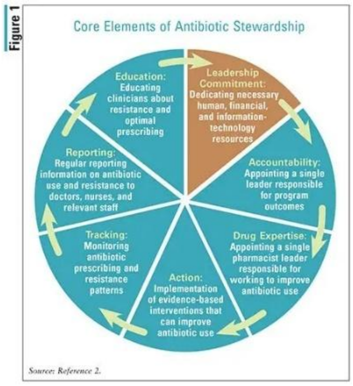
Point Prevalence Survey on Antimicrobial Use and Antimicrobial Stewardship for 2025 in Mauritius



Ministry of Health and Wellness

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Executive Summary

Antimicrobial resistance (AMR) remains a critical and growing public health threat globally and nationally. In response, a Point Prevalence Survey (PPS) on antimicrobial use (AMU) was conducted across public hospitals in Mauritius to assess prescribing practices, compliance with guidelines, and the performance of antimicrobial stewardship (AMS) systems.

This PPS included 555 patients across five regional hospitals, 333 of which were on antibiotics. The findings demonstrate suboptimal antimicrobial prescribing practices across multiple institutions, with marked variability between hospitals and clinical specialties. Overall compliance with the National Antibiotic Guidelines (NAG) remains low, with frequent deviations related to inappropriate antibiotic choice, prolonged duration of therapy, poor documentation of indication, and absence of stop or review dates. These gaps compromise patient safety, undermine stewardship efforts, and contribute to the emergence and spread of AMR.

Even though progress was limited, the following indicators improved from 2018 to 2025: excessively long use of antibiotics, using the wrong type of antibiotics, using the wrong dose of antibiotics and using the wrong frequency of antibiotics. Unfortunately, the proportion of patients who did not require antibiotics but were placed on them, increased, rational use of antibiotics worsened overall and the quantity of antibiotics used has gone up.

Surgical wards were identified as a key area of concern, particularly with respect to surgical prophylaxis, where antibiotics are frequently prescribed for durations exceeding international recommendations. Among institutions, Dr. A. G. Jeetoo Hospital (JH) and Sir Seewoosagur Ramgoolam National Hospital (SSRNH) consistently demonstrated poorer AMS performance and higher antimicrobial consumption, indicating the need for targeted, high-impact interventions at these facilities.

The survey further highlighted systemic weaknesses, including poor utilisation of microbiology results, limited de-escalation of therapy, and inadequate therapeutic drug monitoring for certain antibiotics such as gentamicin and vancomycin.

From a systems and governance perspective, root causes of lapses likely include insufficient leadership engagement, weak readership of guidelines, resistance to change, and inadequate training. In addition, inconsistent prescribing practices have created challenges for antibiotic quantification and procurement, thus contributing to supply gaps. Implementing the National Action Plan on AMR by financing it will help to overcome many of these challenges.

Background

AMR is a major global public health challenge that threatens the effective prevention and treatment of infectious diseases, increases morbidity and mortality, and places a substantial economic burden on health systems. The inappropriate and excessive use of antimicrobials in human health is a key driver of AMR, accelerating the emergence and spread of resistant microorganisms. Strengthening AMS is therefore essential to preserve the effectiveness of existing antimicrobials and to ensure optimal patient outcomes.

Mauritius, like many countries, is facing increasing challenges related to AMR, including infections caused by multidrug-resistant organisms (MDRO) and rising antimicrobial consumption across healthcare settings. In response, national efforts have been undertaken to promote the rational use of antimicrobials, improve infection prevention and control practices, and align national policies with global and regional AMR action plans. Robust data on antimicrobial prescribing practices are critical to inform these efforts, identify priority areas for intervention, and monitor progress over time.

PPS are internationally recognised tools for assessing antimicrobial use (AMU) in healthcare facilities. By providing a snapshot of antimicrobial prescribing at a specific point in time, PPS generate standardized data on the prevalence, indications, choice, and patterns of AMU. These surveys support benchmarking across facilities and over time, highlight gaps in prescribing practices, and inform the design and evaluation of AMS interventions.

In 2025, a national PPS on AMU and AMS was conducted in selected healthcare facilities in Mauritius. The survey aimed to describe current antimicrobial prescribing practices, assess compliance with recommended guidelines, and evaluate key indicators of AMS, including documentation of indication, route of administration, and duration or review dates. The findings of this PPS provide an important evidence base to guide policy development, strengthen AMS programmes, and support ongoing national efforts to combat AMR.

Timeline

- April 2023: The AMR Focal Point for Human Health (AFPHH) highlighted that the World Health Organization's (WHO's) assistance should be requested to support the PPS on AMU based on its well-known expertise on this topic. The Ministry of Health and Wellness (MOHW) acquiesced, and the WHO Country Office was contacted with a concept note and a term of reference for a consultant.
- October 2023: Approval of the National Ethics Committee was sought to carry out surveys in hospitals.
- December 2023: The National Ethics Committee provided its approval. A local consultant was recruited by WHO, but she 'left' within a month.
- April 2025: The National AMS Technical Working Group (NAMS TWG) met and requested its members to submit indicators on AMS for future data analysis.
- May 2025: AMS indicators from regions two, three and five were received and compiled by the AFPHH.
- June 2025: MOHW with the support of WHO carried out a training session on the methodology of Global Antimicrobial Resistance and Use Surveillance System-Antimicrobial Use (GLASS-AMU) and PPS AMU. An operational plan was developed and submitted to MOHW: Dr. A. Joorawon, AMS Team Leader from Sir Anerood Jugnauth Hospital (SAJH), agreed to develop the questionnaire for the PPS study based on WHO's methodology.
- July 2025: NAMS TWG met – the group deliberated on which components of AMS to add to the form.
- August 2025: Members of NAMS TWG made further suggestions to improve the form. Hospitals were requested to assess the form by filling it for a few patients. The Acting Director Health Services (Public Health) of MOHW gave his approval for the PPS to be carried out in the public sector.
- September 2025: During another meeting of the NAMS TWG, members requested that certain sections of the questionnaire be clarified. Another meeting of NAMS TWG was also held to train data collectors on case definitions of infectious diseases. AMS teams preferred not to carry out a pilot study because the exercise was deemed too simple.
- October 2025: The survey was conducted from 1 October 2025 to 15 October 2025 with a minimum sample size of 100 patients per regional hospital. All five regional hospitals took part in the PPS.

- November 2025: The AFPHH validated the data collected by reviewing patient folders.
- December 2025: The data was cleaned and analysed, and this report was written by the AFPHH. It was subsequently forwarded to the NAMS TWG for comments.

Methodology

The survey followed the WHO methodology for PPS on AMU in hospitals, adapted to the local context to capture stewardship-relevant indicators. The PPS was implemented as an active surveillance exercise, with trained data collectors visiting wards and extracting patient-level data directly from medical records.

The survey was multicentre and hospital-based, covering selected public sector acute care hospitals. Only inpatient wards providing acute care services were included. Outpatient departments, long-term care wards, psychiatric units and non-acute facilities were excluded. All patients admitted to a participating ward at 09:00 on the survey day were eligible for inclusion, irrespective of whether they were receiving antimicrobials, to ensure an appropriate denominator for prevalence estimates. Each patient was counted once only and assigned to the ward where they were physically located at 09:00.

The PPS focused on systemic antibacterial agents administered via oral, parenteral, intramuscular, rectal, or inhalation routes. Topical, ophthalmic, and otic antibiotics were excluded. Antivirals, antifungals, and anti-helminthic agents were not included in the survey due to lower utilization and to maintain feasibility.

Data were collected using a modified WHO PPS electronic questionnaire hosted on Google Forms. The tool was adapted to remove duplication with the national Hospital-Acquired Infection (HAI) PPS and expanded to include additional AMS variables. Data sources included patient folders, drug charts, nursing notes, laboratory records, and electronic health records where available. No patient identifiers such as names and addresses were collected to preserve confidentiality.

Facility-based antimicrobial stewardship teams, primarily AMS Registered Medical Officers, carried out data collection under the supervision of AMS team leaders.

For the sake of statistical analysis, duration of treatment was tied to the diagnosis as per the NAG, not the particular regimen in use. Complex situations that require variable duration and type of therapies e.g., for infective endocarditis or bacteremia, were ignored.

Data analysis was carried out using Microsoft Excel 365 and the online calculator https://www.omnicalculator.com/statistics.

See the "National Antimicrobial Use and Antimicrobial Stewardship Monitoring Plan" for more information on the methodology.

Data Quality

Data validation

For the sake of validating the data collected, the AFPHH visited JH, SSRNH, SAJH, Jawaharlal Nehru Hospital (JNH) and Victoria Hospital (VH) on 4/11/25, 7/11/25, 18/11/25, 21/11/25 and 17/10/25 respectively. 39 folders were assessed which, due to limited availability of national staff working on AMR, fell short of the expected 50.

The difficulties confronted by the data collectors included:

- Many diagnoses were not recorded in patient folders – this led to difficulties explaining why antibiotics were started on these patients.
- The data collectors' diagnoses conflicted with those of the specialists' diagnoses.
- Difficulties arose in understanding what doses were being referred to for combination antibiotics (active ingredient vs the entire compound), especially for paediatric patients.
- Inability to know whether a targeted therapy was appropriate or not.
- Trouble finding the results of patients.
- Situations in which doctors prescribed an antibiotic, but the nurse was not administering same and vice versa i.e., doctors stopped an antibiotic but same was being administered by the nurses.
- Cases where doses of antibiotics were incorrectly recorded by the intern in the patient folder but were being correctly administered by the nurse.
- Due to the lack of data collectors, not all wards could be covered on the same day.

Data cleaning

Issues noted during data cleaning were:

- Six duplicates were eliminated.
- Seven missing ages were corrected to the mean values for the given ward.
- Presence of trailing or leading spaces in data entries.
- Six missing serum creatinine values were replaced with a normal value of 80.
- The original Google Form appeared to have been manipulated since data values within lists were written differently across hospitals: differences included typos, abbreviations, spaces and capitalization.

- Obviously incorrect doses of antibiotics – these were corrected.
- Using ‘not applicable’ for diagnosis when ‘undefined’ should have been entered.
- Some missing entries e.g., nine indications for surgery were absent – these could not be corrected.

Data validity score

Figure 1 displays the data validity score (DVS) by hospital. The national DVS was 80%, representing data of borderline quality.

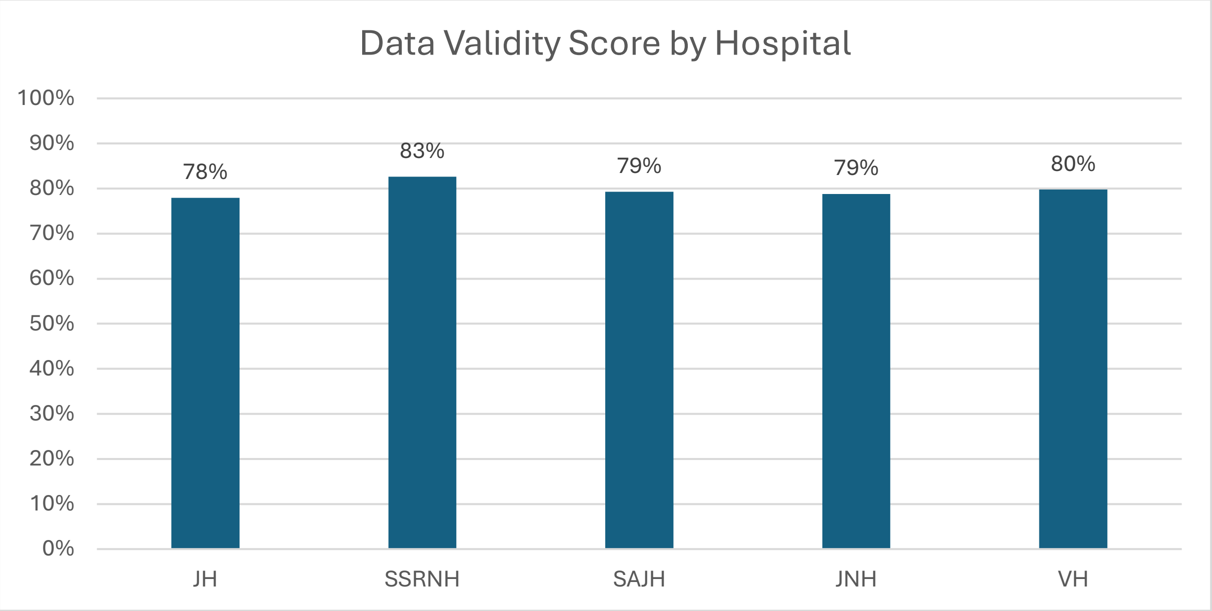

Figure 1

JH most likely had the worse DVS due to a lack of supervision by its doctors. JNH could have had better scores but the correlation between the doctors’ prescription and the nurses’ dispensing of medications was poorer there.

Issues that were encountered and caused a drop in DVS were:

- Incorrectly identifying whether therapy was adapted according to culture results.
- Wrong inputs of whether cultures were taken before a course of antibiotic/s was started.
- Inaccurate entry of diagnosis.
- Erroneous inputs of dates of start of antibiotics.
- Mistaken values for the length of therapy.

With respect to identifying compliance to national guidelines, the survey had a sensitivity of only 40% and specificity of 92%. Values greater than 80% would be acceptable. Reasons for the low sensitivity include:

- The small sample size for the validation.
- The low compliance rate which meant that the AFPHH could hardly identify any compliant therapy during validation.
- Well-recognized struggles in third world countries in which documentation is inadequate – Mexico exemplified this through its article on WHO's PPS methodology in which issues surrounding interpretation of data, fragmentation of information and discordance among experts were explored.[1]

To improve the sensitivity of the survey, it is proposed that clinical documentation should be improved. Moreover, the recently developed national plan on PPS establishes objective definitions that should reduce disagreements during the next PPS.

Results

Demographics

555 patients were surveyed. The mean age was 55 years with a standard deviation of 23 years – see Figure 2 for the distribution by age group. The male to female ratio was 1.02:1. Most patients came from the adult surgical and medical wards. See table 1 for the repartition by hospital.

	JH	SSRNH	SAJH	JNH	VH	Overall
No. of patients (n)	100	100	111	130	114	555
Mean age (y)	54	53	51	61	53	55
% males	45%	46%	62%	42%	57%	50%
% admitted to each ward type						
Adult intensive care unit	23%	10%	5.4%	3.8%	7.9%	9.5%
Adult medical ward	26%	19%	22%	38%	20%	26%
Adult surgical ward	47%	66%	54%	56%	46%	54%
Neonatal intensive care unit	4.0%	5.0%	5.4%	1.5%	6.1%	4.3%
Paediatric medical ward	0%	0%	14%	0%	17%	6.1%
High risk adult ward	0%	0%	0%	0%	2.6%	0.54%

Table 1: Demographics table.

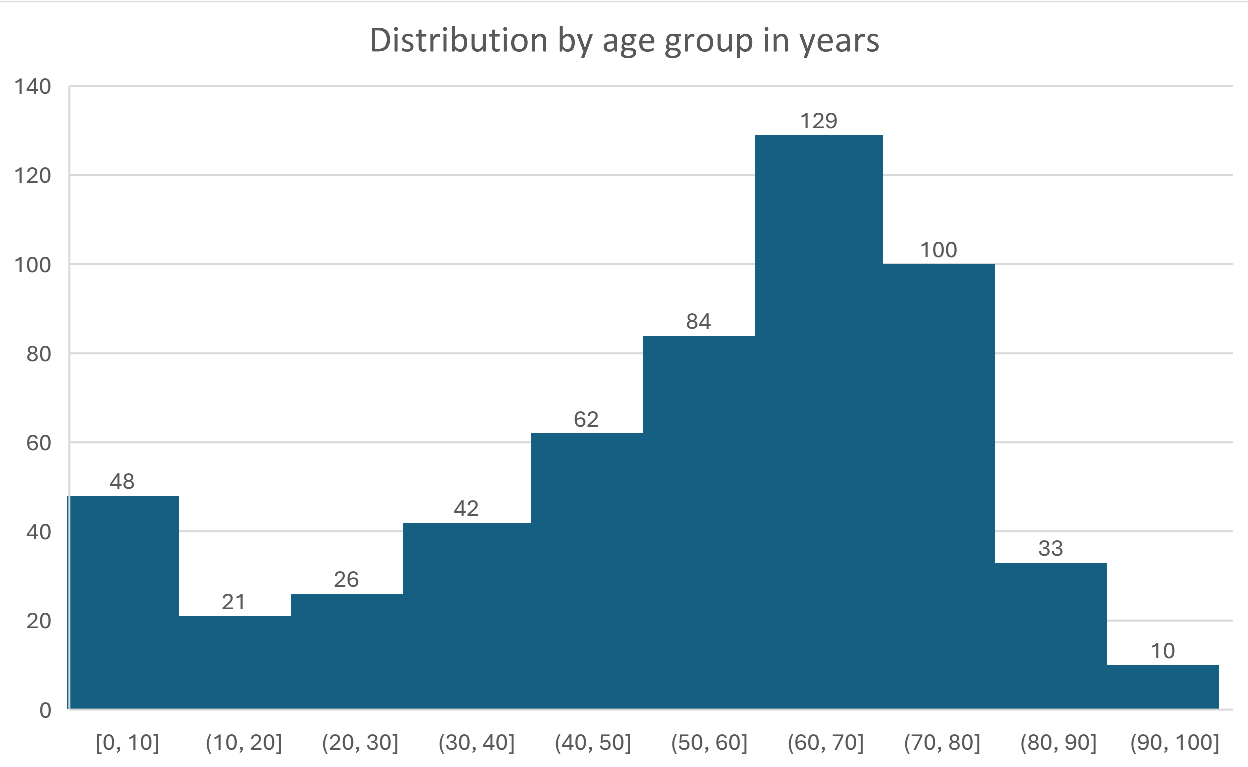

Figure 2: Histogram of age.

Characteristics of patients on antibiotics

333 patients were on 527 antibiotics (an average of 1.6 antibiotics per patient) which accounted for 60% of the population. Transfers from another hospital (public or private) to the original hospital were uncommon. 38% of patients had surgery during their admission, prior to the day of assessment. See table 2 for more information.

The top three surgeries accounting for 72% of the surgeries were: orthopaedic surgery, abdominal surgery and minimally invasive surgery (e.g., biopsy, incision and drainage, drain insertion or insertion of tracheostomy).

64% of indications for antibiotics were for treatment purposes while 27% were for surgical prophylaxis. 94% of patients on surgical prophylaxis received antibiotics for more than 24 hours. Of note, even among the remaining 6% who received ≤ 24 hours of antibiotics, the assessment by the data collector was likely conducted within 24 hours of surgery i.e., the patients would still be on antibiotics if they were re-evaluated later.

The top three infectious diagnoses were skin and soft tissue infections (13%), pneumonia (9.4%) and sepsis (8.5%). 8.0% of patients did not have an identifiable infection of any type during their evaluation.

Amongst children < 12 years old, the most popular diagnoses were sepsis (24%), Ear, Nose and Throat (ENT) conditions (21%) and pneumonia (17%).

	JH	SSRNH	SAJH	JNH	VH	Overall
No. on antibiotics	63	66	60	83	61	333
% aged < 12y	3.2%	7.6%	15%	2.4%	18%	8.7%
% of patients transferred from elsewhere*	4.8%	4.5%	3.3%	7.2%	1.6%	4.5%
% who underwent surgery	43%	36%	25%	51%	28%	38%
CKD stage (n)*						
1	34	30	26	44	32	166
2	13	14	12	17	15	71
3a	8	5	6	6	4	29
3b	4	5	9	5	5	28
4	0	9	4	3	3	19
5	4	3	3	8	2	20
No. of patients on the following no. of antibiotics						
1	36	29	39	45	37	186
2	21	30	16	32	21	120
3	4	7	5	5	3	24

4	0	0	0	1	0	1
> 4	2	0	0	0	0	2
% admitted to each ward type						
Adult intensive care unit	33%	11%	6.7%	4.8%	13%	13%
Adult medical ward	16%	21%	28%	31%	16%	23%
Adult surgical ward	48%	61%	50%	61%	48%	54%
Neonatal intensive care unit	3.2%	7.6%	5.0%	2.4%	6.6%	4.8%
Paediatric medical ward	0%	0%	10%	0%	11%	3.9%
High risk adult ward	0%	0%	0%	0%	4.9%	0.90%

*Table 2: Clinical details of patients on antibiotics. CKD – chronic kidney disease. * - for assessable patients.*

The top three specialties whose patients were most often prescribed antibiotics were neurosurgery (where 86% of patients were on antibiotics), mixed wards (79%) and general surgery (62%) which was closely followed by orthopaedic patients (61%).

The specialties whose patients were the longest on antibiotics on average were neonatology (13 days), neurosurgery (10 days) and mixed wards (9 days).

The three most commonly utilized antibiotics by percentage of prescriptions were ceftriaxone (36%), metronidazole (18%) and ciprofloxacin (12%). Meropenem (6.1%) was more commonly used than amoxicillin/clavulanic acid (5.3%) and piperacillin/tazobactam (1.9%).

Unsurprisingly, the majority of antibiotics (91%) were given via the intravenous route with the rest administered orally. Two patients had a length of therapy that was more than 42 days – this may happen among patients who get recurrent infections (which are often hospital-acquired).

Indicators

Table 4 displays the values for AMS indicators by hospital and nationally. National targets are not yet available for most indicators. It is highlighted that compliance implies adherence to the NAG while appropriateness refers to the use of antimicrobials according to international guidelines – refer to the national AMS plan for details.

The three wards with the highest Defined Daily Dose (DDD) of antibiotics per 1,000 patient-days were the adult intensive care units (ICU) (732), surgical wards (664), and the medical wards (453).

The three specialties with the highest DDD per 1,000 patient-days were obstetrics / gynaecology, neurosurgery and orthopaedics – they used antibiotics 5.6x, 3.6x and 2.6x more than the average specialty. However, given the small sample size for the first two specialties, care should be taken during interpretation.

The hospitals with the highest consumption of antibiotics during the survey were JH (769 DDD per 1,000 patient-days), SSRNH (677) and JNH (555).

The worst Rational Use of Antibiotic (RATA) score[3], a measure of compliance for the prescription of each antibiotic, was found in JH (mean RATA of 2.5/5), SSRNH (2.5/5) and VH (2.6/5) – the higher the number the better the compliance.

Of note, only 14% of patients (excluding those on directed therapy) were on antibiotics that were either fully compliant with the NAG or appropriate (as per international guidelines).

Table 3 shows that all regional hospitals abused antibiotics by using more broad-spectrum antibiotics than required by the NAG.

	Expected mean ASI per NAG	Mean ASI in survey	P-value
JH	5.0	9.6	$1.0*10^{-7}$
SSRNH	3.9	7.6	$5.4*10^{-11}$
SAJH	4.3	7.3	$7.6*10^{-7}$
JNH	5.3	6.7	$7.9*10^{-5}$
VH	4.6	7.3	$4.9*10^{-7}$

Table 3: ASI – Antibiotic Spectrum Index; the higher the number, the broader the spectrum. Expected ASI is based on the diagnosis of the patients and the antibiotics to be prescribed according to NAG.

	Target	JH	SSRNH	SAJH	JNH	VH	Overall
% on antibiotics (n = 333)	NA	63%	66%	54%	64%	54%	60%
% where a diagnosis is written in the patient folder (n = 333)	> 95%[2, 4]	33%	52%	93%	75%	85%	68%
% where a culture was done before antibiotics were started (n = 333)	NA	38%	42%	30%	34%	30%	35%
Mean length of therapy (days) (n = 333)	NA	7	6	7	5	10	7
% of patients on antibiotics who are on meropenem (n = 32)	NA	14%	8%	10%	10%	7%	10%
% of those who are on meropenem who have an appropriate indication for carbapenems as per NAG (n = 32)	NA	33%	40%	0%	25%	25%	25%
% of those on vancomycin or gentamicin who had at least one trough level done (n = 36)	NA	11%	0%	0%	0%	0%	2.8%
% of most recent trough levels of vancomycin or gentamicin which were within acceptable range (n = 1)	NA	0%	UND	UND	UND	UND	0%
% of patients on highly restricted antibiotics that received approval from microbiologist or infectious disease specialist and whose prescription was signed by the Consultant-in-Charge (n = 3)	NA	0%	UND	UND	UND	UND	0%
% of patients who required highly restricted antibiotics and who were placed on them (n = 8)	NA	50%	0%	UND	0%	0%	25%
% of antibiotics that are correctly targeted to the bacteria based on culture results (n = 130)	NA	35%	47%	27%	18%	50%	33%
% of antibiotics for which stop dates or review dates are written (n = 527)	NA	4.3%	6.4%	22%	4.7%	9.2%	8.5%
Mean ASI (n = 333)	NA	9.6	7.6	7.3	6.7	7.3	7.6
% of patients on double (or more) anaerobic coverage (n = 149)	NA	12%	0%	4.3%	9.3%	9.5%	7.4%

% of patients with a proper indication for antibiotics whose duration of therapy exceeded the one in the NAG at the time of the survey (n = 283)	NA	56%	37%	53%	45%	40%	46%
% of patients who should not be on antibiotics but who were on them (n = 333)	NA	9.5%	26%	13%	8.4%	13%	14%
% of patients not on directed therapy who were on the antibiotics as written in the NAG (n = 317)	NA	7%	10%	24%	13%	14%	13%
% of antibiotics (excluding those on gentamicin, amikacin and vancomycin) whose antibiotic dose and route of administration are compliant with the NAG (n = 494)	NA	79%	76%	70%	81%	70%	76%
% of patients not on directed therapy who were compliant overall with the NAG (when assessable) (n = 316)	≥ 90%[2]	1.7%	1.6%	10%	2.5%	1.7%	3.5%
Among those whose type of antibiotics are non-compliant to NAG, % of patients not on directed therapy who were on appropriate antibiotic type (when assessable) (n = 266)	NA	25%	16%	33%	39%	35%	30%
Among patients with prescriptions that are overall non-compliant to NAG, % of patients not on directed therapy who had an overall appropriate therapy (when assessable) (n = 305)	NA	8.6%	4.9%	7.7%	8.3%	14%	11%
% of patients who had double (or more) coverage of microbes as indicated by an overlap in ASI ≥ 3 (when assessable) (n = 332)	NA	30%	15%	17%	6%	16%	23%
% of antibiotics that were of the ACCESS category (when assessable) (n = 526)	NA	35%	41%	29%	45%	33%	37%
% of surgical prophylaxis that is continued for > 24 hours (n = 89)	< 5%[4]	100%	73%	100%	96%	94%	94%

Table 4: Indicators for patients on antibiotics. NA – not available. UND – undefined. NAG – National Antibiotic Guidelines. ASI – Antibiotic Spectrum Index.

Discussion

Figure 3 displays the incidence rate of high priority MDRO (HPMDRO) in the ICUs of the country in October 2025. It is expected that worse AMS would be found in hospitals where MDROs are prevalent. Indeed, the hospitals with the most patients on more than two antibiotics at the same time were SSRNH, JH and JNH, in this order. The same three hospitals had the highest DDD per 1,000 patient-days.

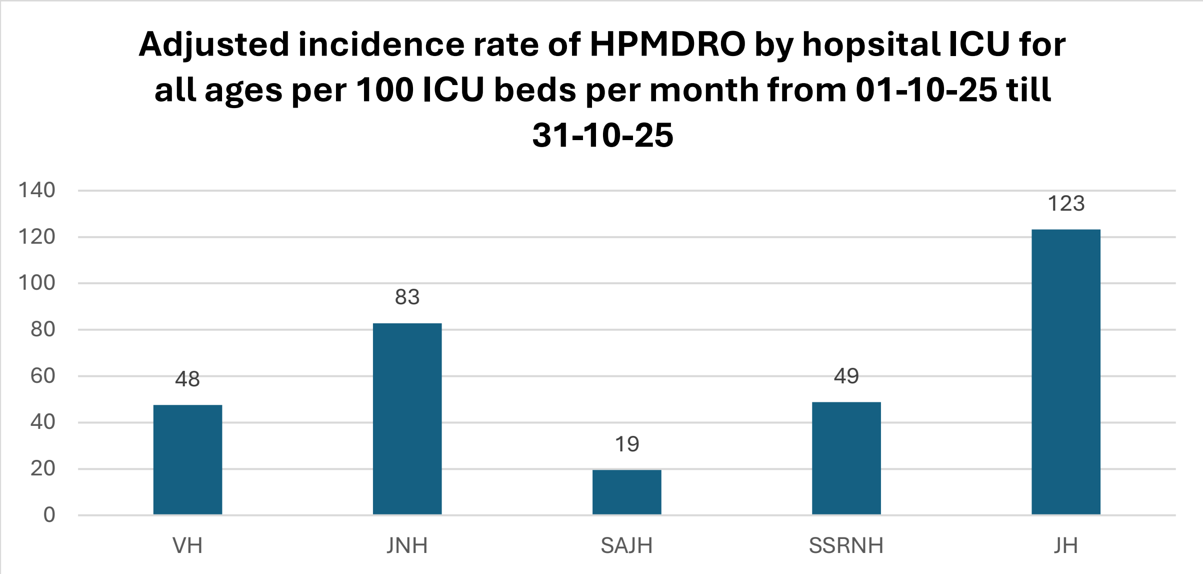

Figure 3

60% of patients surveyed were on antibiotics which is less than the 65% found in the recent HAI PPS study[6] and the 62% in an older study[3]. However, this reduction may be due to coincidence or due to the Hawthorne effect. The corresponding prevalence of antimicrobial use was 81.39% in India while values varied from 49.7% in South Africa, 66.1% in China, 75.6% in Jordan up to 82.1% in Pakistan.[8, 14] It is worth noting that Nigeria reported a drop in antimicrobial use prevalence from 80.6% in 2015 to 44.5% in 2018 i.e., stewardship efforts pay in the long-term.[7] Hence, Mauritius has significant room for improvement. While WHO proposes that a maximum of 26% of patients in the outpatient setting should be prescribed antibiotics[10], a corresponding global benchmark for inpatients has yet to be determined.

This study found that antibiotic use was the highest in neurosurgical wards, general surgical wards and orthopaedic wards, which is similar to the findings of a Russian study in which surgical units had the highest antimicrobial use at 38.1%.[7] Unfortunately, the situation is worse in Mauritius with 86% of neurosurgical patients being placed on antibiotics. In Mauritius, the types of wards with the highest use of antibiotics were the high-dependency units (100% of patients were on antibiotics), adult ICUs (83%) and neonatal ICU (67%) – this is comparable to the same Russian study where up to 100% of patients in the ICU were on antimicrobials.[7]

The prescription pattern in the country has changed from 2018 to 2025 since the most commonly prescribed antibiotics are now ceftriaxone, metronidazole and ciprofloxacin (both by percentage of prescriptions and by sums of DDD) – in 2018, the top three antibiotics used were metronidazole, amoxicillin/clavulanate and ceftriaxone. The changing landscape of how prescribers use antimicrobials can complicate procurement efforts in the public sector. The abnormally elevated use of metronidazole in the country persists. In Europe, the most common antibiotics used were ceftriaxone, amoxicillin/clavulanate and piperacillin/tazobactam.[5]

In the public sector, 37% of antibiotics used in the hospitals were of the ACCESS category, 62% of the WATCH category and 0.57% of the RESERVE category, according to WHO's AWaRe classification. This shows a drop from 7.3% in the use of RESERVE antibiotics since 2018[3] mostly due to colistin being 'out of stock' during the survey period in 2025. International trends are similar with 47% use of ACCESS antibiotics in India[8] while middle-income countries used about 35% ACCESS antibiotics worldwide[7].

The mean length of therapy (LOT) has decreased from 8.7 days per patient in 2018[3] to 6.7 days in 2025. The longest duration of treatment was being prescribed at VH and unsurprisingly, was in the neonatal ICUs followed by adult ICUs. Specialties with the longest LOT was neurosurgery, neonatology and orthopaedics.

The mean RATA score of 2.6 nationally implies that stakeholders should expect at least two components (out of the following five components: type of antibiotics, dose, frequency, duration and accurate de-escalation based on culture results) of an antibiotic prescription to be wrong about 50% of the time. This is worsening since 2018 when the mean RATA was 2.8.

The increase in national DDD per 1,000 patient-days from 427 in 2018[3] to 549 in 2025 bodes poorly for the future of AMR control in the country. Nonetheless, some Southeast Asian countries have worse values e.g., 918 in Vietnam.[9] It is highlighted that since this study was carried out in a short interval of only two weeks, one should be cautious in interpreting this data and annual antimicrobial consumption data from the pharmacy department should be awaited. AMU is known to vary from month to month.

All patients should have a suspected or confirmed infectious diagnosis written in their notes if they are on antimicrobials – JH and SSRNH are faring poorly on this indicator since less than two-thirds of their patients have any diagnosis properly written. Even in Belgium, only 81.9% of patients had a reason for antimicrobial use recorded.[7] Brazil showed an improvement in such documentation from 62.2% in 2015 to 70.9% in 2018 with a more pronounced improvement in Nigeria from 53.4% to 97.2%, thanks to the application of AMS practices.[7]

Similarly, stop dates or review dates are rarely recorded in Mauritius (< 10%), a finding comparable to that in Jordan (8.4%[7]) and in Myanmar (16.6%[7]). In Belgium, such dates are documented 40.8% of the time whilst globally, in low- and middle-income countries, these dates are present in 52% of patient folders.[7] Canada had a stop or review date in 62.9% of its notes.[7] Mauritius has a lot to learn from these countries.

27% of patients had antibiotics for surgical prophylaxis which is more than that in Australia (21.4%[4]), Brazil (18.8%[7]), multiple African countries (up to 18%[7]) and Belgium (11.2%[7]) but comparable to that in Myanmar (32%[7]) although France reports up to 50% of its antibiotics are used for surgical prophylaxis with 50% of them being inappropriate[15].

More than 90% of patients on surgical prophylaxis had multiple doses of antibiotics for more than 24 hours. This is a well-known but nonetheless worrying trend in the country and is similar to the 97% rate of abuse of surgical prophylaxis found in Tanzania, Uganda and Zambia[7]. The comparative figure in Australia is 35.9% only[4], 48.3% in European countries[5], 25.2% in Belgium, 31.1% in Canada, 60.9% in Jordan, 78% in Myanmar, 5% in the Philippines in 2019 (an improvement from 85% since 2017), 65.7% in Nigeria, 81% in Russia and 65% in low- and middle-income countries worldwide[7]. The inability to improve on this indicator is mostly due to the purported beliefs of local surgeons that our operation theatres are of sufficiently poor quality to require prolonged courses of antibiotics.

35% of patients had cultures taken before antibiotics were started which is an improvement from 12.5% in 2018.[11] However, the timing of cultures is not well documented i.e., this figure may actually be worse in reality. Of note, algorithms explaining when blood cultures should be ordered exist; in particular, not all inpatients require blood cultures.[12] However, this indicator assesses all types of cultures.

JH had the highest utilization rate of meropenem with 14% of its patients on antibiotics being on meropenem; this could be due to the high burden of MDRO there. However, more worryingly, only a third of these patients had a proper indication for carbapenem use according to the national guidelines i.e., carbapenem use can be safely reduced by more than 50%. This should reduce the prevalence of extensively resistant microbes in the hospitals. In fact, the unusual practice of prescribing meropenem 3.2 times more frequently than piperacillin/tazobactam may have contributed to the rise of meropenem resistance in the country. 6.1% of the patients in this survey were on meropenem which is above the global average of 4.3% and even higher than the Asian countries which prescribe the most amount of meropenem at 5.2%.[7] Of note, meropenem use increased from 13 DDD per 1,000 patient-days in 2018 to 29 DDD per 1,000 patient-days – a threshold of 23 was previously hypothesized as possibly contributing to carbapenem resistance.[3] The fact that colistin was 'out of stock' during the survey period may have contributed to this unusually high consumption rate of meropenem.

Vancomycin and gentamicin trough levels are of critical importance and help to:

- Avoid nephrotoxicity and ototoxicity,

- Ensure adequate drug exposure,
- Guide dose adjustment, and
- Account for patient variability in renal function, age, weight and critical illness.

It is therefore disturbing that virtually no patients on these antibiotics had their trough levels undertaken – this is partly due to the difficulties for practitioners to access lab results in a timely manner.

It is also troubling that prescriptions for highly restricted antibiotics (linezolid, tigecycline, ceftazidime-avibactam and aztreonam) were not signed by Consultants-in-Charge (CIC) and that folders do not reflect discussions with microbiologists or infectious disease specialists prior to starting these antibiotics. In addition, a majority of patients who need these antibiotics still do not get access to them in the public sector due to stock shortages or other procurement issues. This may lead to premature deaths among septic patients.

De-escalation of therapy remains outside the medical culture of the country with only 33% of regimens being properly targeted to culture results (once these results are available). In many instances, culture results are either ignored or not reviewed at all by the treating doctors. This is an issue not only for culture results but for many tests that have a turnaround time of more than 24 hours. Moreover, clinical inertia is likely to be present whenever patients are improving on the current therapy.

The statistically significant elevated mean value of ASI implies an abuse of broad-spectrum antibiotics in the country and helps to partly explain the elevated rate of MDROs. 7.4% of patients received double anaerobic coverage, a problem that is worse at JH. Overall, this is better than in India where double anaerobic coverage rate was 12.6%.[8] However, double coverage overall, as represented by an ASI overlap of three or more, was 23%, a value close to that in India where double gram-negative coverage was 18.3%.[8] This issue was worse once again at JH.

Antibiotic prescribing should be compliant with standardized guidelines to ensure effective patient care, minimize harm, slow the emergence of AMR, promote consistency and equity of care, facilitate training and decision-making, optimize resource use and provide medico-legal protection. It also facilitates the procurement of medicines by improving forecasting, efficiency, transparency, cost control, and supply security.

However, compliance to the NAG remains very poor in Mauritius (< 5%). Compliance rate to national guidelines was 75.7% in Australia[4], 70% in the UK[13], > 80% in Brazil, 73.2% in Belgium, 70.1% in Jordan, 70% in Russia, 31.9% in Myanmar, and 57% worldwide in low- and middle-income countries[7]. Even though local clinicians profess using international guidelines, appropriateness or compliance was still at 14% only. However, this significantly higher percentage suggests that the diverse training backgrounds of

Mauritian specialists—across multiple countries—have influenced the variability in their prescribing practices. Table 5 explains the main reasons for non-compliance or inappropriateness. In order to be lenient, for compliance assessment, the use of ‘ceftriaxone 1g IV BD’ was accepted even though this does not feature in most, if any, international guidelines. In the same vein, with respect to appropriateness, the use of either intravenous or oral ciprofloxacin was considered to be interchangeable.

Compliance or appropriateness component	Rate in Australia[4]	Rate in 2018 in Mauritius[3]	Rate in this study	Main reasons
Antibiotic not indicated	11%	13%	14%	Patients with acute bronchitis, asymptomatic bacteriuria or without any discernible infection according to the data collector and the patient chart, fell in this category.
Excessive duration	13%	63%	46%	The majority of cases involved surgical prophylaxis, absence of an infectious diagnosis and soft tissue infections. The top three antibiotics involved were ceftriaxone, ciprofloxacin and metronidazole.
Incorrect type or combination of antibiotic/s	15%*	69%	62%	Diagnoses involved were surgical prophylaxis (most surgeons used ceftriaxone instead of cefazolin which is poorly accessible in the country), absence of an infectious diagnosis, soft tissue infections (many patients received metronidazole which is not indicated) and acute bronchitis (where no antibiotics are indicated). The top three culprit antibiotics were ceftriaxone, metronidazole and ciprofloxacin.
Incorrect dose or route	16%¶	39%	28%	The patients most affected were those undergoing surgery (e.g., receiving ceftriaxone 1g instead of 2g), those with sepsis (using 200mg of ciprofloxacin instead of 400mg in adults even when their renal function was normal), pneumonia (e.g., incorrect colistin dose or overdosing trimethoprim-sulfamethoxazole for the given renal function) or cystitis (using the wrong dose of ciprofloxacin as indicated above). The antibiotics misused were mostly ciprofloxacin (using the wrong dose as mentioned above), amoxicillin (mostly underdosed in children) and meropenem (under- or overdosed in children and some incorrect adjustments in adults for renal impairment).
Incorrect frequency	--	33%	30%	Such patients needed antibiotics for surgical prophylaxis, pneumonia or sepsis. The antibiotics involved were mostly ceftriaxone (used for surgical prophylaxis at 2g BD or for extended duration), amoxicillin/clavulanic acid (prescribing 1.2g BD instead of TDS in patients with normal renal function), ciprofloxacin (reducing the dose instead of the frequency in renal impairment) and meropenem (not adjusting frequency according to renal function).

*Table 5: Values from the Australian study were recalculated to reflect a percentage of all the antibiotics instead of a percentage of the inappropriate antibiotics. * - taken as the maximum between spectrum being too narrow or too broad. ¶ - taken as the maximum between incorrect dose / frequency and incorrect route.*

Recommendations

Governance, leadership & financing

- Secure strong upper- and middle-management ownership of AMS at hospital and MOHW levels, with clear accountability for prescribing quality, documentation, and follow-up of investigations.
- Establish a dedicated national budget line for AMR and AMS, recognising AMR as a long-term public health and economic threat.
- Fully finance and operationalise the National Action Plan on AMR; without sustainable financing, improvements in AMS indicators will remain unattainable.
- Set national targets for AMS indicators.

Documentation & prescribing practices

- Urgently improve clinical documentation, including recording:
    - Clear infectious diagnosis or indication for every antibiotic,
    - Stop date, or review date, and
    - Rationale for deviations from the NAG.
- Standardise antibiotic prescription charts for restricted antibiotics, as per international norms, to enhance control.

Guideline compliance

- Given that dissemination of protocols and guidelines has generally failed in the country due to poor readership, CICs should change strategies e.g., through:
    - Ward-based teaching,
    - Case-based discussions, and
    - Integration of NAG into daily clinical workflows and drug charts.
- During training, prioritise surgical prophylaxis and antimicrobial use in surgical wards, where misuse is widespread and improperly prolonged courses are common.

Clinical pharmacy

- Create the role of clinical pharmacists who, amongst other duties, will:
    - Cross-check antibiotic doses,

    - Ensure renal dose adjustments,
    - Verify presence of stop/review dates, and
    - Support adjustments of doses by evaluating trough levels.
- Recruit additional pharmacists where necessary, as current staffing levels may be insufficient to support safe and effective AMS activities at scale.
- Formally integrate pharmacists into ward rounds, particularly in ICUs and surgical wards.
- Address the failure of the new Kardex system that is in place since 2019, acknowledging that inconsistencies between what nurses administer compared with what doctors prescribe persist despite a report in 2020 that showed that 89% of patients did not receive their medications (mostly intravenous fluids) adequately – resistance to change as well as logistic hurdles appear to be the main problems.[16]
- Ensure access to restricted and reserve antibiotics when clinically indicated, with appropriate approval mechanisms, to avoid preventable morbidity and mortality.
    - Given the well-documented challenges in accessing rarely used but clinically critical medicines in the country—largely due to procurement challenges such as the absence of supplier bids for small quantities of products and the disproportionately high costs of these items—it is essential to explore alternative mechanisms to ensure timely availability.
    - In this context, the establishment of a Memorandum of Understanding with an external entity would allow for rapid access to selected essential and life-saving medicines when urgently needed. Such an arrangement would reduce delays in patient care, and strengthen health-system preparedness, ultimately safeguarding lives and enhancing the country's ability to respond effectively to rare but high-risk clinical scenarios.

Laboratory results

- Implement and operationalise the 2023 recommendations made by an external consultant (Dr. Baboolall) on improving the turnaround time of laboratory results.
- Establish systems to ensure culture results are actively reviewed, recognising that failure of nurses to alert doctors about results and poor interdisciplinary communication can contribute to missed opportunities for de-escalation and optimisation of therapy.
- Train staff on the importance of doing vancomycin and gentamicin trough levels.

Procurement & access to antibiotics

- Streamline bureaucratic processes that delay the procurement of essential and last-line antibiotics, including WHO-recommended agents such as cefazolin.
- Align procurement processes with the approved National Antibiotic Guidelines (2024), ensuring that guideline-recommended first-line agents, including those in the WHO Essential Medicines List, are reliably available.

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