Antibiotic Use at Two Central Referral Hospitals in Zimbabwe: A Retrospective Analysis of Prescribing Patterns

Silence Zvaraya*

Department of Clinical Pharmacology, Faculty of Medicine and Health Sciences, University of Zimbabwe, Harare, Zimbabwe

***Corresponding Author**

DOI: https://doi.org/10.51244/IJRSI.2026.1315PH00133

Received: 06 July 2026; Accepted: 11 July 2026; Published: 23 July 2026

ABSTRACT

Background: The quality of antibiotic use is closely linked to the emergence of antibiotic resistance. Growing antibiotic misuse and resistance are making previously treatable infections harder to manage, increasing morbidity, mortality, and healthcare costs. This study provides an in-depth assessment of current antibiotic use in the Zimbabwean public hospital sector, using follow-up indicators that were absent from previous national surveys.

Methods: A retrospective review of inpatient medical records was conducted at Parirenyatwa and Harare Central Hospitals. Records generated between 1 January 2015 and 31 January 2016 were reviewed for adults at both sites; pediatrics records at Harare covered 1 January to 30 September 2016. Systematic sampling was used to select records, and WHO drug-use indicator methodology was applied.

Results: Of 1181 records reviewed, 60.6–69.0% (60–70% overall) included at least one antibiotic. Ceftriaxone was the most frequently prescribed antibiotic (27.3% of all antibiotics). Injections were the main route of administration (55.2–69.8%). Almost all antibiotics (97.7–99.9%) were prescribed from the essential drug list, and 61.3–67.2% were prescribed generically. Broad-spectrum antibiotics predominated (57–63%). Switches from injectable to oral therapy accounted for the majority of antibiotic switches (66–76%). Prophylaxis was the leading indication for antibiotic therapy. A microbial sensitivity test was requested in only 11.5–12.0% of antibiotic-treated encounters.

Conclusion: Antibiotic use at these two central hospitals is high, with more than half of admitted patients receiving antibiotics, largely without microbiological confirmation. These findings justify strengthened antimicrobial stewardship, improved laboratory support, and the development of a national antibiotic use policy for Zimbabwe.

Keywords: antibiotic use; prescribing patterns; drug utilisation; hospital; Zimbabwe; essential medicines; antimicrobial resistance; low-resource setting

INTRODUCTION

Antibiotics account for a substantial share of hospital pharmacy expenditure worldwide, and at least a quarter of hospitalised patients are treated with an antibiotic; however, surveys suggest that 22–65% of these prescriptions are inappropriate or incorrect [1,2]. The quality of antibiotic use is closely linked to the development of antibiotic resistance: as misuse and resistance grow, infections that were once straightforward to treat are becoming difficult to manage, driving up morbidity, mortality, and the cost of care [3, 4]. Beyond the direct cost of unnecessary prescriptions, indiscriminate antibiotic use generates substantial indirect costs through prolonged hospitalisation for multidrug-resistant infections, adverse-drug-reaction-related deaths, and the need for newer, more expensive agents [4].

High rates of antibiotic prescribing for viral illnesses such as otitis media and upper respiratory tract infections have been documented across settings [5–7], and this pattern is generally more pronounced, and less appropriate, in developing than in developed countries. A twelve-country comparative analysis of prescribing in developing countries (excluding Zimbabwe) found that 25–75% of patients received an antibiotic during a clinical visit [1, 4]. Zimbabwe's national medicines survey found that antibiotics accounted for 40.9% of medicines prescribed to outpatients in public hospitals, with up to 69.1% of outpatients receiving an antibiotic at some facilities — a higher rate than seen in retail pharmacies [8, 9]. However, that survey, like most other Zimbabwean drug-use research, focused on outpatients and did not include the follow-up indicators (route of administration, generic prescribing, spectrum of activity, antibiotic switching, or microbial sensitivity testing) needed to characterise the quality, and not just the volume, of antibiotic use.

The decline in the discovery of new antibiotics alongside the emergence of resistance has been identified by the World Health Organization (WHO) as a major health threat for the coming years [10]. Controlling resistance requires better use of existing agents and reduced inappropriate prescribing, yet Zimbabwe has no policy guidelines specific to antibiotic use and very few published studies on the subject beyond the periodic National Medicines Survey. Global estimates suggest antibiotic consumption grew by more than 30% between 2000 and 2010, with penicillins and cephalosporins accounting for nearly 60% of consumption, and use of last-resort classes such as carbapenems and polymyxins rising sharply, particularly in middle-income countries [11]. An estimated 20–50% of all antibiotic use is inappropriate [12], contributing directly to resistance; in low- and middle-income countries, up to 70% of hospital-acquired neonatal infections cannot be successfully treated with WHO-recommended regimens because of resistance [13]. In hospital settings specifically, overuse of broad-spectrum agents — even after negative culture results — has been repeatedly documented in both high-income and developing-country hospitals [14–17], and inappropriate surgical antibiotic prophylaxis remains common in many low-resource settings [18,19].

Generic prescribing and adherence to essential medicines lists (EML) are recognised tools for containing drug costs and promoting rational use [9,20]; after countries introduced generic prescribing, world market prices for medicines on the WHO Model List fell by 40% [9]. Given this backdrop — rising global antibiotic consumption, well-documented inappropriate prescribing in hospital settings, and the absence of in-depth inpatient antibiotic-use data for Zimbabwe — this study set out to characterise the current pattern and profile of antibiotic use at two of Zimbabwe's largest referral hospitals, to provide baseline evidence to inform future antimicrobial stewardship efforts and policy development.

Aim and objectives

The aim of this study was to investigate the current pattern and profile of antibiotic use at Parirenyatwa and Harare Central Hospitals, Zimbabwe. The specific objectives were to determine: (i) the proportion of encounters with an antibiotic prescribed, and the percentage share of individual antibiotics; (ii) the proportion of antibiotics prescribed by generic name and from the essential drug list; (iii) the proportion of broad- versus narrow-spectrum antibiotic use; (iv) the proportion of antibiotic-treated encounters on which a microbial sensitivity test was requested; and (v) the common indications for antibiotic therapy.

Methods

Study design and setting

This was a retrospective review of inpatient medical records at Parirenyatwa and Harare Central Hospitals, two of the largest referral hospitals in Harare and in Zimbabwe. At Parirenyatwa, records generated between 1 January 2015 and 31 January 2016 were reviewed. At Harare, adult records from the same period were reviewed, along with paediatric records generated between 1 January and 30 September 2016.

Sample size and sampling

In line with WHO guidance that drug-use surveys include at least 600 encounters [21], an encounter was defined as any inpatient medical record, and an encounter of interest as any record with at least one antibiotic prescribed. A systematic sampling technique was used: the total number of encounters in the study period was divided by the desired sample size to obtain a sampling interval (e.g., 43,200 encounters ÷ 600 target sample at *Parirenyatwa gave an interval of 72, so every 72nd record was selected).*

Data collection

Medical records of inpatients who received an antibiotic were reviewed for demographic and clinical data, extracted using a structured data-extraction tool adapted from the WHO detailed prescribing encounter form [21] and supplemented with indicators from comparable studies. Variables captured included age, sex, admission and discharge dates, department/ward, diagnosis, prescribed antibiotic(s), route of administration, duration of treatment, generic versus brand naming, essential-drug-list status, narrow- versus broad-spectrum classification, antibiotic switches, and requests for microbial sensitivity testing. The tool was field-tested before data collection began.

Data analysis

Descriptive statistics were used to summarise antibiotic-use patterns, using IBM SPSS Statistics. Core and supplementary drug-use indicators were calculated according to WHO recommended methodology [21], including percentage of encounters with an antibiotic prescribed, percentage share of individual antibiotics, percentage prescribed generically and from the essential drug list, proportion of broad- versus narrow-spectrum antibiotics, percentage of encounters with a microbial sensitivity test requested, percentage of encounters with an injectable antibiotic prescribed, average antibiotic switches per encounter, and the most frequent indications for antibiotic therapy. The Zimbabwe Essential Drugs List (EDLIZ), 6th edition, and the WHO Model List of Essential Medicines were used as reference standards for essential-medicines and generic-name classification.

Ethical considerations

Ethical approval was obtained from the Joint Parirenyatwa Hospital and College of Health Sciences Research Ethics Committee (JREC) and the Harare Central Hospital Ethics Committees prior to data collection. No patient names or other unique identifying information were extracted or recorded, in order to protect patient privacy.

Results

A total of 604 medical records were reviewed at Parirenyatwa, of which 366 (60.6%) included at least one antibiotic prescription; of these, 31.9% of patients were male and 68.1% female (age range 2 days–92 years). At Harare, 577 records were reviewed, of which 399 (69.0%) included at least one antibiotic; 46.2% of these patients were male and 53.8% female (age range 5 hours–84 years). Baseline characteristics are summarised in Table 1.

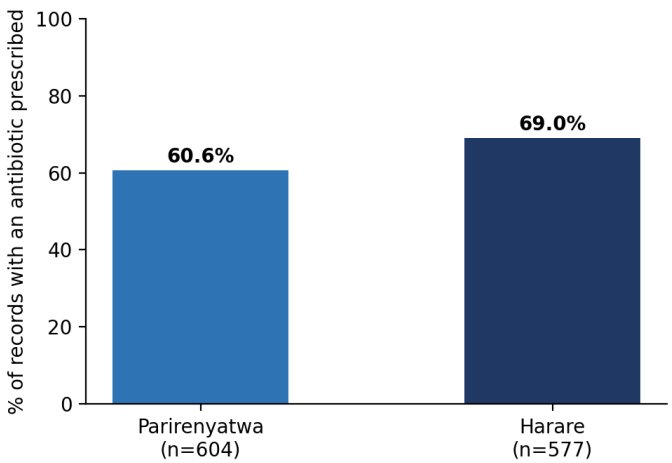

Figure 1. Percentage of inpatient records with at least one antibiotic prescribed, by hospital.

Table 1. Baseline characteristics of study records

Characteristic	Parirenyatwa	Harare
Records reviewed, n	604	577
Records with ≥1 antibiotic, n (%)	366 (60.6)	399 (69.0)
Male, %	31.9	46.2
Female, %	68.1	53.8
Age range	2 days – 92 years	5 hours – 84 years
Total antibiotics prescribed, n	791	963
Antibiotics per antibiotic-treated encounter (mean)	2.16	2.41

The average number of antibiotics prescribed per antibiotic-treated encounter was 2.16 at Parirenyatwa and 2.41 at Harare (combined average 2.29), with a maximum of four and five antibiotics on a single prescription, respectively.

Table 2. Combined percentage share of the most frequently prescribed antibiotics across both hospitals (n = 1754 antibiotic prescriptions)

Antibiotic	Frequency	% of total
Ceftriaxone (iv)	479	27.3
Amoxicillin (po)	253	14.4
Metronidazole (iv)	211	12.0
Metronidazole (po)	196	11.2
Benzyl penicillin (iv)	195	11.1
Gentamicin (iv)	179	10.2
Ciprofloxacin (po)	63	3.6
Erythromycin (po)	32	1.8
Cloxacillin (po)	30	1.7
Tetracycline (eye ointment)	18	1.0
Other (13 additional antibiotics)	98	5.6

Ceftriaxone and amoxicillin were consistently the most frequently prescribed antibiotics at both sites (Table 2), a pattern consistent with the global predominance of penicillins and cephalosporins as first-line agents.

Table 3. Summary drug-use indicators, by hospital

Indicator	Parirenyatwa	Harare
Antibiotics prescribed from essential drug list, %	99.4	99.9
Antibiotics prescribed by generic name, %	67.2	61.3
Broad-spectrum antibiotic use, %	63	57
Antibiotics administered by injection, %	55.2	69.8
Antibiotic switches: injection → oral, % of switches	76	66
Encounters with microbial sensitivity test requested, %	11.5	12.0

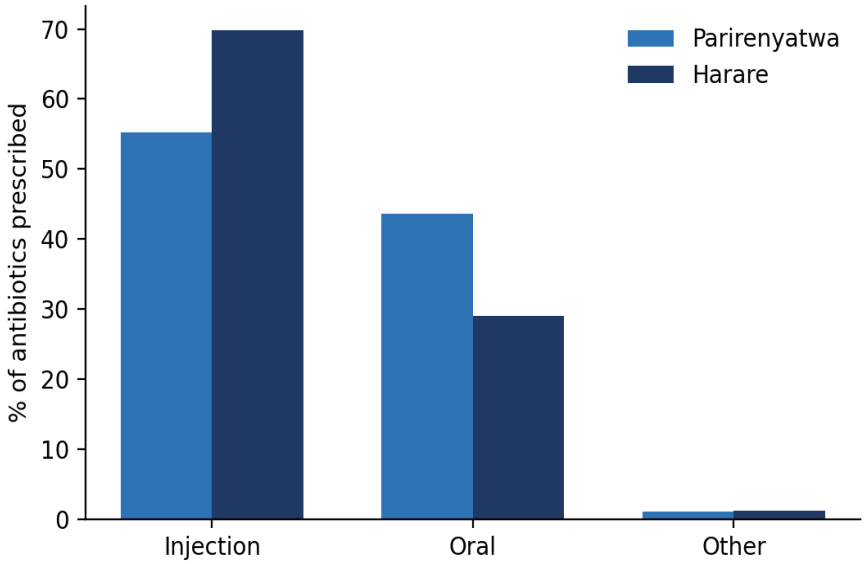

Figure 2. Route of administration of prescribed antibiotics, by hospital.

Table 4. Combined common indications for antibiotic therapy (both hospitals; encounters could have more than one indication)

Indication category	Frequency	% of indications
Prophylaxis (surgical/obstetric)	384	43.0
Respiratory system infections	216	24.2
Other (anaemia, malaria, jaundice, renal disease, malignancy)	82	9.2
Gastrointestinal system infections	67	7.5
Central nervous system infections	47	5.3
Blood infections (sepsis)	35	3.9
Urogenital system infections	35	3.9

Indication category	Frequency	% of indications
Musculoskeletal system infections	12	1.3
Oral infections	6	0.7
Cardiovascular system infections	5	0.6
Skin infections	3	0.3
Eye infections	2	0.2

Prophylaxis — chiefly for caesarean section, vaginal tear repair, and other surgical procedures — was the single most common indication for antibiotic therapy at both hospitals, followed by respiratory tract infections, principally pneumonia. Department-level breakdowns (maternity, paediatrics, and adult wards), including age and gender distributions and department-specific prescribing patterns, are provided in the Supplementary Material.

DISCUSSION

The major finding of this study is that 60.6–69.0% of surveyed inpatients at two Zimbabwean central hospitals received an antibiotic during admission. This is comparable to a study from Israel reporting 62% of admitted patients receiving an antibiotic [14], and somewhat higher than the 56% reported across 323 United States hospitals [15]. The higher figures here are consistent with the broader observation that the principal indication for hospital admission in developing countries is often infectious disease [15], and may also reflect this study's large paediatric sub-sample and the tendency for referral hospitals to receive more complex, infection-prone cases.

Ceftriaxone and amoxicillin were the most frequently prescribed antibiotics, mirroring global patterns in which penicillins and cephalosporins dominate first-line antibiotic use [11]. Given that prophylaxis was the leading indication, the high use of ceftriaxone likely reflects its status as the antibiotic of choice for surgical prophylaxis under EDLIZ, Zimbabwe's national treatment guideline. The low rate of microbial sensitivity testing (11.5–12.0%) may also be driving broad-spectrum, empirical prescribing, since prescribers lacking culture confirmation tend to select agents with wider coverage.

Injectable antibiotics were used more often than oral formulations (55.2–69.8%), most markedly in paediatric wards, where most patients were under three months old and the oral route is often unsuitable. In adult wards, the referral-hospital case-mix — patients with more severe illness requiring rapid onset of action — likely explains the preference for injectables. By contrast, maternity departments favoured oral antibiotics, consistent with prophylaxis for vaginal tears in generally well patients, with injections reserved mainly for caesarean-section prophylaxis. High injectable use carries cost and safety implications: injectable formulations are typically more expensive, require trained staff to administer, and, if hygiene is compromised, can increase the risk of bloodborne pathogen transmission.

Essential-drug-list adherence was high (>95%, close to the WHO ideal of 100%), suggesting that prescribers are largely following EDLIZ guidance; however, this is tempered by well-documented stock shortages of essential medicines at Zimbabwean central hospitals [9], which can force facilities toward more expensive branded alternatives from private wholesalers. Most antibiotics (61.3–67.2%) were prescribed generically, likely reflecting supply through Zimbabwe's National Pharmaceutical Company (NatPharm), which distributes generically named products to public facilities.

Broad-spectrum antibiotics were more commonly prescribed than narrow-spectrum agents (57–63%), consistent with global trends [22] and with United States hospital data showing that broad-spectrum therapy is frequently continued even after pathogen identification [15]. This pattern carries a recognised trade-off: broad-spectrum

use disrupts intestinal flora and increases the risk of Clostridium difficile infection, while a 30% reduction in broad-spectrum prescribing has been associated with a 26% reduction in C. difficile incidence [15]. Low rates of microbial sensitivity testing (11.5–12.0%) — likely compounded by poor record-keeping on culture results — limited our ability to determine what proportion of antibiotics were prescribed based on confirmed sensitivity rather than clinical suspicion alone; this rate is broadly consistent with, though somewhat higher than, the 4% reported in Nigerian hospitals [16] and 20% in another comparable study [23].

The predominant switch pattern, from injectable to oral therapy (66–76% of switches), likely reflects clinical improvement enabling a transition to less expensive, easier-to-administer oral regimens that support adherence after discharge. Consistent with regional evidence that antibiotics are still sometimes given after rather than before surgery [17], some surgical prophylaxis in this study population may have required longer treatment courses than would be expected with pre-operative dosing, with associated cost and resistance implications.

CONCLUSION

Ceftriaxone was the most commonly prescribed antibiotic across both hospitals, with an average of more than two antibiotics prescribed per patient, but fewer than one in five antibiotic-treated encounters had a microbial sensitivity test requested. Poor record-keeping around the request and follow-up of sensitivity testing was also noted. Overall, antibiotic use at these two central hospitals appears high, with more than half of admitted patients receiving antibiotics — findings that justify strengthened monitoring and stewardship to improve the appropriateness of antibiotic therapy.

Limitations

- Incomplete documentation of microbial sensitivity test results meant this study could not reliably estimate the proportion of antibiotics prescribed based on confirmed sensitivity, only on whether a test was requested.
- As central, tertiary referral hospitals, these results reflect local prescribing patterns and patient case-mix, which may limit generalisability to secondary or primary care facilities in Zimbabwe.

Recommendations

- Hospital drug and therapeutics committees should regularly review antibiotic use, conduct audits, and provide prescriber feedback.
- Laboratory capacity should be strengthened to reduce reliance on empirical prescribing and to support resistance surveillance.
- Use of last-resort antibiotic classes should be restricted to prevent the emergence of untreatable strains.
- Zimbabwe should develop and implement a national antibiotic use policy.
- Prescriber and public awareness campaigns should be developed to support more appropriate antibiotic use.

Declarations

Ethics approval and consent to participate

This study was approved by the Joint Parirenyatwa Hospital and College of Health Sciences Research Ethics Committee (JREC) and the Harare Central Hospital Ethics Committees. As this was a retrospective review of de-identified medical records, individual patient consent was not obtained; this should be confirmed against the specific waiver granted by the ethics committees when finalising for submission.

Consent for publication

Not applicable — no identifying patient information is included in this manuscript.

Competing interests

The author declares there are no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors,' as applicable.

ACKNOWLEDGEMENTS

The authors thank the Clinical Directors of Harare Central Hospitals for permission to conduct this study, and the Medical Records Departments of both institutions for their assistance with data access.

REFERENCES

1. Al-Niemat SI, Bloukh DT, Al-Harasis MD, Al-Fanek AF, Salah RK. Drug use evaluation of antibiotics prescribed in Jordan hospital outpatient and emergency clinics using WHO prescribing indicators. Saudi Med J. 2001;29(5):743–8.
2. Faranak A, Kirsteen G, Dilip N, Gabby P, Simon O, Grag R, Peter D. Outcome of an intervention to improve hospital antibiotic prescribing: interrupted time series with segmented regression analysis. J Antimicrob Chemother. 2003;52(5):842–8.
3. Kuster SP, Ruef C, Ledergerber B, Hintermann A, Depiazes C, Neuber R, et al. Quantitative antibiotic use in hospitals: comparison of measurements, literature review and recommendations for standard of reporting. Infection. 2008;36(6):549–55.
4. World Health Organization. Intervention and strategies to improve the use of antimicrobials in developing countries: drug management program. Geneva: WHO; 2001 (WHO/CDS/CSR/DSR/2001.9).
5. Sujith JC. Consequences of irrational use of antibiotics. Indian J Med Ethics. 2008;4:174–5.
6. Steinman MA, Yang KY, Byron SC, Maselli JH, Gonzales R. Variation in outpatient antibiotic prescribing in the United States. Am J Manag Care. 2009;15:861–8.
7. Starrels JL, Barg FK, Metlay JP. Patterns and determinants of inappropriate antibiotic use in injection drug users. J Gen Intern Med. 2009;24(2):263–9.
8. Ministry of Health and Child Care, Zimbabwe. National Medicines Survey: Zimbabwe Public Sector Report. 2013.
9. Ministry of Health and Child Care, Zimbabwe. National Medicines Survey: Zimbabwe Private Sector Report. 2013.
10. World Health Organization. Global strategy for containment of antimicrobial resistance. Geneva: WHO; 2011.
11. Van Boeckel TP, Gandra S, Ashok A, Caudron Q, Grenfell BT, Levin SA, Laxminarayan R. Global antibiotic consumption 2000–2010: an analysis of national pharmaceutical sales data. Lancet Infect Dis. 2014;14(8):742–50.
12. Cizman M. The use and resistance to antibiotics in the community. Int J Antimicrob Agents. 2003;21(4):297–307.
13. Zaidi AK, Huskins WC, Thaver D, Bhutta ZA, Abbas Z, Goldmann DA. Hospital-acquired neonatal infections in developing countries. Lancet. 2005;365(9465):1175–88.
14. Raveh D, Levy Y, Schlesinger A, Greenberg B, Rudensky B, Yinnon AM. Longitudinal surveillance of antibiotic use in the hospital. QJM. 2001;94:141–52.
15. Fridkin SK, Baggs J, Fagan R, Magill S, Pollack LA, Malpiedi P, et al. Vital signs: improving antibiotic use among hospitalized patients. MMWR Morb Mortal Wkly Rep. 2014;63(9):194–200.
16. Chukwuani CM, Onifade M, Sumonu K. Survey of drug use practices and antibiotic prescribing pattern at a general hospital in Nigeria. Pharm World Sci. 2002;24(5):188–95.

17. Aiken AM, Wanyoro AK, Mwangi J, Juma F, Mugoya IK, Scott JAG. Changing use of surgical antibiotic prophylaxis in Thika Hospital, Kenya: a quality improvement intervention with an interrupted time series design. PLoS One. 2013;8(11):e78942.
18. Rana DA, Malhotra SD, Patel J. Inappropriate surgical chemoprophylaxis and surgical site infection rate at a tertiary care teaching hospital. Braz J Infect Dis. 2013;17(1):48–53.
19. Braykov NP, Morgan DJ, Schweizer ML, Uslan DZ, Kelesidis T, Weisenberg SA, et al. Assessment of empirical antibiotic therapy optimisation in six hospitals: an observational cohort study. Lancet Infect Dis. 2014;14(12):1220–7.
20. Jonathan DQ, Hans VH, German V, Lembit R. Twenty-five years of essential medicines. Bull World Health Organ. 2002;80(11):913–4.
21. World Health Organization. How to investigate drug use in health facilities: selected drug use indicators. Geneva: WHO; 1993.
22. McCaig LF, Besser RE, Hughes JM. Antimicrobial prescription in ambulatory care settings, United States. Emerg Infect Dis. 2003;9:432–7.
23. Kollef MH. Appropriate empirical antibacterial therapy for nosocomial infections: getting it right the first time. Drugs. 2000;63:2157–68.
24. Thu TA, Rahman M, Coffin S, Harun-Or-Rashid M, Sakamoto J, Hung NV. Antibiotic use in Vietnamese hospitals: a multicentre point prevalence study. Am J Infect Control. 2012;40(9):840–4.
25. Shankar PR, Pai R, Dubey AK, Upadhyay DK. Prescribing patterns in the orthopaedics outpatient department in a teaching hospital in Pokhara, Western Nepal. Kathmandu Univ Med J. 2006;5(1):16–21..