision of cumulative antimicrobial susceptibility reports on a yearly basis.
5. Provision of alert and surveillance systems (outbreak detection & Investigation)

3.5. INFECTION CONTROL PRACTITIONER (NURSE/DOCTOR):

1. Identify opportunities to tighten infection control practices.
2. Complements the efforts of the AMS team in bringing down resistance rates.

3.6. WARD/CLINICAL PHARMACIST:

1. Clinical role in conjunction with members of the AMS Team:
    - Gives technical input on finer aspects of antimicrobials.
    - Identifies potential patients for stewardship interventions (e.g. de-escalation, IV to PO)
    - Ensures dose optimisation is carried out and clarifies antimicrobials continuing beyond stated review date or the planned duration.
    - Assist in the enforcement of the approval system of restricted antimicrobials & promote compliance to Carbapenem Initiation & 72H Review Form
2. Ensures safe and effective use of medication to reduce the risk for errors and adverse events.
3. Assist in surveillance of antimicrobial use as well as audit and feedback:
    - Identify potential patients & liaise with the primary team doctor for AMS rounds
    - Act as liaison officer to the primary team and assist with ward specific feedback and intervention (e.g., Post-PPS Findings & Intervention).

3.7. ALL PRESCRIBERS:

1. Prescribe antimicrobials in accordance with the principles set within this policy and the Hospital Sungai Buloh Antimicrobial Guidelines.
2. Document the indication for the antimicrobial prescribed and a valid duration/review date in the relevant document (eHIS note, drug remark & prescription).
3. Check that the allergy status of the patient before prescribing any antibiotics.
4. Ensure all antimicrobials planned are ordered immediately & correctly.
5. Review antimicrobials regularly based on microbiology results and the patient's progress. Document the reason if antimicrobials continuing beyond stated review date or planned duration.

3.8. REGISTERED NURSES:

1. When an antimicrobial is prescribed, ensure that antimicrobial treatment is obtained and administered as soon as possible and that doses are not omitted or delayed.
2. Where a planned antimicrobial therapy is not prescribed, nursing staff must ensure that prescibers are informed to prescribe the antimicrobial in eHIS.
3. Check the allergy status of the patient before administering any antimicrobials.
4. Request that prescribers include an indication for the antimicrobial and a valid duration/review date when it's not documented.
5. Clarify with the prescribers for all prescriptions continuing beyond the stated review date or the ordered antimicrobial does not match the plan in clinical note.

3.9. IT OFFICERS:

1. Assist with maintaining and optimizing the localized electronic hospital information system and hospital network to ensure seamless AMS operations.
2. Assist with providing access to microbiological data and antibiotic utilisation data to support informed decision-making.
3. Assist with developing and managing automated reports for antimicrobial utilization and other relevant clinical data to improve monitoring and analysis.
4. Assist with Virtual AMS Rounds - set up and maintain software and hardware for virtual AMS activities, including the integration of AMS-related electronic health record (eHIS) notes, automated alerts, and reminders.
5. Assist with AMS resources/documents accessibility (eg: desktop shortcuts) for healthcare staff to enhance workflow efficiency.
6. Support AMS Awareness Campaigns – assist in the dissemination of AMS-related promotional materials, such as customized desktop backgrounds and digital broadcasts, to reinforce best practices.

4. ANTIMICROBIAL STEWARDSHIP STRATEGIES

A. FORMULARY & ANTIBIOTIC RESTRICTION

The formulary restriction is one of the pillars of the AMS Program. The restrictions are based on department ownership (according to JKUT) as well as the level of prescriber (according to MOH blue book categorisation). This formulary and antibiotic restriction will be reviewed on regular basis.

The list of antibiotics in our facility is separated into three categories:

1. **Green:**

   Antibiotics that do not require pre-approval (Can be prescribed by all doctors)

2. **Yellow:**

   Restricted antibiotics (Prescribed & authorised by ward specialist) and is subject to AMS team review

3. **Red:**

   Reserved antibiotics (Prescribed after referral and approval by designated disciplines)

This restriction is to help control the usage of broad-spectrum antibiotics to prevent misuse and raise awareness among prescribers so each case is carefully reviewed before referring to the specialists for authorisation of broad-spectrum antibiotics.

The table below outlines the three categories of antibiotics and the list of antibiotics in each category.

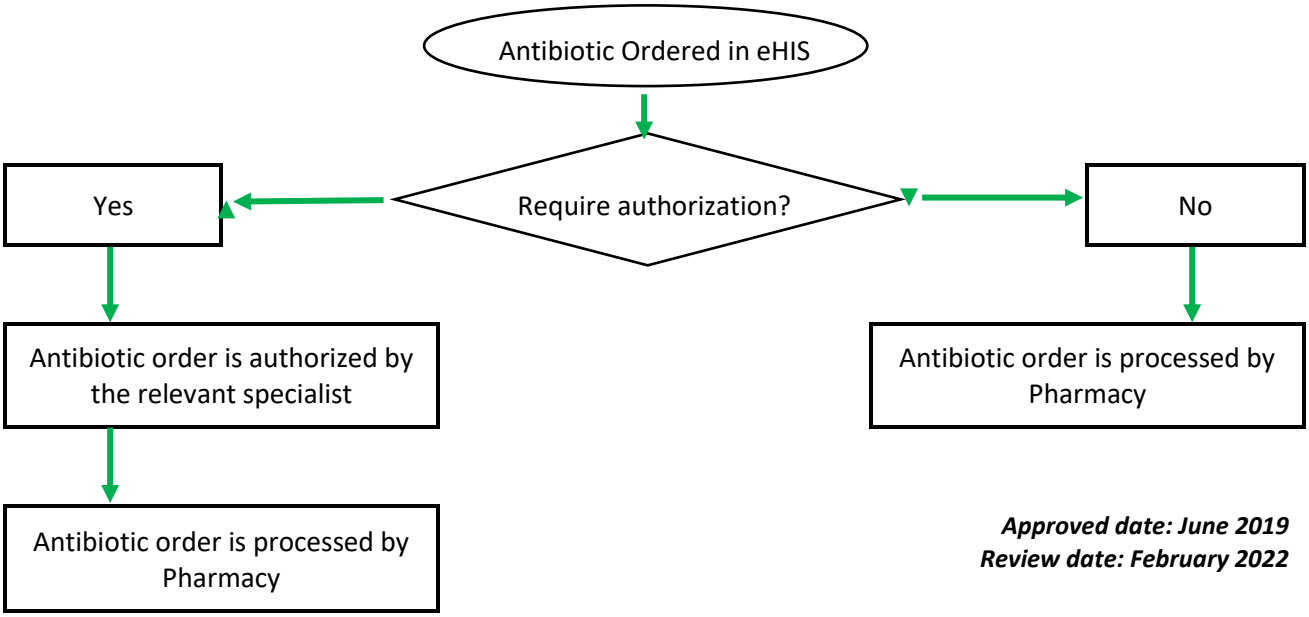
I. ANTIBIOTICS IN GREEN CATEGORY (DO NOT REQUIRE PRE-APPROVAL)			
NO.	**DRUGS**	**PRESCRIBER CATEGORY**	**DEPARTMENT (If no department listed = all department can prescribe)**
1	Amoxycillin Cap/Syrup	**B**	
2	Amoxycillin + Clavulanic Acid Inj/Tab/Syrup	**A (Inj)** **A/KK (Tab/Syr)**	
3	Ampicilin + Sulbactam Inj/Tab/Syrup	**A (Inj/Syr)** **A/KK (Tab)**	
4	Ampicillin Inj/Syrup	**B**	
5	Azithromycin Inj/Tab/Syrup	**A*** **A/KK (Tab/Syr)**	
6	Cefazolin Sodium Inj	**A**	
7	Cephalexin Monohydrate Cap	**B**	
8	Cloxacillin Sod Inj/Cap/Syrup	**B**	
9	Doxycycline Cap	**B**	
10	Erythromycin Ethylsuccinate Tab/Syrup	**B**	
11	Erythromycin Lactobionate Inj	**A***	
12	Metronidazole Inj/Tab/Syrup	**A (Inj)** **B (Tab/Syr)**	
13	Nitrofurantoin Tab	**B**	
14	Nystatin Suspension	**B**	
15	Penicillin G Benzathine Inj	**B**	
16	Penicillin G Procaine Inj	**B**	
17	Penicillin G Sodium Inj (Benzylpenicillin/C-Pen)	**B**	
18	Penicillin VK (Phenoxymethylpenicillin) Tab/Syrup	**C**	
19	Primaquine Tab	**B**	
20	Trimethoprim + Sulphamethoxazole Inj/Tab/Syrup	**A (Inj)** **B (Tab/Syr)**	
21	Tetracycline HCl Cap	**B**	
			Approved date: June 2019 ***Updated: February 2024***

II. ANTIBIOTICS IN YELLOW CATEGORY (SUBJECT TO AMS)			
NO.	**DRUGS**	**PRESCRIBER CATEGORY**	**DEPARTMENT (If no department listed = all department can prescribe)**
1	Amikacin Inj	**A**	
2	Amphotericin B Deoxycholate (Conventional) Inj	**A**	
3	Cefepime Inj	**A***	
4	Cefoperazone Sod Inj	**A**	
5	Cefoperazone + Sulbactam Inj	**A**	
6	Cefotaxime Inj	**A**	
7	Ceftazidime Inj	**A**	
8	Ceftriaxone Inj	**A**	
9	Cefuroxime Inj/Tab/Syrup	**A (Inj/Syrup) A/KK (tab)**	
10	Ciprofloxacin Inj/Tab	**A**	
11	Clarithromycin Tab	**A***	
12	Clindamycin Inj/Cap	**A***	
13	Ertapenem Inj	**A***	**ID**
14	Fluconazole Inj/Cap	**A**	
15	Fusidic Acid Tab	**A***	
16	Gentamicin Sulphate Inj	**B**	
17	Imipenem + Cilastatin Inj	**A***	
18	Itraconazole Cap	**A/KK**	
19	Meropenem Inj	**A***	
20	Oseltamivir Cap/Solution	**A/KK**	
21	Piperacillin + Tazobactam Inj	**A***	
22	Streptomycin Inj	**B**	
23	Vancomycin HCl Inj	**A***	
These antibiotics are categorised as **restricted** as their usage is actively monitored by KKM			
Approved date: June 2019 ***Updated: February 2024***			

III. ANTIBIOTICS IN RED CATEGORY (RESERVED)			
NO.	**DRUGS**	**PRESCRIBER CATEGORY**	**DEPARTMENT (If no department listed = all department can prescribe)**
1	Amphotericin B (Lipid Complex)	**UKK**	**ID**
2	Amphotericin B (Liposomal)	**UKK**	**ID**
3	Anidulafungin Inj	**A***	**ID**
4	Aztreonam Inj	**UKK**	**ID**
5	Ceftaroline Fosamil Inj	**A***	**ID**
6	Ceftazidime + Avibactam Inj	**A***	**ID**
7	Ceftolozane + Tazobactam Inj	**A***	**ID**
8	Colistimethate Sodium (Colistin E) Inj	**A***	**ID/ANAES**
9	Flucytosine Tab	**UKK**	**ID**
10	Fosfomycin Sachet (Granules)	**A***	**ID**
11	Ganciclovir Inj	**A***	**ID**
12	Isoniazid Inj	**UKK**	**ID**
13	Ivermectin Tab	**UKK**	**ID**
14	Levofloxacin Inj/Tab	**A***	**ID**
15	Linezolid Inj	**A***	**ID/ANAES**
16	Linezolid Tab	**A***	**ID**
17	Linezolid Syrup	**A***	**PAED**
18	Micafungin Inj	**A***	**ID/ANAES**
19	Minocycline Cap	**A***	**ID/DERM**
20	Minocycline Inj	**UKK**	**ID**
21	Moxifloxacin Inj/Tab	**A*/UKK**	**ID**
22	Nirmatrelvir/Ritonavir Tab	**UKK**	**ID**
23	Paromomycin Sulphate Cap	**UKK**	**ID**
24	Pentamidine Isethionate Inj	**A*/UKK**	**ID**
25	Polymyxin B Inj	**A*/UKK**	**ID/ANAES**
26	Praziquantel Tab	**UKK**	**ID**
27	Rifabutin Cap	**UKK**	**ID**
28	Rifampicin Inj	**UKK**	**ID**
29	Tigecycline Inj	**UKK**	**ID**
30	Trimethoprim Tab	**UKK**	**PAED**
31	Valganciclovir Tab	**A*/UKK**	**ID**
32	Voriconazole Inj/Tab	**A***	**ID**
			Approved date: June 2019 ***Updated: Feb 2024***

Flowchart for Ordering Green Category Antibiotics

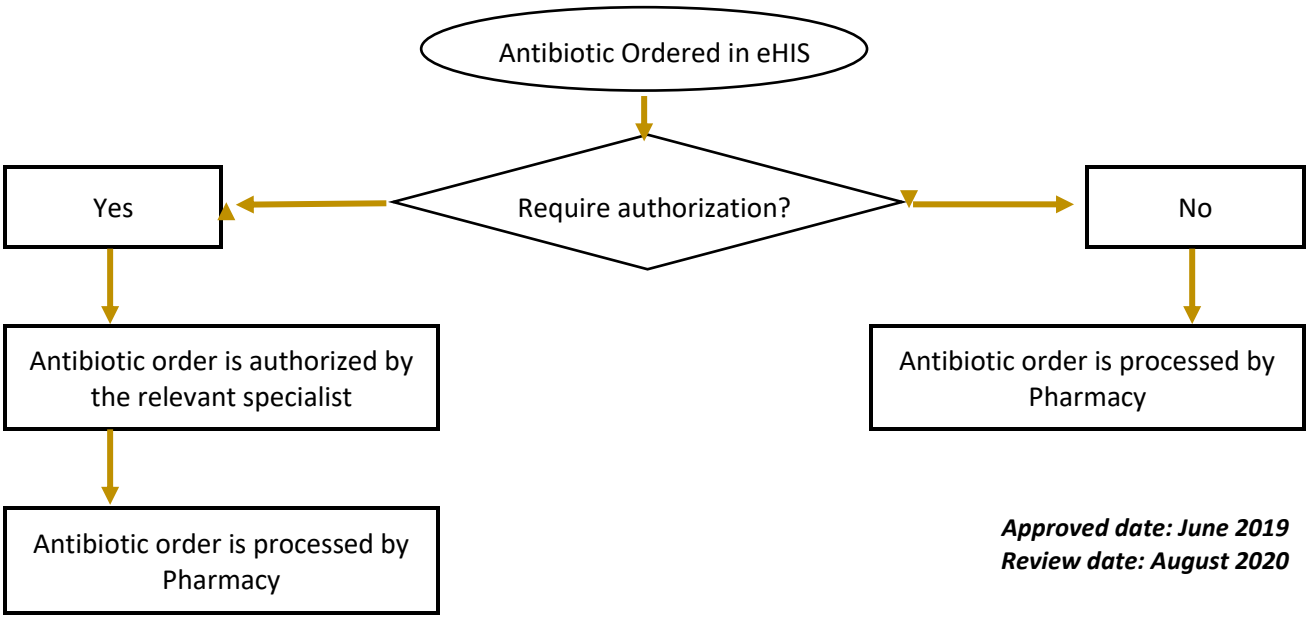
(Antibiotics that do not require pre-approval (Can be prescribed by all doctors))



Approved date: June 2019
Review date: February 2022

Flowchart for Ordering Yellow Category Antibiotics

(Prescribed & authorised by ward specialist and is subjected to AMS team review)

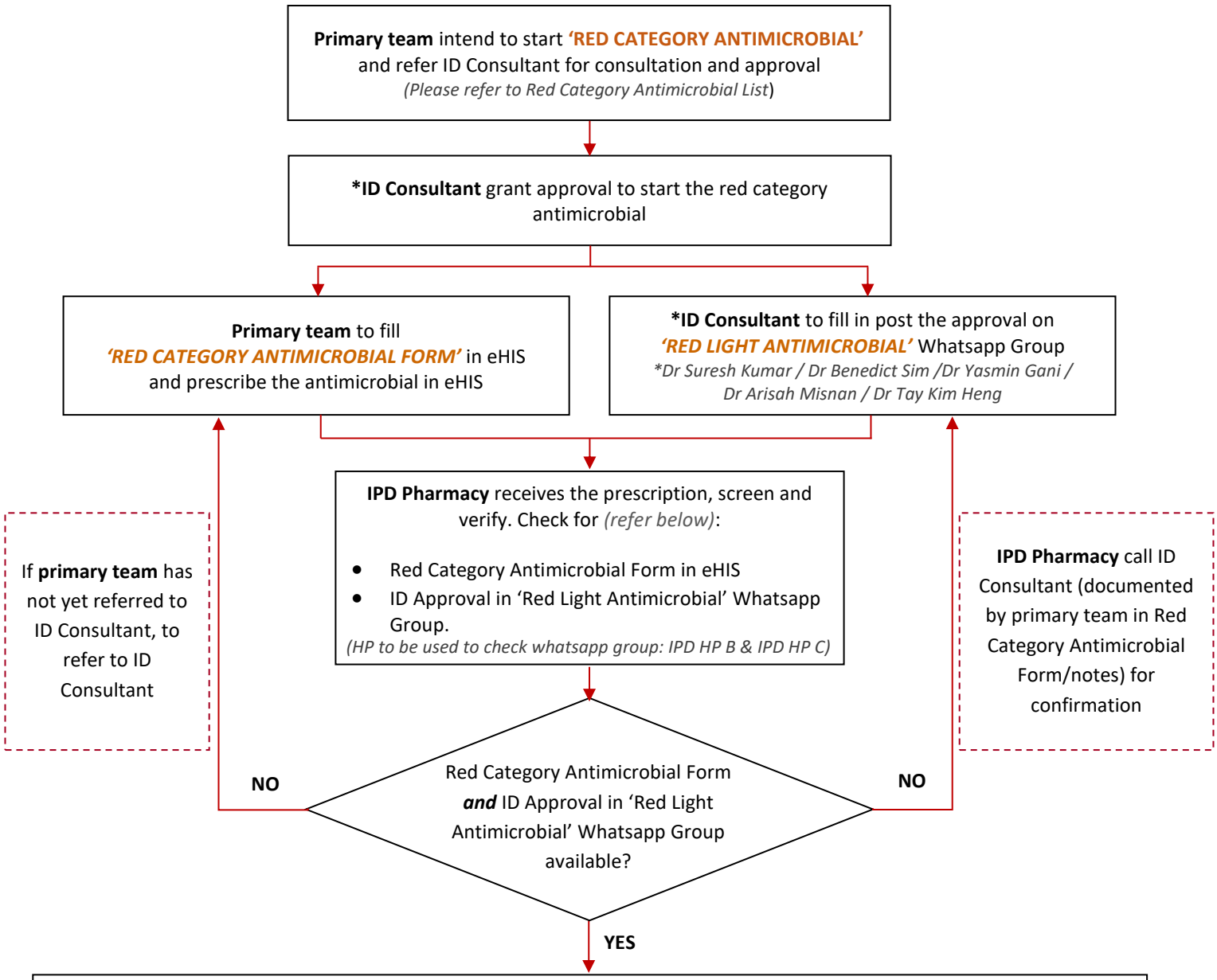


Approved date: June 2019
Review date: August 2020

***If starting on carbapenem, please fill up the Carbapenem Initiation form in eHIS**
****Antibiotic usage is subjected to audits by the AMS team**

Flowchart for Ordering Red Category Antibiotics

(Prescribed after referral and approval by designated disciplines)



IPD Pharmacy:

- Record ID approval in drug remarks during verification stage.
- Ensure prescription matches with the plan by ID Consultant in the 'Red Light Antimicrobial' Whatsapp Group & supply accordingly.

During After Office Hour (AOH), without Red Category Antimicrobial Form in eHIS or ID Approval in 'Red Light Antimicrobial' Whatsapp Group, only STAT dose (or up to 24H) supply is allowed. Change the duration to STAT/1 day & write remark 'To get ID approval and red category antimicrobial note before processing the next supply'. To supply for STAT dose or 1 day supply only.

***EXCEPTIONS =**

For antimicrobials with **CO-OWNERSHIP**, ID approval is **NOT** required if the primary team's department is a co-owner.
E.g: ***Colistin, Polymyxin B & Micafungin Inj*** *(co-owned by ANAESTH & ID), ICU team do* ***NOT*** *require ID approval to start.*

Approved date: September 2022
Review date: April 2022

B. ANTIBIOTIC ORDER TOOL – CARBAPENEM INITIATION & 72 HOURS REVIEW FORM

Carbapenem Order Form is an antibiotic order tool designed to guide the clinician to use carbapenems judiciously. The form encourages clinicians to review basic clinical and laboratory information and categorise antimicrobial use as empirical or definitive. The order form is available in eHIS and must be filled up when the Carbapenem is ordered.

Every prescription of a Carbapenem needs a Carbapenem form to be filled upon initiation. If the 'Carbapenem Initiation Form' is not filled up, it will be assumed that the Indication Category is 'empirical', and only a **maximum of 4 days** of Carbapenem will be supplied.

If the Indication Category is 'definitive', only the 'Carbapenem Initiation Form' needs to be filled up, and Carbapenem will be supplied until the prescription reaches full supply.

If the indication category is 'empirical,' the managing team must review the need for continuing Carbapenem therapy beyond 72 hours. The prescriber is obligated to complete the 'Carbapenem 72 Hour Review Form' and document the rationale for the continuation of Carbapenem therapy. Supply of Carbapenem will not be provided unless the 'Carbapenem 72 Hour Review Form' is completed.

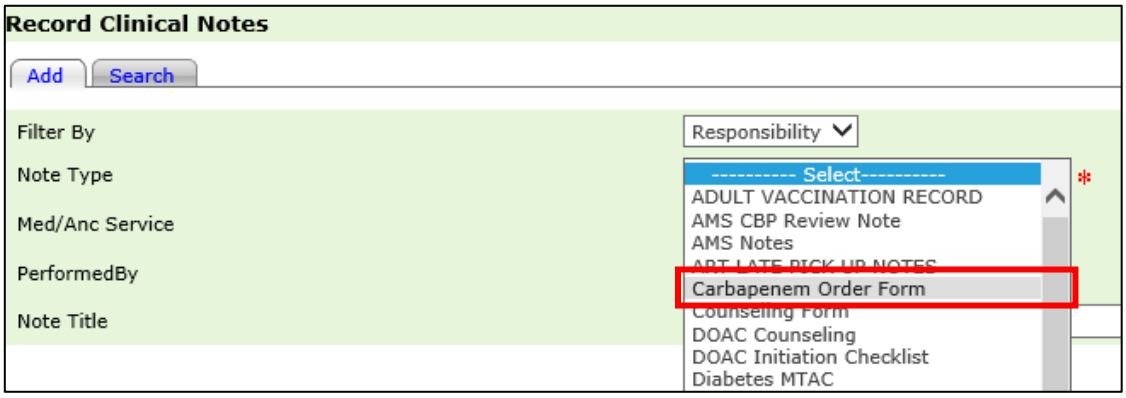
If the carbapenem order stops by 72 hours, this review is not necessary.

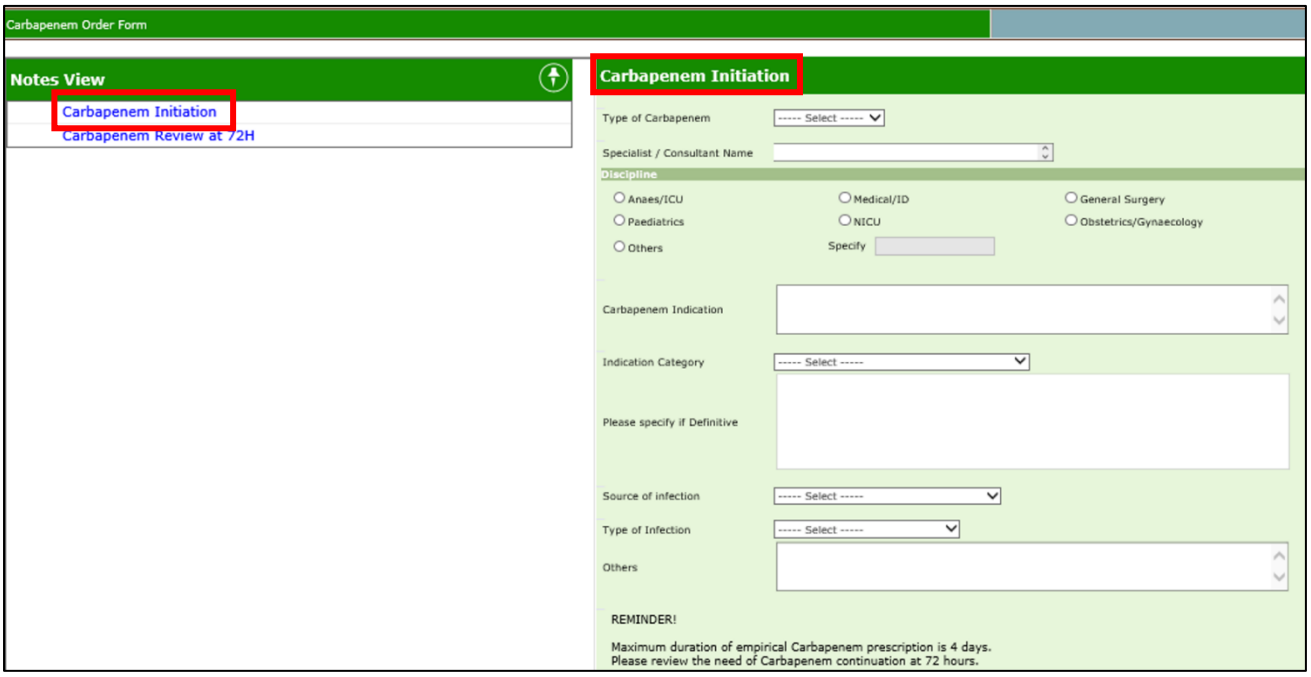
The purpose of this is to encourage the managing team to examine if there is a need to continue the Carbapenem based on the patient's latest clinical status and any preliminary or confirmed results, particularly microbiology culture results.

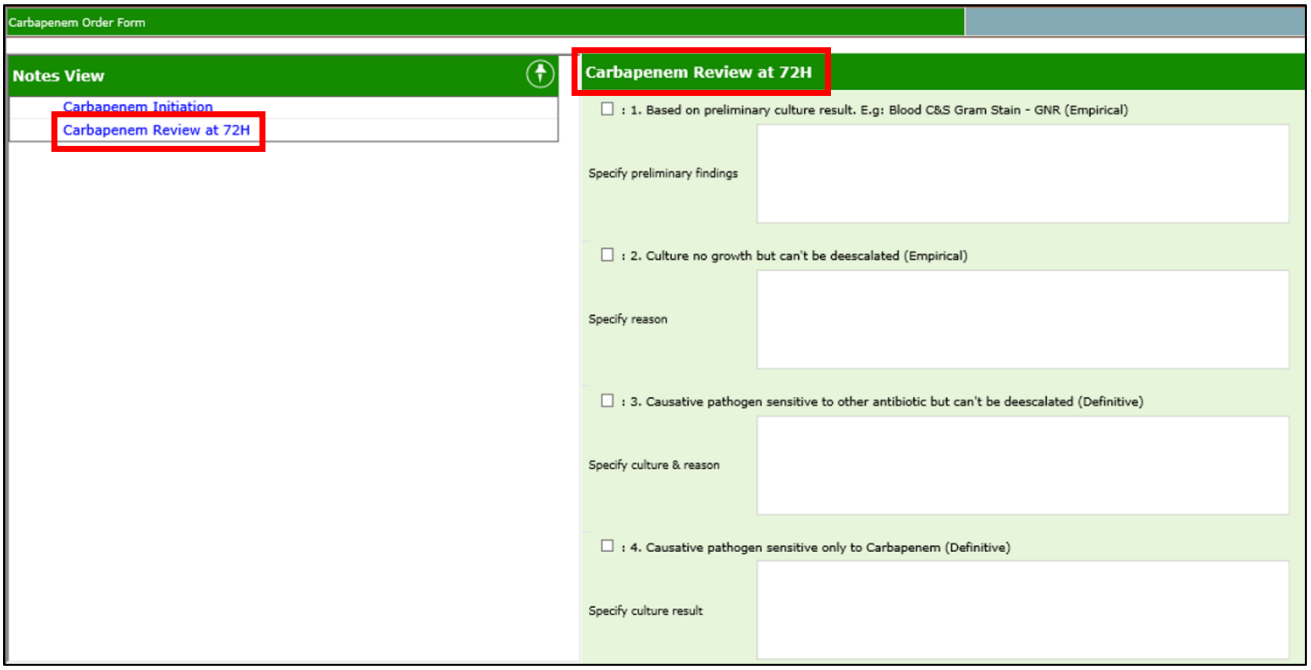
The results of this are tabulated by the respective ward pharmacists and forwarded to the AMS team. Data are then collated, analysed 3 monthly, and fed back to the respective departments via departmental meetings or the hospital HIACC meeting.

Below is the Carbapenem Initiation & 72 hours order form and the workflow of Carbapenem supply in Hospital Sungai Buloh.

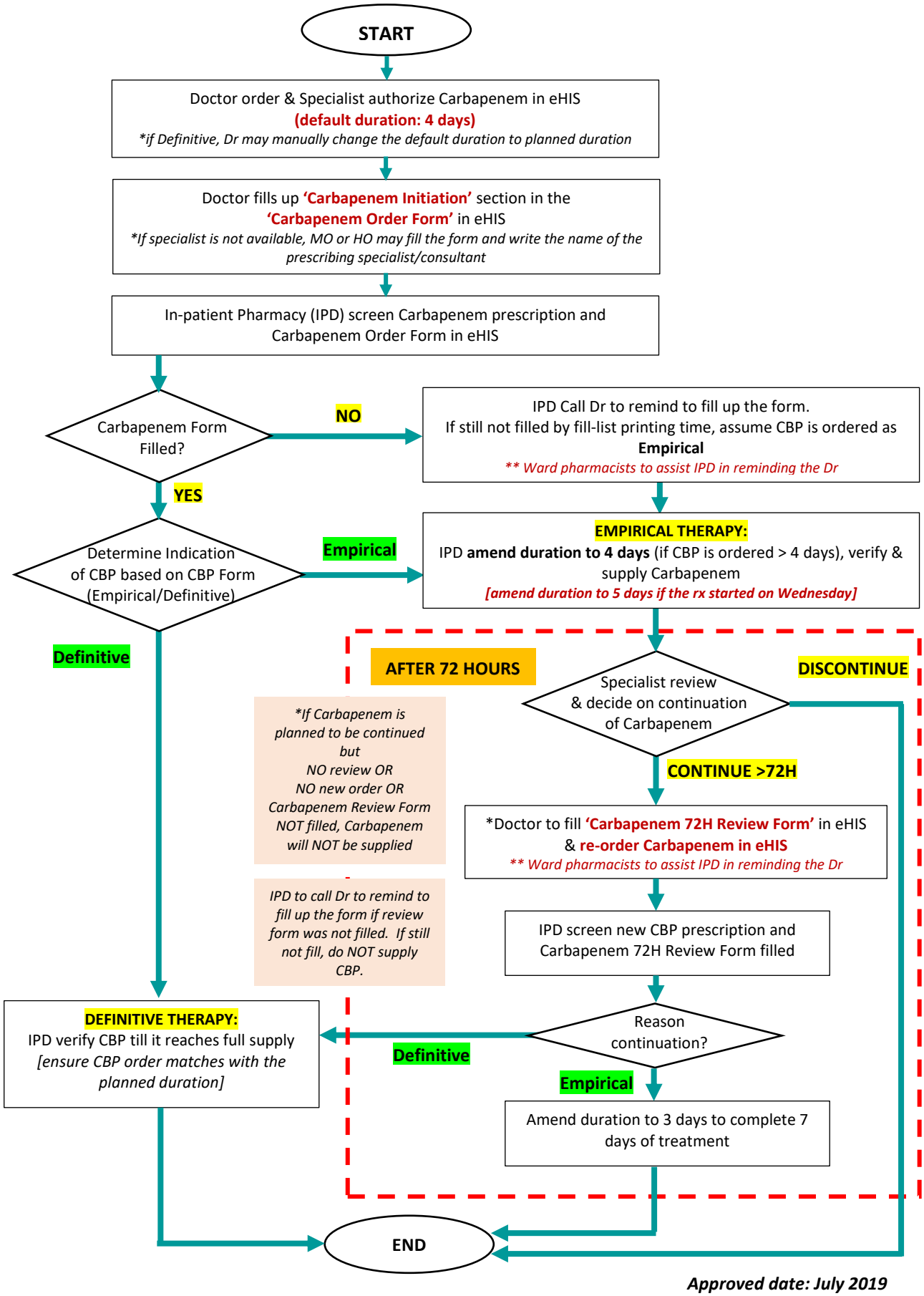
CARBAPENEM ORDER FORM IN EHIS







FLOWCHART FOR CARBAPENEM SUPPLY IN HSGB



Approved date: July 2019
Revised date: September 2023

C. INTRAVENOUS (IV) TO ORAL (PO) SWITCH & OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY (OPAT)

"Intravenous to Oral Switch" is the practice of converting intravenous antimicrobials therapy to an effective alternative oral formulation.

Converting antimicrobials from IV to oral administration offers several benefits to patients. It eliminates adverse events linked to IV therapy such as catheter-related bloodstream infections and thrombophlebitis. Additionally, it enhances patient comfort and mobility, potentially leading to earlier discharge from the hospital.

IV to oral antimicrobials conversion also confers an economical advantage as oral antimicrobials are cheaper than IV antimicrobials. Reducing the usage of needles and other consumables needed for IV administration also contributes to cost-saving. Cost savings are achieved through lowering direct acquisition costs, eliminating the need for ancillary supplies, reducing pharmacy and nursing time, and shortening the length of hospital stay.

In a situation where a patient is suitable for oral antibiotic therapy, but there is no appropriate oral antibiotic available to treat the infection, outpatient parenteral antibiotic therapy (OPAT) can be considered after assessing the patient's medical and social suitability. This option enables medically stable and ambulatory patients, who would otherwise require a hospital bed, to be discharged sooner while still receiving parenteral antibiotic therapy.

The implementation of Intravenous to Oral Switch at Hospital Sungai Buloh may be referred to **DIAMS (Daily Integration of Antimicrobial Stewardship) – IV to PO Switch & OPAT Quick Guide** [*also available in Antibiotic SOS link on the desktop*].

For more details on IV to PO, refer to KKM AMS protocol 2022.

https://pharmacy.moh.gov.my/en/documents/protocol-antimicrobial-stewardship-ams-programme-healthcare-facilities-second-edition-2022.html

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

IV to PO Switch & OPAT Quick Guide

"SAFE Antibiotics, SAFE Recovery, SAFE Return Home"

LAUNCHED: NOVEMBER 2022. UPDATED: APRIL 2024

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).
Revised on 8th April 2024.
Only for internal circulation (HSgB). For further enquiries, kindly contact ext 4126/4123.

Disclaimer: *This guide provides general advice based on published evidence and expert opinion for hospital-wide standardization of practice. This guide may not cover all aspects of clinical practice, thus healthcare practitioners are encouraged to review patient details and professionally assess the relevance of the guide to each clinical situation. This guide is subject to periodic updates. We assume no responsibility for any party who referred to an outdated version of the guide.*

DAILY INTEGRATION OF ANTIMICROBIAL STEWARDSHIP (DIAMS)

IV to PO Switch & OPAT Quick Guide

"SAFE Antibiotics, SAFE Recovery, SAFE Return Home"

LAUNCHED: NOVEMBER 2022. UPDATED: APRIL 2024

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%	300 mg QID for adult < 60 kg
Cloxacillin	500 mg q6h 1000 mg q6h 2000 mg q6h	250 mg QID 500 mg QID 1000 mg QID	~ 50%	250 mg for mild infection
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	200-300mg 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

By AMS team (Izyana Munirah Idham, Hannah Md Mahir, Adam Ashraf Jaafer, Fong Siew Li, Syazwan Husori & Khairun Azwani).
Revised on 8th April 2024.
Only for internal circulation (HSgB). For further enquiries, kindly contact ext 4126/4123.

Disclaimer: This guide provides general advice based on published evidence and expert opinion for hospital-wide standardization of practice. This guide may not cover all aspects of clinical practice, thus healthcare practitioners are encouraged to review patient details and professionally assess the relevance of the guide to each clinical situation. This guide is subject to periodic updates. We assume no responsibility for any party who referred to an outdated version of the guide.

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

IV to PO Switch & OPAT Quick Guide

" SAFE Antibiotics, SAFE Recovery, SAFE Return Home"

LAUNCHED: NOVEMBER 2022. UPDATED: APRIL 2024

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*

By AMS *team (Izyana Munirah Idham, Hannah Md Mahir, Adam Ashraf Jaafer, Fong Siew Li, Syazwan Husori & Khairun Azwani).*
Revised on 8th April 2024.
Only for internal circulation (HSgB). For further enquiries, kindly contact ext 4126/4123.

Disclaimer: *This guide provides general advice based on published evidence and expert opinion for hospital-wide standardization of practice. This guide may not cover all aspects of clinical practice, thus healthcare practitioners are encouraged to review patient details and professionally assess the relevance of the guide to each clinical situation. This guide is subject to periodic updates. We assume no responsibility for any party who referred to an outdated version of the guide.*

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

IV to PO Switch & OPAT Quick Guide

" SAFE Antibiotics, SAFE Recovery, SAFE Return Home"

LAUNCHED: NOVEMBER 2022. UPDATED: APRIL 2024

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**	
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	-

*****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

By AMS team (Izyana Munirah Idham, Hannah Md Mahir, Adam Ashraf Jaafer, Fong Siew Li, Syazwan Husori & Khairun Azwani).
Revised on 8th April 2024.
Only for internal circulation (HSgB). For further enquiries, kindly contact ext 4126/4123.

Disclaimer: This guide provides general advice based on published evidence and expert opinion for hospital-wide standardization of practice. This guide may not cover all aspects of clinical practice, thus healthcare practitioners are encouraged to review patient details and professionally assess the relevance of the guide to each clinical situation. This guide is subject to periodic updates. We assume no responsibility for any party who referred to an outdated version of the guide.

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

OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY (OPAT)

LAUNCHED: APRIL 2024

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	Ext 4144
ID Specialist	On-call Phone: 012-3010577
OPAT Pharmacist	Pn Afra Nahdia (via operator) / En Adam Ashraf
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).*
Revised on 17th April 2024.
Only for internal circulation (HSgB). For further enquiries, kindly contact ext 4126/4123.

Disclaimer: *This guide provides general advice based on published evidence and expert opinion for hospital-wide standardization of practice. This guide may not cover all aspects of clinical practice, thus healthcare practitioners are encouraged to review patient details and professionally assess the relevance of the guide to each clinical situation. This guide is subject to periodic updates. We assume no responsibility for any party who referred to an outdated version of the guide.*

5. AMS ROUNDS

AMS Rounds are ideally conducted twice a week in Hospital Sungai Buloh, which are on Tuesdays and Thursdays. Wards that are involved in AMS rounds are Intensive Care Unit, Medical, Surgical, Orthopaedic and Neurosurgical Wards. The rounds are led by an Infectious Disease Consultant and/or Specialist, and also include Medical Officers of the related wards, Clinical Microbiologists, Ward Pharmacists, AMS Pharmacists and Infectious Control Nurses.

The Ward Pharmacists will alert the AMS team when a patient in their ward is prescribed a broad-spectrum antibiotic but has not been reviewed by Infectious Disease Team. Antibiotics which have been prescribed for longer than 2 weeks can also be subjected to AMS Rounds. Criteria of patients to be reviewed during AMS Rounds are:

1. Patients on one or more of the following antibiotics:
    i. Ceftriaxone more than 7 days (*newly added criteria)
    ii. Carbapenem
    iii. Polymyxins
    iv. Vancomycin
    v. Cefepime
    vi. Piperacillin & Tazobactam
    vii. Azole / Amphotericin B (*newly added criteria)

2. Patients on prolonged antibiotics (more than 7 days) except cases that require prolonged IV antimicrobial therapy such as infective endocarditis, meningitis and osteomyelitis.

3. Patients on ≥ 2 antibiotics with/without overlapping spectrum (excluding patients on HIV-opportunistic infections, anti-tuberculosis and H. pylori treatment).

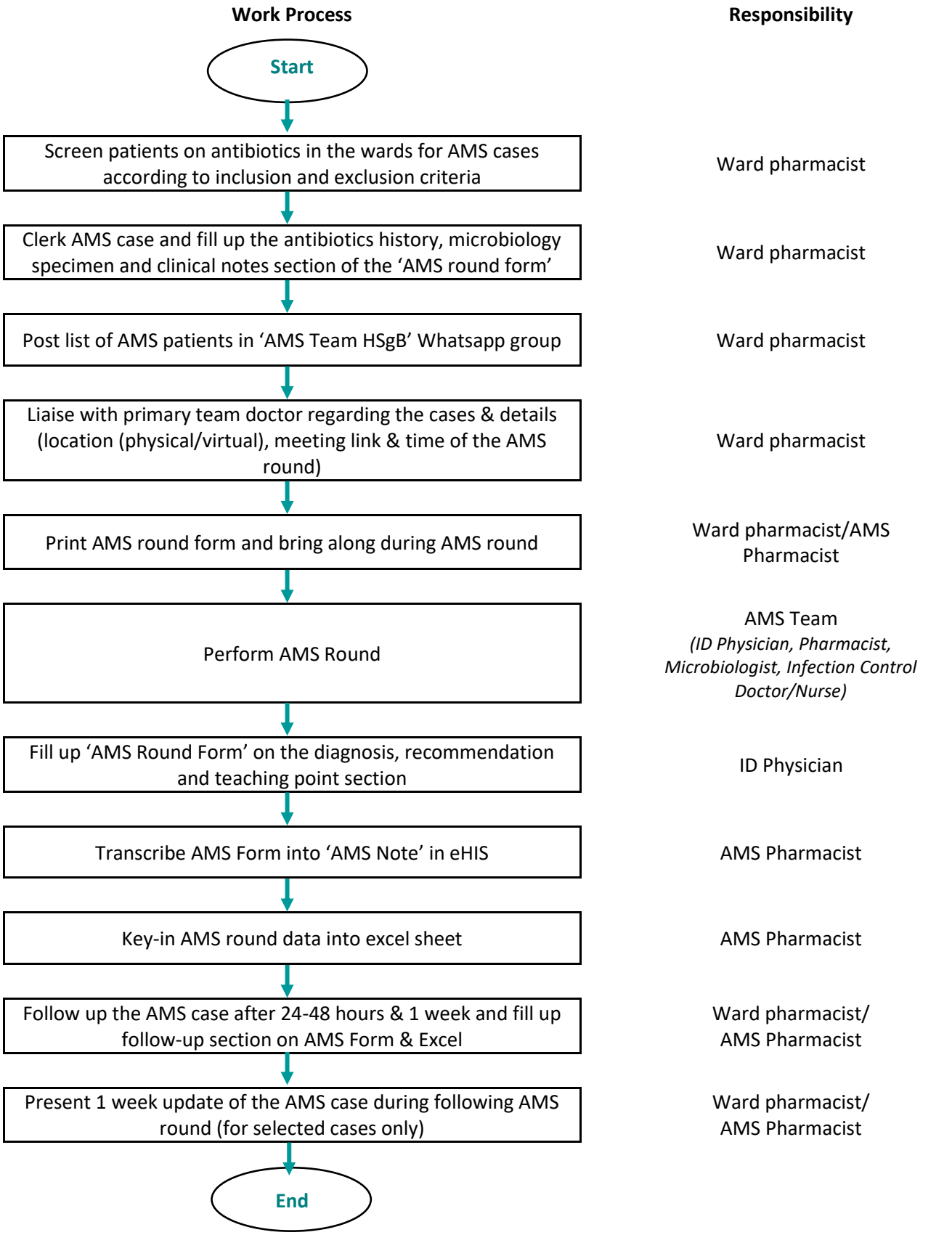
4. Other cases as deemed necessary by ward pharmacists. This include patients who are already under ID Referral or receiving Definitive Antibiotic Therapy. For example:

    i. No definitive or clearcut plan from ID.
    ii. Case has not been reviewed by ID for quite some time.
    iii. Patient is experiencing ADR from the antibiotic treatment, especially nephrotoxic drugs.
    iv. Unclear regimen or deviation from the normal recommended regimen, either dose, choice or combination of antibiotic therapy.

The AMS team will visit the patient in their respective ward and discuss the case with the managing team in charge of that patient to examine if the usage of broad-spectrum antibiotic is justified and appropriate and whether the prescribing comply with this Policy and Hospital Antibiotic Guideline. Direct feedback will be given to the primary team during the round.

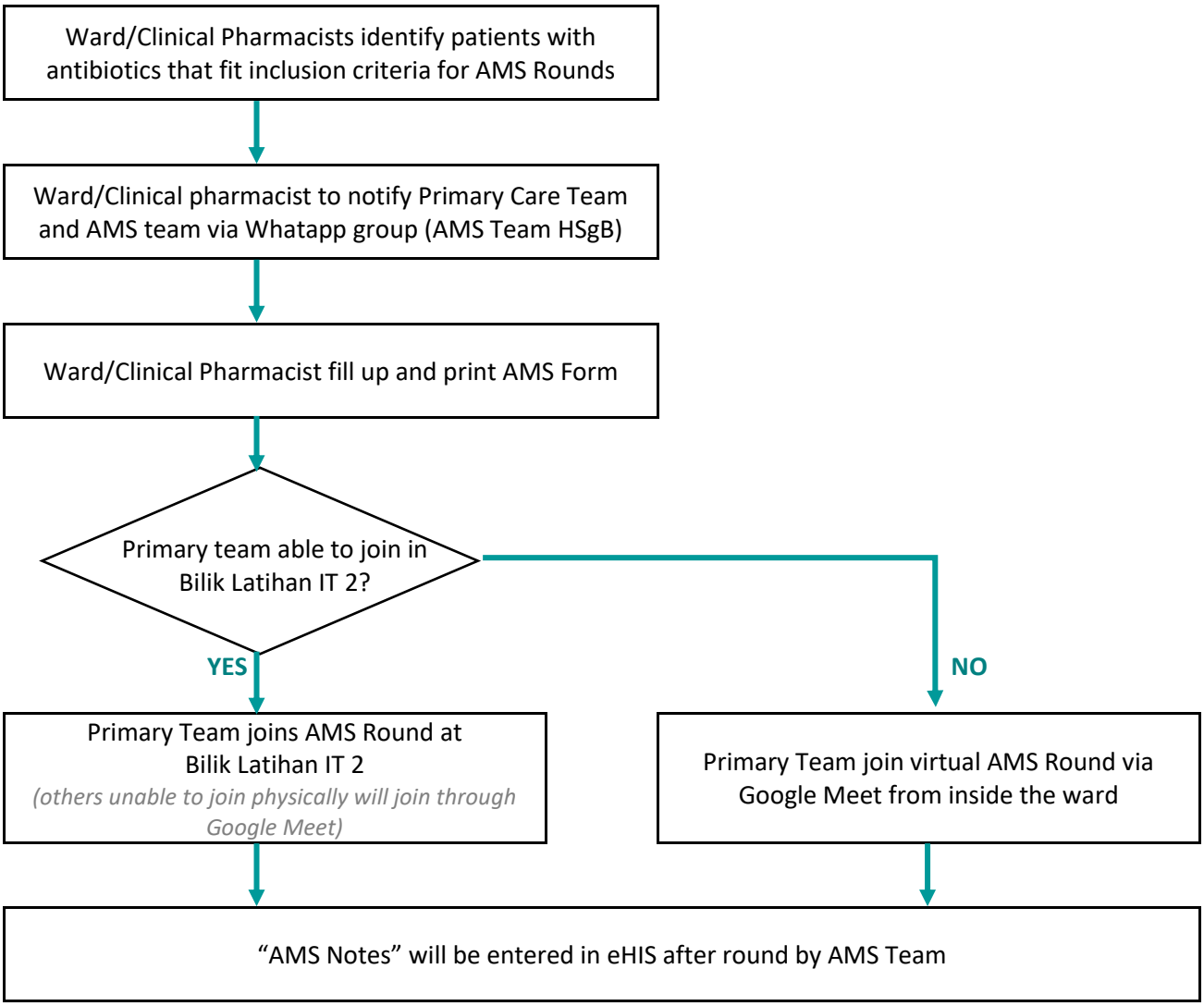
The AMS Round workflow is as follows:

A. AMS ROUND WORKFLOW (PHYSICAL ROUND)



Approved date: January 2019
Review date: April 2022

B. AMS ROUND WORKFLOW (VIRTUAL ROUND)



Approved date: January 2022
Review date: April 2022

6. REGIMEN FOR PROPHYLAXIS/TREATMENT OF INFECTIONS

6.1. All clinicians affiliated with Hospital Sungai Buloh are strongly encouraged to familiarize themselves with the available antimicrobial guidelines and the location to access these guidelines. These guidelines should serve as their primary point of reference when prescribing antimicrobials for prophylaxis and treatment of infections within the hospital premises.

- Hospital Sungai Buloh Antibiotic Guideline [for treatment in General Adult]
- National Antibiotic Guideline (latest edition) [for treatment in Paediatrics & Neonates]
- ICU Antibiotic Guideline (latest edition) [for treatment of critically-ill patients in Intensive Care Unit]

6.2. Antimicrobial prescribers are encouraged to familiarize themselves with the antimicrobial quick guides accessible through the HSgB Antibiotic SOS Linktree. Examples of the available guides on the Linktree include:

- IV to PO Switch & OPAT Quick Guide
- Antimicrobial Standard Dose & Renal Adjusted Dose Quick Guide
- Paediatric Antimicrobial Dose Guide
- Vancomycin Protocol
- HSgB Algorithm for Staphylococcus aureus Bacteremia
- HSgB Algorithm for Resistant Gram Negative (GNR) Infections

6.3. These guidelines is made available on the 'Antibiotic SOS' link on hospital desktop: HSgB ANTIBIOTIC SOS | Linktree

6.4. All new staff (house officer/medical officer/pharmacist) will receive antimicrobial prescribing guidance from the Antimicrobial Stewardship Team pharmacist as part of their orientation programme.

6.5. Education and training covering appropriate prescribing of antimicrobials and the management of the patients with infections will be part of the mandatory training for junior doctors. This training will be delivered by Antimicrobial Stewardship Team via platform such as Infection Control & Antimicrobial Stewardship (ICAMS) Workshop.

7. MONITORING OF COMPLIANCE AND EFFECTIVENESS

7.1. Audits or monitoring of antimicrobial prescribing and use will be done on a regular basis via the following methods:

- Defined Daily Dose (DDD)
- Retrospective Audits
- Prospective Audit & Feedback.
    - AMS Multidisciplinary Round
    - Point Prevalence Survey (PPS) of Antimicrobials

7.2. The usage of selected antimicrobials is monitored monthly using Defined Daily Dose (DDD). The monthly data will highlight the trend of usage of that agent. The yearly average can be extracted from this data, and the antimicrobial usage between years can be compared.

The 3 monthly DDD data is sent to Jabatan Kesihatan Negeri Selangor. Every 6 months, the DDD data is presented and discussed at Hospital Infection and Antibiotic Control Committee (HIACC) meeting.

7.3. Prospective audit via hospital-wide Point Prevalence Survey on Antibiotics are generally done once a year, in conjunction with the Hospital Acquired Infection PPS. This audit looks into the compliance with guideline (± appropriateness), reason for non-compliance & documentation of antibiotic indication.

7.4. Results and actions from the retrospective and prospective audit will be reported back to the respective disciplines/department, head of the AMS Team and chairman of the to the Hospital Infection & Antibiotic Control Committee (HIACC) via HIACC meeting.

Feedback for review of patients during AMS round, the appropriateness and the compliance with the Hospital Antibiotic Guideline will be given directly to the clinical teams during the AMS round.