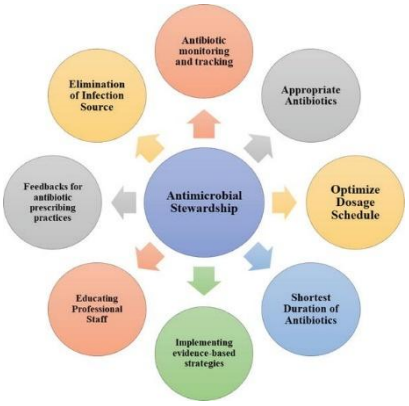
NATIONAL ANTIMICROBIAL USE AND ANTIMICROBIAL STEWARDSHIP MONITORING PLAN

Ministry of Health and Wellness



MAURITIUS

January 2026

Approval Form

Version: 1.0 **Effective date:** 31/01/26

NATIONAL ANTIMICROBIAL USE AND ANTIMICROBIAL STEWARDSHIP MONITORING PLAN			
	NAME	**SIGNATURE**	**DATE**
AUTHORIZED BY	Permanent Secretary *Mrs. M. Ramkhelawon*	✓	30/01/26
APPROVED BY	Ag. Director Health Services *Dr. F. Khodabocus*	✓	22/01/26
PREPARED BY	IPC Writing Committee *Dr. D. Nuckchady*	✓	07/01/26

AUTHOR

Dr. D. Nuckchady (Specialist in Internal Medicine and Infectious Diseases).

The work of Dr. A. Joorawon in developing an electronic questionnaire based on information found in this plan and in carrying out literature reviews is acknowledged.

PEER REVIEW

The support, comments and insight of our regional Antimicrobial Stewardship teams are appreciated.

Date of next review: 30/06/29

Identification number: MOHW_IPC_AMUAMSP_2026_v1

Contents

Introduction

Antimicrobial resistance (AMR) remains one of the most urgent public health threats of our time, with profound implications for patient safety, health-care delivery, and national development. In Mauritius, the rising burden of resistant infections—reflected in recent regional and global surveillance reports—underscores the need for a coordinated, evidence-driven approach to optimizing antimicrobial use across all levels of the health system. This National Antimicrobial Use and Antimicrobial Stewardship Monitoring Plan provides the framework to achieve this aim.

Data from the 2025 World Health Organization (WHO) report "Tracking the threat: antimicrobial resistance surveillance and priority pathogens in the WHO African Region"[1] which is based on the Global Antimicrobial Resistance and Use Surveillance System **(**GLASS) submissions of 2022, further reinforce the urgency of this initiative. The report notes that in bloodstream infections (BSI), *Acinetobacter baumannii* showed alarmingly high resistance to carbapenems, with imipenem resistance reaching 60% across reporting countries and 78% in Mauritius and South Africa.[1] Likewise, *Klebsiella pneumoniae* in BSI exhibited high resistance to cefotaxime (80% in Mauritius) and cefepime (69%) with carbapenem resistance reaching up to 35%. In urine cultures across Africa, *K. pneumoniae* showed a resistance rate of 78% to co-trimoxazole, 76% to cefotaxime, and 57% to ciprofloxacin, while meropenem resistance reached 17% regionally and up to 35% in Mauritius.[1] These alarming figures clearly demonstrate that resistant pathogens are already widespread in Mauritius and demand robust, sustained stewardship and surveillance responses.

This plan operationalizes the commitments of the Mauritius National Action Plan on AMR 2024 (NAP AMR), specifically:

- Activity 3.3.2: Design and implement a national antimicrobial use surveillance plan that defines activities and roles consistent with international surveillance standards (human sector), and
- Activity 3.3.3: Conduct antimicrobial consumption and use monitoring surveys and ensure their dissemination to decision-makers (human sector).[2]

By establishing a national system to routinely collect, analyse, and report antimicrobial consumption and use data, this plan will guide policy, strengthen antimicrobial governance, and inform targeted stewardship interventions.

Mauritius has already laid the foundation for responsible antimicrobial use through the establishment of Antimicrobial Stewardship (AMS) teams in healthcare institutions and the publication of National Antibiotic Guidelines (NAG). However, the functionality of these AMS teams, their level of implementation, and adherence to guidelines vary across facilities. This monitoring plan provides the mechanisms to systematically assess their

performance, identify gaps, and promote the consistent application of stewardship principles to ensure the right antibiotic is used for the right indication, at the right dose and duration.

This plan is fully aligned with objective 4 of the WHO Global Action Plan on AMR[3], which calls for the optimization of antimicrobial medicines in human and animal health through the establishment of stewardship programmes that monitor and promote the rational use of antimicrobials in accordance with international standards.

It is also consistent with the recommendations of the Africa Centers for Disease Control and Prevention's (ACDC's) "African Union AMR Landmark Report: Voicing African Priorities on the Active Pandemic", which emphasizes the need to integrate and strengthen AMR stewardship programmes in health-care settings in the African continent to guide and monitor appropriate antimicrobial use.[4]

Moreover, this monitoring plan is concordant with the African Union Framework for Antimicrobial Resistance Control 2020–2025, particularly Strategic Objective 6.1, which focuses on increasing the proportion of physicians and other human health providers adhering to antimicrobial use guidelines.[5]

Against this backdrop, this National Antimicrobial Use and AMS Monitoring Plan represents a critical step toward safeguarding the efficacy of lifesaving medicines, improving patient outcomes, and ensuring that Mauritius remains aligned with global and regional standards in the fight against AMR. Through systematic monitoring, transparent reporting, and continuous improvement, this plan aims to strengthen the national health system and support evidence-based decision-making at all levels.

Objectives

- Monitor antimicrobial use trends at healthcare facility level
- Assess compliance with the NAG
- Review the appropriateness of antimicrobials used
- Evaluate the effectiveness of AMS teams
- Track the consistency of AMS practices across facilities
- Strengthen stewardship actions at facility and national levels
- Align national stewardship and surveillance activities with global and regional standards
- Identify priority areas for AMS interventions based on current use patterns
- Support evidence-based decision-making and policy development

Roles, Responsibilities, Governance Structure and Coordination

Effective implementation of the National Antimicrobial Use and Antimicrobial Stewardship Monitoring Plan requires strong governance, coordinated action across sectors, and clear definition of roles and responsibilities. The following structures and actors will support the planning, execution, and continuous improvement of antimicrobial use monitoring activities in Mauritius.

1. Upper Management of the Ministry of Health and Wellness (MOHW)

MOHW will serve as the central authority responsible for the overall governance of the monitoring plan. Its key responsibilities include:

- Providing financial and logistical support required for the implementation of surveys and monitoring exercises, including budgetary allocation for transport, training, and supporting materials, if needed.
- Ensuring availability of adequate human resources, including surveillance officers, pharmacists, Information Technology (IT) specialists, data managers, and administrative support.
- Providing the necessary IT infrastructure, including laptops, tablets, data collection tools, secure servers, and digital platforms to support real-time data management and reporting.
- Facilitating collaboration and coordination between relevant units and divisions within the Ministry, including the Pharmacy Unit, IT Bureau, Infection Prevention and Control Committees, Curative Services, and Public Health Services.
- Promoting multi-sectoral cooperation with external partners, including academia, laboratories, professional councils, WHO, Indian Ocean Commission, ACDC and the veterinary and environmental health sectors under the One Health framework.

2. One Health Steering Committee on AMR and Zoonosis

This Committee will play a strategic oversight role by:

- Ensuring it is fully functional as the multisectoral coordinating body overseeing AMR activities across human, animal, and environmental sectors.
- Reviewing findings from antimicrobial use surveys and point prevalence surveys (PPS) and using them to guide decision-making, resource allocation, and policy adjustments.

- Ensuring integrated responses to AMR challenges, including addressing inappropriate antimicrobial use in both human health and veterinary/public health contexts.

3. National Antimicrobial Stewardship Technical Working Group (National AMS TWG)

The National AMS TWG will serve as the operational and technical coordination mechanism by:

- Ensuring the smooth planning, implementation, and supervision of antimicrobial use monitoring exercises, including PPS, audits, and consumption assessments.
- Developing and updating standardized tools, protocols, and reporting templates.
- Providing technical guidance to healthcare facilities and AMS teams throughout data collection and analysis phases.
- Overseeing training and capacity-building initiatives for all personnel involved in stewardship and surveillance activities.

4. Pharmacy Unit (at Central and Institutional Levels)

The Pharmacy Unit plays a critical role in ensuring access to reliable antimicrobial use data. Its responsibilities include:

- Facilitating access to dispensing data, stock records, procurement logs, and antimicrobial consumption data from health-care facilities.
- Supporting the validation of antimicrobial utilization metrics, including DDD (Defined Daily Dose) calculations and antibiotic category analyses.
- Providing pharmacists to assist with data interpretation, stewardship interventions, and follow-up actions.

5. Hospital Management

Hospital management teams will ensure that monitoring exercises are conducted smoothly by:

- Providing full access to relevant patient data, medical records, electronic systems, and local prescribing information as required for audit and surveillance activities.
- Facilitating institutional support and cooperation among departments, ensuring staff availability for data collection and review.
- Guaranteeing that no administrative or operational barriers impede clinical audits, PPS activities, or stewardship assessments.

6. AMR Focal Point for Human Health

The AMR Focal Point will play a coordinating and supervisory role by:

- Providing technical guidance, troubleshooting challenges, and ensuring alignment with national and international AMR surveillance standards.
- Acting as the link between MOHW leadership, the AMS TWG, and healthcare institutions, ensuring timely communication and reporting.

7. Antimicrobial Stewardship Teams

AMS teams within hospitals and health centres are critical to local implementation. Their responsibilities include:

- Assisting with data collection for PPS, audit exercises, and antimicrobial use surveys.
- Providing clinical insights and contextual information to help interpret prescribing patterns and identify areas requiring corrective action.
- Supporting the implementation of stewardship interventions, including feedback to prescribers, guideline adherence initiatives, and training.

8. Medical Records Department, Ward Managers, Charge Nurses and Consultants-in-Charge (CIC)

These key facility stakeholders ensure access to clinical information and facilitate execution of monitoring activities. Their responsibilities include:

- Granting timely access to patient folders and medical records required for surveys.
- Facilitating coordination at ward level, including identifying eligible patients and maintaining efficient record retrieval systems.
- Ensuring that audit teams and surveyors are not obstructed in their work and that all necessary documentation is made readily available.
- Supporting compliance with data quality standards, including completeness and accuracy of records.

Monitoring Methodology

The monitoring plan uses a cross-sectional PPS design in line with the WHO Methodology for Point Prevalence Surveys on Antibiotic Use in Hospitals as well as the Global Point Prevalence Survey of Antimicrobial Consumption and Resistance's standardized approach – notwithstanding, adaptation to local needs has been carried out.[6, 32] Estimates will be derived from patient-level data sources (paper patient records, drug charts, electronic health records, nursing notes and / or interviews with treating doctors or nurses). Basic disaggregation will be available i.e., by hospital, ward type, age group, gender, and diagnosis.

This exercise will be a form of active surveillance i.e., data collectors will physically visit wards and extract information directly from patient records and relevant sources for electronic input at the point of collection or shortly after collection.

The PPS will be a multi-centre, national survey across several hospitals. Initially, only healthcare facilities in the public sector will be covered. The survey will cover solely acute care inpatient wards.

The initial phase will include exclusively antibiotics administered through the following routes: oral, parenteral, intramuscular, rectal, and inhalation, i.e., topical, ocular and otic antibiotics are not included. Antivirals, antifungals and anti-helminths are being excluded initially due to their lower utilization rate and presumptive lower resistance rate to these antimicrobials.

The inclusion criterion is as follows: all patients who are hospital inpatients at or before 09:00 (in the morning) on the day of the survey, irrespective of whether they are receiving an antibiotic. Each patient is assigned to the ward where they are physically located at 09:00. Surveys will be typically conducted in the afternoon to minimise disruption during physician ward rounds since data collectors should avoid interfering with clinical care.

During the period of data collection, data collectors will cover all patients in a single ward in a day. Data collection will not continue beyond two weeks for each hospital. The time needed to fill each form was found to be less than that for the PPS for HAI[10] – 10 minutes per patient in a normal ward and 15 minutes per patient in the ICU.

Google Forms which were used successfully in the PPS on hospital-acquired infections (HAI) will be used to host the modified WHO PPS electronic toolkit. Of note, sections were removed if they duplicated with the HAI PPS. Furthermore, after a literature review of established forms utilized in developed countries,[11, 12] additional questions were added to cover stewardship aspects.

Compliance with switching from an intravenous to an oral antimicrobial is not being assessed in the first instance due to potential difficulties for our data collectors to assess

this. In addition, allergy mismatch is not being taken into account for now due to the rarity of this issue in the country.

Facility-based AMS teams, primarily AMS Registered Medical Officers (AMS RMOs), supported by Infection Prevention & Control teams if necessary, will undertake data collection under the guidance of their AMS Team Leaders.

To preserve patient confidentiality, sensitive information like patient names will not be collected. However, MOHW's clearance will be obtained prior to each survey round – approval from the National Ethics Committee will be sought if MOHW requires it. Since direct contact with patients is not involved, informed consent of patients specific to this survey is not required.

Data collectors are entitled to be protected by ensuring that a "no-blame approach" is implemented at the facilities where the survey will be conducted, especially when 'prescription errors' are identified. Of note, if serious errors capable of affecting the life of the patient/s are noted (e.g., a patient being placed on penicillin despite a documented severe allergy to this class of medication), the data collectors will be ethically mandated to inform the treating team.

It is highlighted that a national training on the above methodology as well as the use of epidemiological case definitions was completed in 2025 for all participating AMS teams. Subsequently, no pilot project was performed after consultation with AMS team members since the form was deemed to be quite simple to fill.

Of note, before each survey, refresher training will be conducted to ensure uniformity of data collection.

Sampling Strategy

Using an online statistical tool available at https://www.openepi.com/Menu/, assuming 4,622 inpatient beds (in both public and private sectors) are available in the country[7], an expected prevalence of 62% ± 5% of antibiotic use[8], a design effect of 1 (i.e., a simple random selection, which is not reflective of reality given clustering within hospitals) and a 95% confidence interval, the sample size should be 336 i.e., inclusion of 70 patients per regional hospital would have been sufficient.

However, using WHO's more accurate methodology[6], given that Mauritius has 11 public healthcare facilities with in-patient services, one parastatal body (Cardiac Trust Fund) and 20 private ones (excluding the psychiatric hospital and non-admitting community hospitals)[7], the design effect for an average of 144 beds/hospital would be 11.7, which would correspond to the inclusion of 26 hospitals in the survey and collecting data from all patients if the hospital has less than 500 beds and 50% of patients if the hospital has 500 to 800 beds.

Moreover, the European CDC's methodology considers it optimal to include ≥ 75% of hospitals in the country (= 24 hospitals) and ≥ 75% of patients.[9]

However, due to a lack of staff to carry out data collection, a poor sampling strategy will be utilized i.e., including < 50% of acute care hospitals and < 50% of all occupied acute care hospital beds – a minimum of 100 patients per hospital will be included. Of note, including patients not on antibiotics is mandatory to provide the correct denominator for prevalence estimates.

To ensure adequate coverage and inclusion of vulnerable patients, each hospital's sample must as a bare minimum have patients from all their Intensive Care Units (ICU) (including the Neonatal ICU), at least one surgical ward, at least one orthopaedic ward and at least one medical ward. The definition of ICU is any unit capable of caring for intubated patients and that has admitted at least one ventilated patient over the prior month.

The following are excluded currently: outpatient departments, long-term care wards, psychiatric wards unless classified as acute inpatient, and non-acute units.

If the mandatory wards together do not yield 100 patients, data collectors will include additional wards (e.g., paediatrics or obstetrics & gynaecology) until the hospital reaches the 100-patient target.

A comprehensive sampling technique will be used i.e., the data collector will input entries for all inpatients in a specific ward on the same day, even if this means the sample size of 100 will be exceeded. If there are less than 100 patients in the hospital, all patients will be included.

Each patient may be included only once during the entire national round. To prevent duplication:

- Assign the patient to the ward where they are physically located at 09:00 on the survey day.
- If a patient is transferred between wards after 09:00, they remain assigned to the original ward for the purposes of the survey and must not be re-counted in the receiving ward.
- If the hospital conducts ward-by-ward collection on different days (within the hospital's two-week window), data collectors must check the hospital patient list or ID to ensure a patient who was already surveyed in a prior ward is not re-surveyed after transfer.
- Readmissions: If a patient was discharged and later re-admitted within the same national PPS round, treat as a new admission only if the patient was not already included in that hospital's PPS dataset.
- Short-stay or same-day in-patients: Include if they meet the 09:00 inpatient criterion and are assigned to an inpatient ward at 09:00.
- Patients temporarily off ward (e.g., in operation theatre): If not physically present on the ward at 09:00 but still admitted and assigned to that ward, they are included.

The data collection will be completed within two weeks across the country for the national survey for all eligible hospitals so that data can be compared across healthcare facility.

However, hospitals willing to carry out the survey on their own (at their local level) may do so using the same methodology in their own time.

Should classification of hospitals be required, the definitions present in the HAI plan will be utilized.[10]

Variable Definitions

The variables used in the questionnaire are described in the following table.

Variable Name	Definition
Hospital	Name of the hospital where the patient is admitted.
Ward	Ward where patient is physically located on the survey day.
Patient Initials	Non-identifiable initials to avoid duplication while preserving anonymity.
Folder Number	Unique hospital identifier for the patient (medical record number). Used to ensure one entry per patient.
Gender	Recorded biological sex of the patient (Male/Female).
Age	Age in years of the patient on the date of the survey. For patients below 1y of age, three decimal points should be used e.g., 15 days of age = 0.041y and 2 months of age = 0.167y. This variable is numerical only i.e., do not enter 'days' or 'months'.
Date of Admission	Date on which the patient was admitted for the current hospital stay.
On Antibiotics	Whether the patient is on antibiotics on the day of the survey at 9am (Y/N). If not, the survey ends for this patient, and the data collector should move to the next patient.
Creatinine	The last creatinine level in µmol/l – used to check whether the antibiotic dose has been adjusted per renal function.
Transfer	Whether the patient was transferred from another hospital. The question asks whether the transfer is from a private or public hospital. Patients who were discharged and then gets admitted to the current hospital (even within 24 hours) is not considered to be a transfer.
Age < 12 years	Indicates if the patient is <12 years old (Yes/No). Triggers requirement to document weight.
Weight	Body weight in kg for paediatric patients; required for dose accuracy assessment.
Surgery	Indicates whether the patient underwent any surgical procedure during the current hospital stay (Yes/No).
Type of Surgery	Category describing the type of surgery – coded according to WHO's PPS methodology. Minimally invasive surgeries include biopsies, incisions & drainage, insertion of drains and insertion of tracheostomies. Arthroscopies are not considered minimally invasive. Manipulation under anaesthesia is not considered a surgical procedure since intact skin is not broken.
Number of Antibiotics	Number of systemic antibiotics taken by the patient on the survey day.

Indication for Antibiotics	The main reason the antibiotic is being used: Treatment, Surgical Prophylaxis, Medical Prophylaxis, or Unknown. For uniformity, use the following algorithm:
	• Use 'Treatment' if a diagnosis can be obtained as defined for the variable 'Diagnosis' below.
	• OTHERWISE, consider the indication to be surgical prophylaxis:
	  ○ If it is written as such in the patient chart (the words 'surgical prophylaxis' do not have to be mandatorily present; words like 'before surgery' or 'for surgery' are sufficient) OR
	  ○ If nothing specific is written in the chart AND the antibiotic is initiated 24h before or after surgery.

	• OTHERWISE, use the term medical prophylaxis in the following instances:
	  ○ Prevention of opportunistic infections in AIDS patients, transplant patients or neutropenic patients,
	  ○ Prevention of spontaneous bacterial peritonitis in late-stage cirrhosis, in particular during a variceal bleed,
	  ○ Prior to dental procedures,
	  ○ Prior to endoscopy,
	  ○ Intra-partum group B Streptococcus prophylaxis,
	  ○ Preterm Premature Rupture of Membranes prophylaxis,
	  ○ Post-splenectomy,
	  ○ Rheumatic heart disease,
	  ○ Post-exposure prophylaxis after exposure to anthrax, meningococcus, pertussis, diphtheria, invasive Group A Streptococcus, *Haemophilus influenzae* type b, or leptospirosis,
	  ○ Recurrent urinary tract infections,
	  ○ Recurrent chronic obstructive pulmonary disease exacerbations,
	  ○ Animal or human bites, or
	  ○ Cystic fibrosis.
	• OTHERWISE, enter 'Unknown.
	For prophylaxis for cervical cerclage and perineal tear, use surgical prophylaxis.

Surgical Prophylaxis Duration	Single dose, ≤24 hours, or >24 hours.
Diagnosis	Coded classification of diagnosis according to the WHO's PPS form. The diagnosis is entered as per the patient record. If this is unclear, the data collector should use the annexed case definitions to infer the diagnosis. If no indication can be deduced, then use 'UND' for undefined. To avoid conflicts, when a diagnosis is written in a patient chart, data collectors should not override such diagnoses, even when case definitions are not met. Do not enter more than two infectious diagnoses per patient. Select the preferred diagnosis as per annex A; if more than two diagnoses are still present, choose the most serious ones. For surgical site infections (SSI), record the diagnosis as SSI, not the reason for the surgery (e.g., appendicitis). Enter the current diagnosis, not a previously treated one.
Reason Recorded	State whether an indication for the antimicrobial is documented in the clinical notes (Yes/No). Answer 'Yes' even if the reason is present after the antibiotic/s was started. Regarding surgical prophylaxis, assume a reason has been recorded if the team mentions that the antibiotic is to be given pre-op, a certain duration of time before incision or because of a surgery.
Culture Sample Taken Before Antibiotics	Whether any cultures were collected before starting antibiotics. The following algorithm should be used to compare dates given expected difficulties to answer this question: • If the dates of culture ordered and antibiotics started are different in the patient folder, compare these.

	• If the dates are the same in the folder, check the date the antibiotic was administered according to the 'Fluid Chart' or 'Drug Kardex' comparing it with the date the culture was taken according to the 'Lab Request Form' or the 'Nurse Lab Book'. • If the dates are still the same, assume the cultures were taken before the antibiotics if this was explicitly recorded in the doctor's notes; otherwise, state that it is unknown. Since the patient may have had multiple cultures taken and may be on several antibiotics, it is not easy for the data collector to know which dates to compare. Thus, the following steps should be followed: • A course of antibiotic therapy starts when the first antibiotic for this patient stay is initiated; the course ends when he / she is on no antibiotic (*any* antibiotic) for > 24 hours. • Answer 'Yes' to the question if any culture was taken within 7 days before the course started. Of note, nucleic acid tests and other molecular tests are currently ignored since we do not perform these to detect bacteria on a regular basis. Serological tests e.g., for syphilis, are also being ignored for now.
Antibiotic Name	Generic name (International Non-proprietary Name[17]) of each prescribed systemic antibiotic that the patient is currently on – to avoid confusion, consider the antibiotics prescribed at 9am on the survey day. A maximum of four antibiotics can be entered. Do not enter antibiotics that the patient received previously but is no longer on. If the patient is on more than four antibiotics, record the ones which were started the earliest. If some of them were started on the same day, enter the names of those with the highest ASI.
Adapted to culture and sensitivity	Whether the regimen was adjusted in response to culture and sensitivity (C&S) results (Yes/No/C&S not available/C&S not ordered). See the chapter on indicators for a definition for targeted therapy.
Start Date of Antibiotic	The date the antibiotic course was initiated.
Stop Date or Documented Duration	Indicates whether stop/review date or planned duration is recorded (Yes/No). Answer 'Yes' even if the date / duration is mentioned days after the antibiotic was started. Just writing 'D1, D2, D3, etc.' is not sufficient to answer 'Yes'.
Unit Dose	Numerical dose prescribed. For antibiotic combinations like amoxicillin-clavulanic acid, enter the combined dose e.g., 1g amoxicillin with 200mg clavulanic acid = 1.2g (or 1,200mg).
Unit Dose Measure Unit	Unit of measurement (mg, g, IU, MU).
Frequency	Number of administrations per day (e.g., once daily or twice daily).
Route of Administration	Route used: Oral (O), Parenteral (P), Inhalation (INH), or Rectal (R).
Length of Therapy	Number of days the patient has been on any antibiotic during the current hospitalization (inclusive of the survey day). Ignore days when the patient is not receiving any antibiotic.
Meropenem Use	Indicates whether the patient is receiving meropenem currently (Yes/No). A special emphasis is laid on carbapenem use in this survey due to the elevated rate of resistance to carbapenems in the country.
Reason for Meropenem Use	Clinical justification for meropenem use as per the NAG[15] (i.e., septic shock, ventilator-associated pneumonia, pancreatic abscess or a culture positive for a gram-negative organism that is resistant to cephalosporins, piperacillin-tazobactam and amoxicillin-clavulanic acid AND susceptible to

	meropenem). Whenever last line antibiotics like ceftazidime-avibactam are unavailable, the user can check the 'Culture Positive' box if the gram-negative organism is also resistant to meropenem since the combination of meropenem with colistin is allowed as per the National Antibiotic Guidelines.[15]
Vancomycin or Gentamicin Use	Indicates use of vancomycin or gentamicin (Yes/No).
Therapeutic Drug Monitoring Done	Indicates whether trough levels were measured for either vancomycin or gentamicin (Yes/No).
Trough Level Within Expected Range	Whether the latest trough level was within therapeutic range.
Restricted Antibiotic Use	Indicates use of linezolid, tigecycline, ceftazidime-avibactam, or aztreonam (Yes/No).
Infectious Disease / Microbiology Consultation	Indicates whether an Infectious Disease specialist or Microbiologist was consulted as recorded in the chart before starting restricted antibiotics (Yes/No).
Consultant-in-Charge Authorisation	Indicates whether the CIC authorised the restricted antibiotic (Yes/No).
HPMDRO Culture	Whether a high-priority multidrug-resistant (HPMDRO) gram-negative organism was identified in any of the cultures taken during the patient stay (Yes/No).
Therapy for Gram-Negative HPMDRO	Whether at least one recommended agent for gram-negative HPMDRO therapy according to the National Antibiotic Guidelines[15] (tigecycline, ceftazidime-avibactam, aztreonam or ampicillin-sulbactam) is being used.
Name of Treating Specialist	Name(s) of specialist(s) responsible for the patient's care.

Table 1: ASI – Antibiotic Spectrum Index.

Parameters that can be added in the future if time permits include:

- Assessing for allergy mismatch, and
- Checking for IV-to-oral switch by asking whether the patient can tolerate oral food e.g., is the patient confused, is he / she intubated or what is his / her Glasgow Coma Scale.

As per a previous PPS plan on HAI[10], a ward type is considered to be 'mixed' if (a) > 50% of its patients do not fall neatly into a single category or (b) the ward type does not remain stable for a period of at least 30 days e.g., it changes from being 'medical' to 'surgical' on a weekly basis.

- If > 50% of patients are of one type e.g., surgical, then the ward is assigned that particular type.

The questionnaire will be adapted and updated prior to each survey round if needed.

Quality Assurance

The data validity score (DVS) will be used to assess data quality as in the HAI plan (see the table below for details) – calculation of sensitivity and specificity will be based on compliance rates.[10]

Data Validity Score	Quality level
> 95%	Good
85-95%	Acceptable
75-84%	Borderline
< 75%	Poor

Table 2: Interpretation of the data validity score

Data validity will be assessed by a team composed of the AMR Focal Point for Human Health and two trained staff from the hospital being evaluated. Given existing human resource constraints, data validation will be allowed for up to six weeks after data collection.

Data quality assurance will be assured through the following methods:

- Standardised tools: Use of the same form and case-based definitions whenever necessary implies consistency.
- Supervision: Trained AMS Team Leaders are expected to ensure compliance with this document.
- Double-checking: A proportion of records will be reassessed by a different person.
    - 10% of medical records will be randomly selected for review.
    - Selected folders should be evenly distributed throughout the wards and ICUs.
    - Medical Records Officers are expected to fully support the retrieval of patient folders as needed.
- Real-time validation: Google Forms includes required fields and basic logic checks. Post-collection, data will be exported to an MOHW secure environment for cleaning and further validation (range checks, missingness and checks on the inclusion criteria).
    - The validation will assess four key dimensions: timeliness, completeness, accuracy, and consistency.

Due to the extensive interconnection between indicators, adjustments will not be made to numerical rates based on the DVS.

Data Analysis and Reporting

AMS teams will submit their data to the AMR Focal Point for Human Health within 24 hours after the completion of data collection.

All data collected through Google Forms will be compiled into a centralized dataset maintained by the AMR Focal Point for Human Health. Data cleaning will be carried out on de-identified information – each patient will be assigned a unique identifier which is his / her Medical Record Number.

MOHW-authorised members of the National AMS TWG will have access to raw datasets. Any external sharing of facility-level identifiable data will require MOHW approval. Data retention and archiving will follow MOHW data governance policies.

Once cleaned, the final dataset will be prepared for analysis using statistical software (e.g., Excel, R or SPSS). The analysis will involve looking at the following characteristics:

- Age distribution,
- Gender distribution,
- Proportion of patients on antimicrobial therapy,
- Ward type,
- Antimicrobial prescription profile including dosage regimens,
- Categories of antimicrobial prescribed,
- Indication for use of antimicrobials,
- AWaRe classification,
- Compliance rate, and
- Appropriateness of therapy,

A standard submission template will be used to ensure uniformity. The AMR Focal Point will acknowledge receipt and integrate each hospital dataset into the national database.

A report will be compiled within six weeks after data validation is complete in which key findings will be elaborated, trends will be interpreted, and recommendations will be made. The national report will be shared with:

- The One Health AMR and Zoonosis Steering Committee,
- The MOHW senior management,
- Hospital management teams,

- National AMS Technical Working Group,
- IPC units,
- Pharmacy Department, and
- Other relevant stakeholders.

The findings will:

- Support national decision-making and resource allocation,
- Identify areas requiring targeted AMS interventions,
- Inform training, capacity building, and guideline revisions,
- Strengthen compliance and prescriber accountability, and
- Track progress over time in tackling antimicrobial resistance.

Antimicrobial Use and Antimicrobial Stewardship Indicators

General indicators

In 2025, members of the National AMS TWG met to develop AMS indicators. Thereafter, the indicators hereunder were compiled. Of note, the indicators were chosen so as not to overlap with already established AMR indicators.

- Prevalence of antibiotic use (i.e., % of inpatients on ≥ 1 systemic antimicrobial)
- Indication distribution
- % antimicrobial prescriptions with indication documented in chart: best practice is > 95%[12]
- % of surgical prophylaxis lasting >24 hours: best practice is < 5%[12]
- % of time cultures are taken before antibiotics are started
- % of time vancomycin & gentamicin blood levels are measured after these medications are started
- % of time stop / review date of antimicrobial is documented
- % of patients receiving double anaerobic coverage
- % of patients who received a duration of antibiotics longer than required according to guidelines
    - For combinations of antibiotics, the maximum duration of use will be considered.
    - If multiple diagnoses are present, the maximum expected duration will be utilized for analysis.
    - Non-compliance to duration of therapy may be misleading in rare instances where patients get recurrent infections of different types, thus requiring prolonged therapy.
- % of patients who received antibiotics when these are not indicated
- % of antibiotics that are incorrectly dosed
- % of antibiotics that are corrected targeted to the culture results
- % of time meropenem is used for an indication listed in the national guidelines
- Mean ASI – this can be disaggregated by hospital

- % of patients with an excessive overlap in spectral coverage when combinations are used (as indicated by a concurrent ASI ≥ 3)
- Mean Rational Use of Antibiotic (RATA) score.

The above indicators can be disaggregated by hospital, category, AWaRe classification, ward type and specialist category, where necessary.

Guideline compliance rate[12]

Figure 1 shows a conceptual framework to assess adherence.

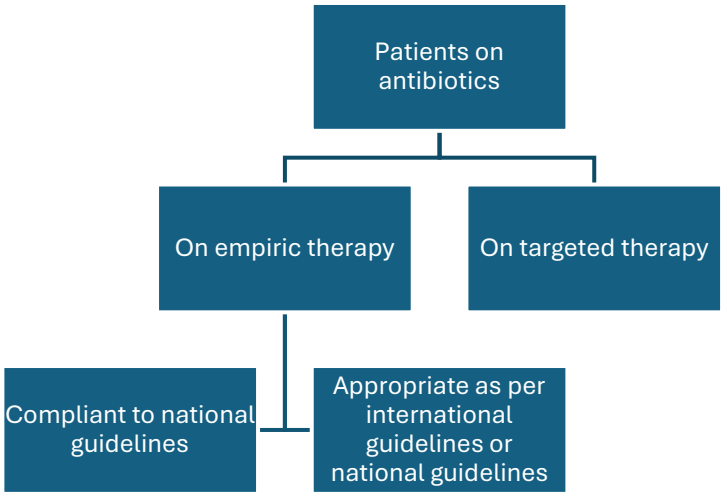


Figure 1

- The definition of compliance will be: compliant with the NAG[15] (with the right choice, dosage, route, duration, frequency and combination if multiple antibiotics are to be used)
    - The prescription complies with the national guidelines and takes into account acceptable alterations due to the patient's age, weight, renal function (eGFR/CrCl), etc., or other prescribed medications (e.g., due to possible interactions).
    - If one medication in a combination is, for instance, of the wrong dose, the entire prescription is considered non-compliant for that particular patient – hence, compliance rate is calculated by patient, instead of by antibiotic. This is similar to what was done in a Belgian study.[33]
    - Dose and frequency cannot be assessed for vancomycin, gentamicin and amikacin given issues getting trough levels in the hospitals.
    - If multiple diagnoses are present, any combination of antibiotics for any of the diagnoses will be accepted provided that not more than three antibiotics are used at the same time.

- If the NAG does not have the necessary information for that particular diagnosis, refer to the latest guideline from the following organizations (guidelines from referral centers – GRC) in the given order to assess compliance:
    - World Health Organization,[34]
    - National Health Services of the United Kingdom,[35, 36]
    - Infectious Disease Society of America,[37]
    - American Society of Health-System Pharmacists,[38]
    - Haute Autorité de Santé of France,[39]
    - Centre Hospitalier Universitaire de France,[40]
    - UpToDate, or
    - Indian Council of Medical Research[16].
  - If the antibiotic regimen recommended by a GRC is not available in a particular hospital, then the regimen from the next organization in the above list can be considered.
  - If the regimen in use does not exist in any of the guidelines from the above organizations, then the prescription is considered non-compliant.
- Noncompliant
  - This includes using antibiotics when there is no proper indication.
- Not assessable e.g., due to lack of data

Directed or targeted therapy

The 'directed therapy' category encompasses scenarios in which a microbiology test has identified a likely bacterial pathogen, and laboratory susceptibility information is available to guide antimicrobial use.[12]

For combination therapies, for proper directed therapy, all antibiotics need to be targeted to the culture results. The dose, route, duration and frequency should continue to be the same as listed in the NAG.

A treatment is considered targeted if there exists an infective diagnosis AND:

- All the cultures done within 14* days of the survey date are either negative OR grew a commensal (see the HAI Surveillance Plan for a definition of commensal[10]) AND

- All antibiotics were stopped OR the patient is on antibiotics which have a combined ASI of ≤ 6 (see annex B; i.e., equivalent to using a 3rd generation cephalosporin or amoxicillin-clavulanate) for most diagnoses¶.[14]

OR

- At least one culture within 14* days of the survey date grew one or more non-commensals AND the antibiotic/s the patient is on cover these organism/s (see annexes B and C) AND the combined ASI as calculated in reference 14 is the least possible ± 1 (using the currently available antibiotics in that hospital)¶.

* The duration of 14 days is extended to six weeks (= 42 days) for sub-acute infections as per the NAG[15] as follows: prostatitis, brain abscess, spinal epidural abscess, lung abscess, empyema, infective endocarditis, osteomyelitis and septic arthritis. The duration is extended to six months for active tuberculosis.

¶ If the antibiotic is recommended by an Infectious Disease Specialist or a Microbiologist, it will be considered adapted to the culture. An ASI not exceeding the one recommended in the NAG can be accepted for diagnoses that usually have negative cultures from common sites (blood, urine or respiratory tract) or high lethality: community-acquired pneumonia, osteomyelitis, brain abscess, septic shock or neutropenic sepsis / febrile neutropenia.

Appropriateness rate[12]

- Appropriate (optimal and adequate)
    - To be appropriate, either the prescription is compliant as described above OR all the following should apply:
        1. An indication exists for an antimicrobial AND
        2. An antimicrobial is given to the patient with the right dosage, route and duration (adjusted for the patient's age, weight, renal function, etc., or other prescribed medications when needed) AND
        3. Either:
            - Culture result/s is/are available, and therapy is directed as defined above OR
            - Culture/s is/are not carried out or results are not available AND any of the antibiotic combinations in the GRC listed above are in use

        AND

4. IV to oral switch is carried out when adequate *(not assessable in this survey)* AND
5. The patient does not have an allergy to that medication *(not assessable in this survey)* AND
6. If the antibiotic is used on a pregnant woman, it is not considered teratogenic *(not assessable in this survey)* AND
7. If the antibiotic is used on a child < 12 years old, it is known to be suitable for the paediatric population AND
8. If the antimicrobial is used for surgical prophylaxis, the duration is < 24 hours.

- Inappropriate (suboptimal and inadequate)
- Not assessable

It is highlighted that using the WHO PPS methodology by itself generally does not support reliable calculation of consumption metrics such as Defined Daily Dose (DDD), Days of Therapy (DOT) or Length of Therapy (LOT) because the PPS is designed as a cross-sectional assessment of antibiotic use on a given day, not as a longitudinal record of all antibiotics used over time. Therefore, to facilitate such calculations, users are expected to input some prior data like dates of start of antibiotics, etc.

Monitoring and Evaluation

Doing more frequent PPS has the following advantages:

- It supports advocacy for AMS,
- It improves accuracy through repeated implementation given the learning curve,
- It helps build and retain local expertise, and
- It expands the pool of trained personnel and preserves institutional memory.

However, frequent PPS is resource-intensive and time-consuming. Taking this into consideration, the indicators relevant to this document are as follows:

- From 2025 onwards, 100% of regional hospitals will conduct an AMU and AMS PPS each year.
- From 2027 onwards, ≥ 50% of specialized, district and community hospitals in the public sector will conduct an AMU and AMS PPS each year.
- 100% of facilities taking part in the survey will have a DVS > 85% as from 2027.

Limitations and Roadmap

Inherent limitations of the PPS methodology

The PPS provides a rapid, simple and standardized snapshot of antimicrobial use across participating healthcare facilities. However, like all cross-sectional survey designs, it has inherent methodological limitations that must be acknowledged.

1. Inability to monitor treatment duration metrics

- A PPS captures antimicrobial use at a single point in time. As a result, it cannot reliably track duration-based indicators, such as DOT.

2. One antimicrobial may be prescribed for multiple conditions

3. Misclassification bias

- Several variables in a PPS involve clinical judgement and therefore are susceptible to inter-observer variability, including diagnosis classification, presence of HAI, assessment of guideline compliance and appropriateness of therapy.

4. Sampling and selection bias

- Participation of healthcare facilities is unlikely to be universal since PPS often depends on voluntary participation. This limits the statistical power and generalizability of the results

Expected internal problems during implementation

The following operational challenges are anticipated:

1. Deficient or fragmented clinical documentation

2. Limited number of trained data collectors

- Competing clinical responsibilities reduce available time

3. Discordant data between sources[13]

- Differences between physician notes, drug charts and nursing dispensing logs are expected.

Roadmap to upscale the PPS

To improve coverage, robustness, and national representativeness of antimicrobial use data, the following steps are proposed:

1. Expand facility participation for improved sampling & power

- Gradually include all regional and district public hospitals

- Inclusion of the private healthcare sector

3. Broaden scope beyond antibiotics

- Over time, include antiviral agents, antifungals and antiparasitic agents

4. Increase frequency of PPS

5. Extend PPS to other care settings

- Future expansions may include outpatient departments, emergency departments, community health centres, dialysis units and day care centers.

Annex A: List of standardized case definitions

General considerations

Accurate and consistent case definitions are essential for the quality and comparability of data collected. Their use supports standardisation, ensures uniform interpretation of clinical conditions, and strengthens the validity of the findings.

However, when the treating physician has clearly documented a diagnosis or clinical indication in the medical record, that diagnosis should be used without modification. This approach reduces conflict between data collectors and clinicians. It also respects clinical judgement and avoids challenging therapeutic decisions. Moreover, it simplifies the work of AMS teams, allowing them to focus on data extraction rather than interpretation.

Hence, if the diagnosis is not recorded or ambiguous, the data collector should apply the standard PPS case definition listed in this chapter to classify the type of infection.

It is critical to emphasise that these PPS case definitions are not intended to guide clinical management, are used purely for epidemiological categorisation to support surveillance and stewardship monitoring and do not override clinical decisions made by treating physicians.

The PPS survey does not distinguish between suspected, probable, and confirmed infections. All suspected diagnoses are acceptable for the purpose of empirical therapy. This mirrors real-world prescribing practices, where empirical therapy often precedes laboratory confirmation.

The case definitions included are intentionally limited to the most frequent infectious syndromes encountered among inpatients in acute care wards i.e., the list is not an exhaustive taxonomy of all infectious diseases.

If an infection may be healthcare-associated, data collectors must use the HAI case definitions from the National HAI Surveillance Plan.[10]

Unless otherwise stated, the case definitions in this annex have been adapted or taken verbatim from the European CDC.[18] To maintain simplicity, the definitions will apply to all age groups.

The list of preferred diagnoses to be recorded in cases of multiple diagnoses is displayed in Table 3.

Diagnoses of the patient	Diagnosis to record
Common cold / pharyngitis, severe influenza-like illness and / or acute bronchitis, as well as pneumonia	Pneumonia (PNEU)
Common cold / pharyngitis and / or severe influenza-like illness as well as acute bronchitis	Acute bronchitis (BRON)
Cystitis and pyelonephritis	Pyelonephritis (PYE)
Cystitis and prostatitis	Prostatitis (GUM)
Pyelonephritis and prostatitis	Pyelonephritis (PYE) and prostatitis (GUM)
Bacteraemia and sepsis	Bacteraemia (BAC)
Sepsis and febrile neutropenia	Febrile neutropenia (FN)
Sepsis with any other diagnosis (except bacteraemia and febrile neutropenia)	Include both
Febrile neutropenia with any other diagnosis (except sepsis)	Include both
Bacteraemia and any other diagnosis	Include both
SIRS and any other diagnosis	Prefer the other diagnosis

Table 3

CNS: Infections of the central nervous system

Meningitis[19]

1. Organism(s) identified from cerebrospinal fluid (CSF) by a culture or non-culture based microbiologic testing method or seen on Gram stain of CSF OR
2. BOTH of the following:
    - At least two of the following:
        - Fever (>38.0°C) or hypothermia (< 36.0°C) or headache or hypotonia
        - One or more meningeal signs (Kernig's sign, Brudzinski's sign, or nuchal rigidity)
        - One or more cranial nerve signs (papilloedema or abnormal cranial nerve III, IV, VI, or VII test)
    - AND at least one of the following:
        - Increased white cells, elevated protein, or decreased glucose in CSF
        - Positive blood culture for a non-commensal

Encephalitis[19, 20]

1. Positive microbiological test on brain tissue or on CSF for an organism known to cause encephalitis OR
2. BOTH of the following:
    - Patient has at least two of the following signs or symptoms:
        - Fever (>38.0°C) or hypothermia (< 36.0°C)
        - Acute onset hemiparesis or flaccid paralysis
        - Glasgow Coma Scale < 15 or irritability or lethargy
        - Seizures
    - AND at least one of:
        - Increased white cells or elevated protein, as well as normal glucose in CSF
        - CT scan or MRI of the brain is suggestive of encephalitis

EYE: Endophthalmitis and other bacterial eye conditions

Endophthalmitis[21]

1. Intra-ocular fluid (aqueous or vitreous) showing pathogen on Gram stain or on culture OR
2. All three of the following:
    - Patient has at least two of the following signs or symptoms:
        - Eye pain
        - Redness of eyes or swelling of eyelid or periorbital edema
        - Photophobia
        - Decrease in visual acuity
        - Chemosis
    - AND at least one of:
        - Hypopyon
        - Vitritis
        - Afferent pupillary defect
        - Fibrinoid anterior chamber response
        - Corneal edema
        - Retinitis
    - AND at least one of:
        - Patient had recent trauma to the eye/s
        - Patient had recent surgery on the eye/s
        - A blood culture is positive for a non-commensal

ENT: Infections of ear, nose, throat, larynx and mouth

Common cold or pharyngitis[18]

1. At least two of the following:
    - Rhinorrhoea or sneezing
    - Nasal congestion
    - Sore throat or hoarseness or odynophagia
    - Dry cough
    - Cervical lymphadenopathy
2. AND the patient does not meet criteria for severe influenza-like illness, bronchitis or pneumonia

Severe influenza-like illness[18]

1. Fever ≥ 38ºC
2. AND at least three of the following:
    - Chills
    - Headache or eye pain
    - Myalgia
    - Malaise or loss of appetite
    - Sore throat
    - Dry cough
3. AND the patient is admitted
4. AND the patient does not meet criteria for bronchitis or pneumonia

Sinusitis[19]

1. Microbiologic test on sample from sinus cavity is positive OR
2. BOTH of the following:
    - Patient has at least one of the following signs or symptoms:
        - Fever (>38.0°C),
        - Pain or tenderness over the involved sinus,
        - Headache,

        - Purulent exudate from nose, or
        - Nasal obstruction
    - AND Imaging test evidence of sinusitis (for example, x-ray or CT scan)

BRON: Acute bronchitis or exacerbations of chronic bronchitis

Acute bronchitis – MacFarlane criteria[22]

1. Onset of illness within the last 21 days
2. AND new onset cough
3. AND at least one of the following respiratory signs or symptoms:
    - New/increased sputum production
    - Chest pain
    - Tachypnoea
    - Wheezing
4. AND the patient does not meet criteria for pneumonia or exacerbation of chronic obstructive pulmonary disease

Exacerbation of chronic obstructive pulmonary disease (COPD) – Winnipeg criteria[23]

1. The patient is known to have COPD
2. AND at least two of the following:
    - Increased sputum purulence (change in color or consistency of sputum)
    - Increased sputum volume
    - Increased dyspnea (shortness of breath)
3. AND the patient does not meet criteria for pneumonia

PNEU: Pneumonia

Pneumonia[18, 19]

1. Chest x-ray shows a new infiltrate, consolidation or cavitation
    - If the patient has underlying heart failure, a repeat chest x-ray within 7 days should be done to confirm the diagnosis of pneumonia (e.g., through persistence of infiltrates despite use of diuretics)
2. AND at least one of respiratory signs or symptoms:
    - New or increased cough
    - New/increased sputum production
    - O_2 saturation < 94% or reduced >3% from baseline
    - Abnormal lung examination (new or changed) (rales or bronchial breath sounds)
    - Pleuritic chest pain
    - Respiratory rate ≥ 25 breaths/min
3. AND at least one of the following constitutional symptoms:
    - Fever (>38.0°C)
    - WBC > 14,000 leucocytes/mm^3
    - Acute change in mental status from baseline
    - Acute functional decline: New 3-point increase in total activity of daily living (ADL) score (range 0-28) from baseline based on 7 ADL items (bed mobility, transfer, locomotion, dressing, toilet use, personal hygiene, eating) each scored from 0 (independent) - 4 (total dependence)

CVS: Cardiovascular infections: endocarditis, vascular graft

Infective endocarditis (IE) - 2023 Duke-ISCVID criteria[24]

- Major criteria:
    - Microbiologic criteria (either positive blood cultures or positive laboratory test)
        - Positive blood cultures (1 of the following):
            - Microorganisms that commonly cause IE isolated from 2 or more separate blood culture sets
            - Microorganisms that occasionally or rarely cause IE, isolated from 3 or more separate blood culture sets
        - Positive laboratory test (1 of the following):
            - Positive PCR or other nucleic acid-based technique from blood for *Coxiella burnetii*, *Bartonella spp*, or *Tropheryma whipplei*
            - *Coxiella burnetii* antiphase I IgG antibody titer ≥1:800 or *Coxiella burnetii* isolated from a single blood culture
            - Indirect immunofluorescence assays for detection of IgM and IgG antibodies to *Bartonella henselae* or *Bartonella quintana,* with IgG titer ≥1:800
    - Imaging criteria (either of the following):
        - Echocardiography and/or cardiac CT imaging (any of the following):
            - Echocardiography and/or cardiac CT demonstrating vegetation, valvular/leaflet perforation, valvular/leaflet aneurysm, abscess, pseudoaneurysm, or intracardiac fistula
            - Significant new valvular regurgitation on echocardiography, compared with previous imaging; worsening or changing of pre-existing regurgitation is not sufficient
            - New partial dehiscence of prosthetic valve (compared with previous imaging)
        - [18F]-FDG PET/CT imaging

            - Abnormal metabolic activity involving a native or prosthetic valve (at least 3 months after implantation), ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads, or other prosthetic material
        - Surgical major criterion
            - Evidence of IE observed by direct inspection during cardiac surgery, in the absence of major microbiologic or imaging criteria, and in the absence of pathologic (microbiologic or histologic) criteria
- Minor criteria
    - Predisposition
        - Previous history of IE
        - Prosthetic valve
        - Previous valve repair
        - Congenital heart disease
        - More than mild regurgitation or stenosis (of any etiology)
        - Endovascular CIED
        - Hypertrophic obstructive cardiomyopathy
        - Injection drug use
    - Fever
        - Temperature ≥38.0°C (100.4°F)
    - Vascular phenomena
        - Clinical or radiographic evidence of arterial emboli, septic pulmonary infarcts, cerebral or splenic abscess, mycotic aneurysm, intracranial haemorrhage, conjunctival haemorrhages, Janeway lesions, purulent purpura
    - Immunologic phenomena
        - Positive rheumatoid factor, Osler nodes, Roth spots, or immune complex-mediated glomerulonephritis
    - Microbiologic evidence (falling short of major criteria)

        - Positive blood cultures for a microorganism consistent with IE but not meeting requirements for major criteria
        - Positive culture, PCR or other nucleic acid-based test (amplicon or shotgun sequencing, in situ hybridization) for an organism consistent with IE from a sterile body site other than cardiac tissue, cardiac prosthesis, or embolus; or a single finding of a skin bacterium by PCR on a valve or wire without additional clinical or microbiological supporting evidence
    - Imaging criteria
        - Abnormal metabolic activity detected by [18F]-FDG PET/CT within 3 months of implantation of prosthetic valve, ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads or other prosthetic material
    - Physical examination criteria (if echocardiography is not available)
        - New valvular regurgitation identified on auscultation (based on expert opinion); worsening or changing of pre-existing murmur not sufficient

Microorganisms that commonly cause IE include:

- *Staphylococcus aureus*
- *Staphylococcus lugdunensis*
- *Enterococcus faecalis*
- All streptococcal species except for *S. pneumoniae* and *S. pyogenes*
- *Granulicatella* and *Abiotrophia* spp
- *Gemella* spp
- HACEK group microorganisms (*Haemophilus* spp, *Aggregatibacter actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella kingae*)

In the setting of intracardiac prosthetic material, the following additional bacteria should be included as "typical" pathogens: coagulase negative staphylococci, *Corynebacterium striatum*, *Corynebacterium jeikeium*, *Serratia marcescens*, *Pseudomonas aeruginosa*, *Cutibacterium acnes*, non-tuberculous mycobacteria (especially *M. chimaerae*), and *Candida* spp.

- Definite endocarditis

    - Pathologic criteria are met
    - OR one of:
        - 2 major criteria
        - 1 major criterion and 3 minor criteria
        - 5 minor criteria
- Possible endocarditis
    - 1 major criterion and 1 minor criteria
    - 3 minor criteria

A diagnosis of possible IE is sufficient for entry into the questionnaire.

GI: (e.g. salmonellosis, antibiotic-associated diarrhoea, gastroenteritis, food poisoning)

Gastroenteritis[18]

1. Diarrhoea, three or more liquid or watery stools above normal baseline for the resident in 24-hr period OR
2. Vomiting, two or more episodes in 24-hr period OR
3. BOTH of the following:
    - Positive stool specimen for bacterial or viral pathogen
    - AND at least one of the following: nausea, vomiting, abdominal pain or tenderness, diarrhoea

IA: Intra-abdominal sepsis, including hepatobiliary

Intra-abdominal infection including gallbladder, bile ducts, liver (excluding viral hepatitis), spleen, pancreas, peritoneum, retroperitoneal, subphrenic or subdiaphragmatic space, or other intraabdominal tissue[19]

1. Positive culture for a non-commensal of fluid from an intra-abdominal abscess OR
2. Intra-abdominal abscess or other evidence of intra-abdominal infection on gross anatomic (e.g., exploratory laparotomy) or histopathologic exam OR
3. BOTH of the following:
    - Patient has at least two of the following signs or symptoms:
        - Fever (>38.0°C)
        - Hypotension
        - Nausea or vomiting
        - Abdominal pain or tenderness
        - Elevated transaminase level(s) or jaundice
    - AND abdominal imaging test shows evidence of definitive / probable infection (for example, ultrasound, CT scan, MRI, ERCP, radiolabel scans [gallium, technetium, etc.] or on abdominal x-ray)

SST-O: Cellulitis, wound, deep soft tissue not involving bone, not related to surgery

Cellulitis/soft tissue/wound infections[18]

1. Pus at a wound, skin, or soft tissue site OR
2. Four or more new or increasing signs/symptoms:
    - Heat at affected site
    - Tenderness or pain at affected site
    - Redness at affected site
    - Serous drainage at affected site
    - Swelling at affected site
    - At least one of the following constitutional symptoms:
        - Fever (>38.0°C)
        - WBC > 14,000 leucocytes/mm^3
        - Acute change in mental status from baseline
        - Acute functional decline: New 3-point increase in total activity of daily living (ADL) score (range 0-28) from baseline based on 7 ADL items (bed mobility, transfer, locomotion, dressing, toilet use, personal hygiene, eating) each scored from 0 (independent) - 4 (total dependence)

BJ-O: Septic arthritis, osteomyelitis, not related to surgery

Osteomyelitis[19]

1. Positive bone culture OR
2. Patient has evidence of osteomyelitis on gross anatomic or histopathologic exam OR
3. BOTH of the following:
    - Patient has at least two of the following localized signs or symptoms:
        - Fever (>38.0°C)
        - Swelling
        - Pain or tenderness
        - Heat
        - Drainage
    - AND bone imaging test shows evidence of definitive / probable infection (for example, x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.])

Septic arthritis (native joint)[25]

1. Positive synovial culture OR
2. ≤ 2 joints are affected AND all three of the following:
    - At least one of (new or worsening) at the affected site:
        - Joint pain
        - Swelling
        - Erythema
        - Warmth
    - AND at least one of:
        - Fever (>38.0°C)
        - WBC > 14,000 leucocytes/mm^3
        - High CRP above lab upper cut-off limit
        - High ESR above age-adjusted cut-off limit
    - AND at least one of:

- Purulent synovial fluid
- WBC in synovial fluid > 50,000/mm^3

CYS: Symptomatic lower urinary tract infection (e.g. cystitis)

Urinary tract infection[18]

1. Acute dysuria AND at least one of:
    - Urine WBC ≥ 10/HPF
    - Positive nitrite test on urine sample
2. OR acute pain/swelling or tenderness of the testes, epididymis, or prostate
3. OR BOTH of the following:
    - At least one of:
        - Fever (>38.0°C)
        - WBC > 14,000 leucocytes/mm^3
        - At least 10^5 cfu/ml of no more than 2 species of microorganisms in a voided urine sample
    - At least one of (new or increased):
        - Suprapubic pain/tenderness
        - Gross hematuria
        - Urinary frequency
        - Urinary urgency
        - Urinary incontinence
        - Dysuria
4. OR at least two of the following (new or increased):
    - Suprapubic pain/tenderness
    - Gross hematuria
    - Urinary frequency
    - Urinary urgency
    - Urinary incontinence
    - Dysuria

If the patient also meets the criteria for pyelonephritis, the user should use the latter category instead.

If the patient also meets the criteria for prostatitis, the user should use the latter category instead.

PYE: Symptomatic upper urinary tract infection (e.g. pyelonephritis)

Pyelonephritis[26]

1. One or more of the following:
    - Flank/loin pain or tenderness
    - Vomiting
    - Rigors
2. AND one or more of the following:
    - Fever (> 38.0°C) or hypothermia (< 36.0°C)
    - WBC > 14,000 leucocytes/mm^3
3. AND one or more of the following:
    - At least 10^5 cfu/ml of no more than 2 species of microorganisms in a voided urine sample
    - An imaging study of the kidney showing inflammation (e.g., ultrasound or CT scan)

    OR

1. One or more of the following:
    - Suprapubic pain/tenderness
    - Gross haematuria
    - Urinary frequency
    - Urinary urgency
    - Urinary incontinence
    - Dysuria
2. AND one or more of the following:
    - Fever (> 38.0°C) or hypothermia (< 36.0°C)
    - WBC > 14,000 leucocytes/mm^3
3. AND an imaging study of the kidney showing inflammation (e.g., ultrasound or CT scan)

If the patient also meets the criteria for prostatitis, the user can enter both diagnoses.

ASB: Asymptomatic bacteriuria

Asymptomatic bacteriuria

1. Positive urine culture AND
2. Patient does not meet criteria for cystitis AND
3. Patient does not meet criteria for pyelonephritis AND
4. Patient does not meet criteria for prostatitis

OBGY: Obstetric or gynaecological infections

Pelvic inflammatory disease[27]

1. Female patient AND
2. Lower abdominal tenderness AND
3. Tenderness with motion of the cervix AND
4. Adnexal tenderness AND
5. Ectopic pregnancy, appendicitis, pyelonephritis, endometritis, intestinal perforation and ovarian torsion have been ruled out AND
6. At least one of the following:
    a. Positive nucleic acid test for *C. trachomatis* infection or gonorrhea or positive culture for gonorrhea
    b. Purulent material in the peritoneal cavity obtained by culdocentesis or laparoscopy
    c. Pelvic abscess or inflammatory complex detected by bimanual examination or by sonography
    d. Temperature greater than 100.4°F (greater than 38.0°C)
    e. Leukocytosis greater than 14,000 white blood cells/mm^3
    f. Patient is a sexual contact of a person known to have gonorrhea, chlamydia, or nongonococcal urethritis

GUM: Prostatitis, epididymo-orchitis

Acute bacterial prostatitis[28]

1. Male patient AND
2. Absence of testicular pain AND
3. One or more of the following:
    - Suprapubic pain/tenderness
    - Gross haematuria
    - Urinary frequency
    - Urinary urgency
    - Urinary incontinence
    - Dysuria
4. AND one or more of the following:
    - Fever (> 38.0°C) or hypothermia (< 36.0°C)
    - WBC > 14,000 leucocytes/mm^3
    - Rigors or chills or myalgias
5. AND one or more of the following:
    - Pelvic pain
    - Perineal pain
    - Tender prostate on digital rectal exam
    - PSA is acutely elevated
6. AND one or more of the following:
    - At least 10^5 cfu/ml of no more than 2 species of microorganisms in a voided urine sample
    - Imaging study of the prostate is positive for inflammation or presence of abscess

BAC: Laboratory-confirmed bacteraemia

Bacteraemia

1. ≥ 1 positive blood culture for a non-commensal OR
2. ≥ 2 positive blood cultures for a commensal

If the patient meets other case definitions (other than sepsis), enter this diagnosis also.

CSEP: Clinical sepsis excluding febrile neutropenia

Clinical sepsis[29]

1. Negative blood culture/s or no blood culture done AND
2. A SOFA score increase from baseline by ≥ 2 AND
3. The patient does not meet the case definition for febrile neutropenia.

See the chart below to calculate the SOFA score.

Table 1. Sequential [Sepsis-Related] Organ Failure Assessment Score[a]

	Score				
System	0	1	2	3	4
Respiration					
Pao_2/Fio_2, mm Hg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
Coagulation					
Platelets, $\times 10^3/\mu L$	≥150	<150	<100	<50	<20
Liver					
Bilirubin, mg/dL (μmol/L)	<1.2 (20)	1.2-1.9 (20-32)	2.0-5.9 (33-101)	6.0-11.9 (102-204)	>12.0 (204)
Cardiovascular	MAP ≥70 mm Hg	MAP <70 mm Hg	Dopamine <5 or dobutamine (any dose)[b]	Dopamine 5.1-15 or epinephrine ≤0.1 or norepinephrine ≤0.1[b]	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1[b]
Central nervous system					
Glasgow Coma Scale score[c]	15	13-14	10-12	6-9	<6
Renal					
Creatinine, mg/dL (μmol/L)	<1.2 (110)	1.2-1.9 (110-170)	2.0-3.4 (171-299)	3.5-4.9 (300-440)	>5.0 (440)
Urine output, mL/d				<500	<200

Abbreviations: Fio_2, fraction of inspired oxygen; MAP, mean arterial pressure; Pao_2, partial pressure of oxygen.

[a] Adapted from Vincent et al.[27]

[b] Catecholamine doses are given as μg/kg/min for at least 1 hour.

[c] Glasgow Coma Scale scores range from 3-15; higher score indicates better neurological function.

If the patient meets other case definitions, enter this diagnosis also.

Septic shock[41]

1. Clinical sepsis as defined above AND
2. Hypotension requiring vasopressors to maintain a mean arterial pressure ≥ 65 mm Hg

FN: Febrile neutropenia or other form of manifestation of infection in immunocompromised host (e.g. HIV, chemotherapy, etc.) with no clear anatomical site

Febrile neutropenia[30]

1. One of the following:
    - Fever of >38.3°C
    - Two consecutive readings of temperature >38.0°C over ≥ 2 h
2. AND an absolute neutrophil count of $< 0.5 \times 10^9$/L.

If the patient meets other case definitions, enter this diagnosis also.

SIRS: Systemic inflammatory response with no clear anatomical site

Systemic inflammatory response[31]

1. At least two of:
    - Fever (> 38.0°C) or hypothermia (< 36.0°C)
    - Respiratory rate > 20/min or $PaCO_2$ < 20 mmHg
    - Heart rate > 90 bpm
    - WBC > 12,000/mm^3 or < 4,000/mm^3 or > 10% immature bands

Annex B: Modified Antibiotic Spectrum Index

The following table is adapted from reference 14.

Agent	MSSA	*E. faecalis, E. faecium*	Anaerobes	*B. fragilis*	*Moraxella sp., H. influenzae*	*E. coli, Klebsiella sp.*	*Enterobacter sp., Serratia sp., Citrobacter sp.*	ESBL	PSAR	MRSA	PCN-resistant pneumoniae	VRE	Atypical	MDRO	CRE	SUM
Oxacillin	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dicloxacillin	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Flucloxacillin	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Amoxicillin	0	1	0	0	0	0.5	0	0	0	0	0	0	0	0	0	1.5
Ampicillin	0	1	0	0	0	0.5	0	0	0	0	0	0	0	0	0	1.5
Cephalexin	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Metronidazole	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
Penicillin	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Aztreonam	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	3
Cefazolin	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3
Cefdinir	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3
Azithromycin	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	3
Clarithromycin	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	3
Erythromycin	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3
Ceftazidime	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	4
Clindamycin	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	4
SMX/TMP	1	0	0	0	1	1	0	0	0	1	0	0	0	1	0	5
Telavancin	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	5
Gentamicin	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	5
Ceftriaxone	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	5
Vancomycin	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	5
Cefotaxime	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	5

Minocycline	1	0	0	0	1	1	0	0	0	1	0	0	1	1	0	6
Colistin	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	6
Doxycycline	1	1	0	0	1	1	0	0	0	1	0	0	1	0	0	6
Amikacin	0	0	0	0	1	1	1	1	1	0	0	0	0	1	0	6
Tobramycin	0	0	0	0	1	1	1	1	1	0	0	0	0	1	0	6
Amox/clav	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	6
Linezolid	1	1	0	0	0	0	0	0	0	1	1	1	0	1	0	6
Amp/sul	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	7
Cefepime	1	0	0	0	1	1	1	0	1	0	1	0	0	1	0	7
Ciprofloxacin	1	0	0	0	1	1	1	1	1	0	0	0	1	0	0	7
Ceftaroline	1	1	0	0	1	1	0	0	0	1	1	0	0	1	0	7
Ceftol/tazo	0	0	1	1	1	1	1	1	1	0	0	0	0	1	0	8
Ceftaz/avi	0	0	1	0	1	1	1	1	1	0	0	0	0	1	1	8
Pip/tazo	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	8
Levofloxacin	1	0	0	0	1	1	1	1	1	0	1	0	1	1	0	9
Ertapenem	1	0	1	1	1	1	1	1	0	0	1	0	0	1	0	9
Moxifloxacin	1	0	1	1	1	1	1	1	0	0	1	0	1	0	0	9
Meropenem	1	0	1	1	1	1	1	1	1	0	1	0	0	1	0	10
Mero/vabor	1	0	1	1	1	1	1	1	1	0	1	0	0	1	1	11
Imipenem	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	11
Tigecycline	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	13

Table 4: MSSA – methicillin-susceptible Staphylococcus aureus, ESBL – extended spectrum beta-lactamase, PSAR – Pseudomonas aeruginosa, PCN - penicillin, VRE – vancomycin-resistant enterococci, MDRO – multidrug resistant organisms, CRE – carbapenem-resistant Enterobacteriaceae. SMX/TMP – sulfamethoxazole / trimethoprim.

Annex C: Antibiotic Spectrum

See reference 42 for details.

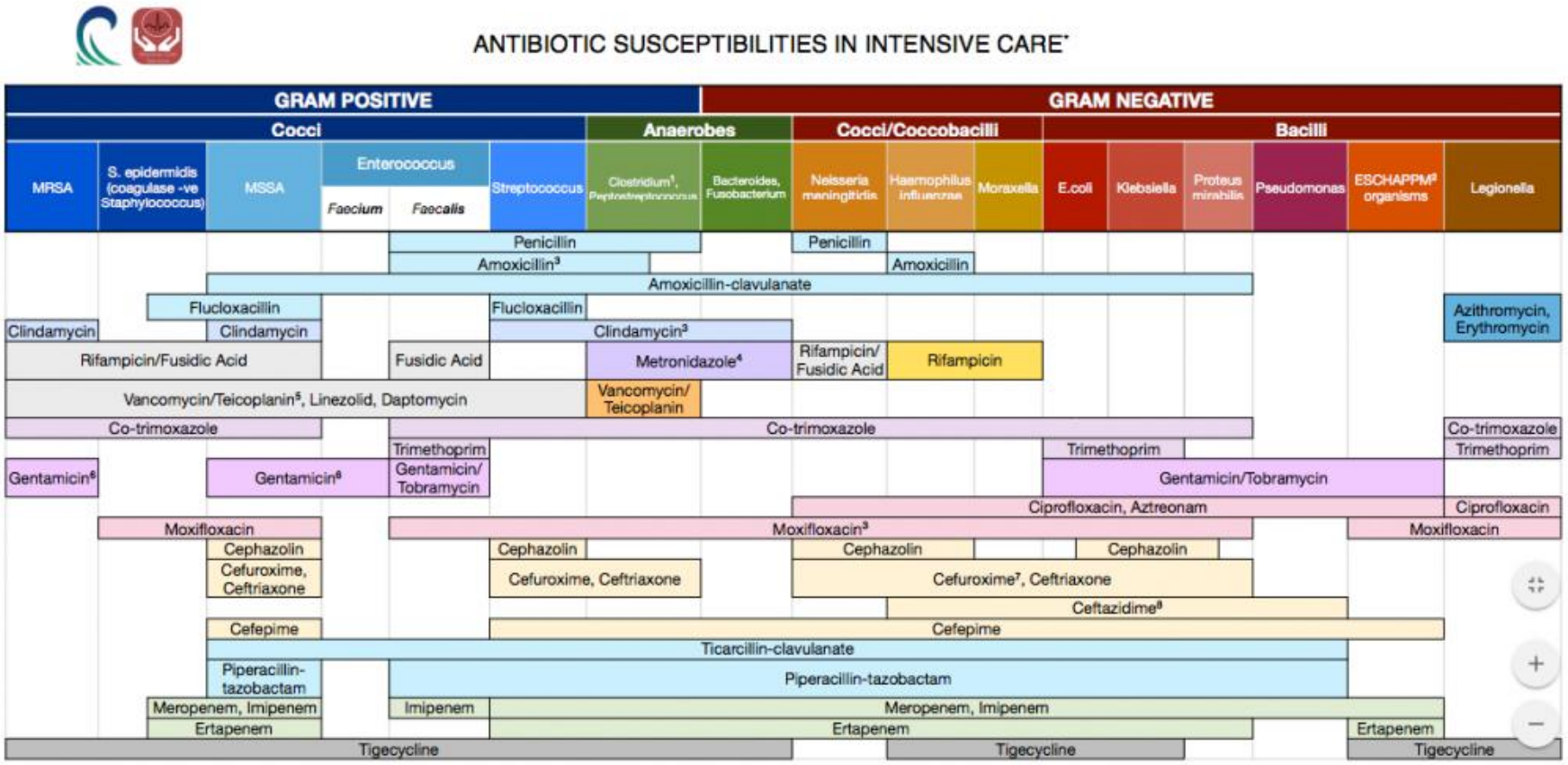


Figure 2: ESCHAAPPM is a mnemonic for the organisms with inducible beta-lactamase activity that is chromosomally mediated - E: Enterobacter spp., S: Serratia spp., C: Citrobacter freundii, H: Hafnia spp., A: Acinetobacter spp., A: Aeromonas spp., P: Proteus spp. (excluding P. mirabilis), P: Providencia spp. And M: Morganella morganii.

References

1. Tracking the threat: antimicrobial resistance surveillance and priority pathogens in the WHO African Region: A WHO GLASS-based regional perspective. World Health Organization. 2025.
2. NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE APRIL 2024 TO MARCH 2029. Ministry of Health and Wellness, Mauritius. 10 April 2024.
3. GLOBAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE. World Health Organization. 2015.
4. Voicing African Priorities on the Active Pandemic: ACCELERATING THE CONTINENTAL RESPONSE TO ANTIMICROBIAL RESISTANCE (AMR) - African Union AMR Landmark Report. Africa Union, Africa CDC. 2024.
5. African Union Framework for Antimicrobial Resistance Control 2020–2025. African Union. 2019.
6. WHO methodology for point prevalence survey on antibiotic use in hospitals. Geneva: World Health Organization. 2018.
7. Health Statistics Report. Ministry of Health and Wellness, Mauritius. 2023.
8. Nuckchady, D. Antibiotic Usage Pattern in a Hospital in Mauritius, the RATA score and its Association with Multi-Drug Resistance. World Journal of Pharmacy and Pharmaceutical Sciences. Volume 12, Issue 2, 19-31.
9. European Centre for Disease Prevention and Control. Point prevalence survey of healthcare associated infections and antimicrobial use in European acute care hospitals. Stockholm: ECDC; 2024.
10. National Surveillance Plan on Hospital Acquired Infections. Ministry of Health and Wellness, Mauritius. September 2025.
11. Looke D and Duguid M. Chapter 5: Measuring the performance of antimicrobial stewardship programs. Antimicrobial stewardship in Australian hospitals.
12. Australian Commission on Safety and Quality in Health Care (2015). Antimicrobial prescribing practice in Australian hospitals: results of the 2014 National Antimicrobial Prescribing Survey, ACSQHC, Sydney.
13. Zumaya-Estrada FA, Alpuche-Aranda CM, Saturno-Hernandez PJ. The WHO methodology for point prevalence surveys on antibiotics use in hospitals should be improved: Lessons from pilot studies in four Mexican hospitals. Int J Infect Dis. 2021 Jul;108:13-17. doi: 10.1016/j.ijid.2021.04.079.
14. Dan Ilges, David J Ritchie, Tamara Krekel, Elizabeth A Neuner, Nicholas Hampton, Marin H Kollef, Scott Micek, Assessment of Antibiotic De-escalation by Spectrum Score in Patients With Nosocomial Pneumonia: A Single-Center, Retrospective Cohort Study, *Open Forum Infectious Diseases*, Volume 8, Issue 11, November 2021, ofab508, https://doi.org/10.1093/ofid/ofab508
15. National Antibiotic Guidelines. Ministry of Health, Mauritius. 2024.
16. https://amrtg.icmr.org.in/dashboard.html
17. https://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/tools-to-assist-with-the-classification-in-the-hs/hs_classification-decisions/inn-table.aspx
18. Protocol for PPS of HAI and antimicrobial use in European long-term care facilities: Annex 4 - Case definitions of infections. European Centers for Disease Control and Prevention. https://www.ecdc.europa.eu/sites/default/files/media/en/publications/Report%20Assets/hai-net/HALT3MainProtocol-Annex4-CaseDefinitions.pdf
19. Surveillance Definitions for Specific Types of Infections. CDC/NHSN. January 2025.
20. Gluckman SJ. Viral encephalitis in adults. UpToDate. 15 August 2025.
21. STANDARD TREATMENT GUIDELINES OPTHALMOLOGY. Ministry of Health & Family Welfare Govt. of India.
22. https://bestpractice.bmj.com/topics/en-gb/135
23. https://www.uniqcret.com/post/anthonisen-criteria-to-start-antibiotics-in-copd-with-ae-case

24. Vivian H Chu and Andrew Wang. Clinical manifestations and evaluation of adults with suspected left-sided native valve endocarditis. UpToDate. 2 Oct 2025.
25. Earwood JS, Walker TR, Sue GJC. Septic Arthritis: Diagnosis and Treatment. Am Fam Physician. 2021 Dec 1;104(6):589-597. PMID: 34913662.
26. URINARY TRACT INFECTIONS - Acute Pyelonephritis in Adults / Upper UTI. Nottinghamshire Area Prescribing Committee. June 2024. https://www.nottsapc.nhs.uk/media/k5gimusx/acute-pyelonephritis-adult.pdf
27. Pelvic Inflammatory Disease (PID) – 1996 Case Definition. National Notifiable Disease Surveillance System – US CDC. 16 April 2021.
28. Alain Meyrier, Barbara W Trautner, Prathit A Kulkarni. Acute bacterial prostatitis. UpToDate. 8 Jul 2025.
29. https://epomedicine.com/emergency-medicine/understanding-new-definition-sepsis/
30. de Naurois J, Novitzky-Basso I, Gill MJ, Marti FM, Cullen MH, Roila F; ESMO Guidelines Working Group. Management of febrile neutropenia: ESMO Clinical Practice Guidelines. Ann Oncol. 2010 May;21 Suppl 5:v252-6. doi: 10.1093/annonc/mdq196
31. Varon J, Baron RM. A current appraisal of evidence for the approach to sepsis and septic shock. Ther Adv Infect Dis. 2019 Jul 5;6:2049936119856517. doi: 10.1177/2049936119856517.
32. Herman Goossens, Erika Vlieghe, Ann Versporten and Ines Pauwels. Global Point Prevalence Survey: Impact and Value. 2023.
33. Vandael E, Latour K, Goossens H, Magerman K, Drapier N, Catry B, Versporten A; Belgian Point Prevalence Survey Study Group. Point prevalence survey of antimicrobial use and healthcare-associated infections in Belgian acute care hospitals: results of the Global-PPS and ECDC-PPS 2017. Antimicrob Resist Infect Control. 2020 Jan 13;9(1):13. doi: 10.1186/s13756-019-0663-7.
34. The WHO AWaRe (Access, Watch, Reserve) antibiotic book. Geneva: World Health Organization; 2022.
35. https://www.lancashireandsouthcumbriaformulary.nhs.uk/docs/files/CORP-GUID-309%2018thed%202024.pdf
36. 202212surgicalprophylaxis.pdf
37. https://www.idsociety.org/practice-guideline/all-practice-guidelines/
38. https://www.ashp.org/surgical-guidelines
39. https://www.has-sante.fr/jcms/p_3278764/fr/choix-et-durees-d-antibiotherapies-preconisees-dans-les-infections-bacteriennes-courantes
40. https://hal.science/hal-03487469/document
41. Singer M, Deutschman CS, Seymour CW, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. 2016;315(8):801–810. doi:10.1001/jama.2016.0287
42. https://wuolah.com/apuntes/mecanismos-de-enfermedad/mecanismos-de-enfermedad-maria-rivera-espectro-antibiotico-pdf-5237596