

**ASSESSING PRESCRIBING PATTERNS OF ESSENTIAL MEDICINES IN THREE RURAL DISTRICT HOSPITALS IN RWANDA**

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ABSTRACT

Inappropriate prescribing is a global health problem and main challenges include over prescription of antibiotics, over-use of injections, over-spending by failing to prescribe generic medicines and prescription of multiple medicines. This cross-sectional study included patient encounters at outpatient departments of three rural hospitals in Rwanda to assess prescribing patterns of essential medicines using the WHO core prescribing indicators. Patient encounters were randomly sampled. Chi-square and Kruskal-Wallis statistical tests were used to compare results. Our findings show that the average number of medicines prescribed per patient (1.8) was within WHO targets, the percentage of encounters with an antibiotic prescribed (37.2%) was above targets, while the percentage of encounters with an injection prescribed (7.2%) and percentage of medicines prescribed in generic names (75.0%) or from the National Essential Medicines List (70.5%) were below WHO targets. Clinicians, researchers, academics and policymakers should use these findings to plan for interventions like problem-based learning or Drug and Therapeutics Committees that promote good prescribing practices.

Key words: Prescribing patterns, Prescribing indicators, Essential medicines, WHO core drug use indicators, Drug use in health facilities, Rwanda

INTRODUCTION

According to the World Health Organization, more than 50% of all medicines are prescribed, dispensed or sold inappropriately.^[1] There are often problems with prescribing patterns, particularly in resource poor settings. Challenges include over prescription of antibiotics, over-use of injections due to the misconception of their efficacy, over-spending by failing to prescribe generic medicines and unnecessary prescription of multiple medicines.^[2,3,4]

Access to medicines is greatly affected by the prescribing behaviors in health facilities. Even though standard treatment guidelines are well established, many prescribers do not follow these guidelines.^[2,3,4,5] Bad prescribing habits lead to ineffective and unsafe treatment, exacerbation of illness, harm to the patient and a waste of resources due to the use of unnecessary products, the use of unnecessarily

expensive products or the use of more products than required.^[6,7] There are also hidden costs of poor prescribing practices such as prolonged hospital stays, introduction of medicine resistance, spread of disease to other individuals and lost days of work.^[7]

In Rwanda, the majority of medications prescribed in public health facilities are supplied through a National Medical Procurement and Production Division (MPPD) which procures pharmaceuticals that are distributed to district pharmacies which in turn supply to the district hospitals and health centers. The Rwanda Ministry of Health (MOH) aims to ensure equitable access to essential medical products of assured quality, safety, efficacy and cost-effectiveness.^[8] The MOH has established clinical guidelines such as the National Standard Treatment Guidelines, the National Therapeutic Formulary and the National Essential Medicine List that guide prescribing of

appropriate treatments for common illnesses at appropriate levels. In 2007, MOH initiated mechanisms to promote the rational use of medicines including establishment of Drug and Therapeutics Committees (DTCs) in all district and referral hospitals. The main role of DTC is to assess problems related to the use of medicines and propose strategies to address them at health facilities.^[8]

Few studies in East Africa have explored prescribing patterns in national health facilities and to our knowledge; none have been published from Rwanda. Our study assessed prescribing patterns of essential medicines in three rural district hospitals supported by Partners In Health-Inshuti Mu Buzima (PIH-IMB) in Rwanda using the WHO core drug use indicators in order to identify gaps in prescribing practices. The ultimate aim of this study is to inform the development of equitable and efficient pharmaceutical systems and to mitigate the consequences of inappropriate use of medicines.

MATERIALS AND METHODS

Rwanda, located in Eastern Africa, is one of the most densely populated countries in Africa (415 inhabitants/km²).^[9] The health system in Rwanda is a decentralized, multi-tiered system with over 450 health centers (prevention, primary health care, inpatient and maternity), 43 district hospitals (inpatient and outpatient), 3 national referral hospitals and 3 specialized hospitals. This study was conducted at Rwinkwavu, Kirehe and Butaro District Hospitals, public hospitals that are supported by PIH-IMB, a US-based non-governmental organization that supports the Government of Rwanda to strengthen health care delivery in those districts.

This cross-sectional study included a random selection of 321 patient encounters, 107 per hospital, between the 1st July 2012 and 30th June 2013. The study population included patient encounters from the outpatient departments of three district hospitals in rural Rwanda, which predominantly serve patients referred from the primary care facilities.

The WHO core indicator of proportion of encounters prescribed antibiotics was considered the primary outcome and used for sample size calculation. We compared the proportion of visits with antibiotics prescribed to the WHO standard target of 25% using a two-sided test at $\alpha=0.05$ significance level. Assuming that the true proportions of visits with antibiotics prescribed is 40%, then we needed a sample size of 107 patient charts at each site to have 90% power to detect a difference.

Data was extracted from the outpatient registers and randomly sampled patient charts. Data was entered directly into an electronic data collection form on the following variables: provider type, patient gender, patient age, definitive diagnosis, and whether a patient received a medical prescription. For patients that received a medical prescription, the following information was collected: whether an antibiotic or injection was prescribed, the

number of medicines prescribed, if the prescription was by generic name and if the prescribed drug was from the National Essential Medicines List. Data was double entered and checked for consistency. Inconsistencies were confirmed against paper records and corrected.

We assessed prescribing patterns of essential medicines at outpatient departments using proportions with 95% confidence intervals. Chi-square and Kruskal-Wallis statistical tests were used to compare our results across three hospitals and to the WHO standard targets for best prescribing practices. The data was analyzed using Stata v12.0 (College Station, TX: StataCorp LP).

This study received technical review and approval from the Inshuti Mu Buzima Research Committee and the Rwanda Biomedical Center-National Health Research Committee and ethical clearance from Rwanda National Ethics Committee. The MOH and the management of the three district hospitals provided final authorization for the use of the data for the study.

RESULTS

Across the three hospitals, a total of 321 patient encounters were analyzed. In the basic characteristics of our study sample, the majority of the patients (57.8%) were between 15-44 years and 51.4% were male (Table 1). The most common definitive diagnoses were infectious diseases (26.5%) and entero-gastric diseases (12.4%). The majority of patients (85.0%) received a prescription and physicians provided 99.4% of all prescriptions.

Overall, 587 medicines were prescribed and the average number of medicines prescribed per patient encounter was 1.8 (SD=1.16), compared to the WHO target of 1.6 to 1.8 (Table 2). The average number was higher in Rwinkwavu at 2.1 compared to 1.6 in Butaro and 1.7 in Kirehe District Hospital ($p=0.002$).

The aggregate percentage of encounters with an antibiotic prescribed was 37.2% (95% CI: 31.9-42.5) compared to the WHO target of 20.0% to 26.8%, with no significant difference found between the district hospitals. The overall percentage of encounters with an injection prescribed was 7.2% (95% CI: 4.3-10.0) compared to the WHO target of 13.4 to 24.1%. It was higher at Rwinkwavu (15.0%) compared to Kirehe (3.7%) and Butaro (2.8%) ($p=0.001$).

Across the three sites, the percentage of medicines prescribed with generic names was 75.0% (95% CI: 71.2-78.4) compared to the WHO target of 100%. This was higher in Butaro (77.2%) compared to Rwinkwavu (75.2%) and Kirehe (72.6%) ($p<0.001$). Most medicines (70.5%; 95% CI: 66.7-74.2) were prescribed from the National Essential Medicines List compared to WHO target of 100%. This rate was higher at Rwinkwavu (73.9%) compared to Kirehe (68.8%) and Butaro (67.8%) District Hospitals ($p<0.001$).

DISCUSSION

The findings of our study show that the average number of medicines prescribed per patient encounter are within WHO targets. However, similar studies conducted in sub-Saharan Africa have shown polypharmacy with high variability in the average number of medicines, ranging from 1.9 to 3.2.^[2,3,4,5] We believe the lower rates of the average number of medicines prescribed per patient encounter at these sites in Rwanda is attributable to national guidelines with references to National Essential Medicines List that recommend prescribers to rely on definitive diagnosis which limit the number of medicines prescribed.

The aggregate percentage of encounters with an antibiotic prescribed, 37.2%, was higher than the WHO target range of 20-26.8%, but lower than the 38% to 68.1% of encounters found in other studies from sub-Saharan African countries.^[2,3,10,11] Antibiotic resistance has been on the rise globally, leading to poorer health outcomes and extra costs for the government to resolve the problem.^[11] While the antibiotic use is comparatively low for the region, the consequences of inappropriate over-prescription of antibiotics are major, and efforts should be increased to encourage their appropriate use.

According to similar studies recently conducted in sub-Saharan Africa, there continues to be high variability in the percentage of injections per encounter from 8.3% to 38.1%.^[2,3,4,10] Our findings show that the percentage of encounters in which an injection was prescribed is 7.2%, which is below WHO standards. In Rwandan settings, prescription of injections is common for inpatients but reserved for limited cases in outpatient departments. Our study focused on outpatient departments explaining the low use of injections. However, since the goal of this indicator is to minimize the use of injections, the three rural hospitals are performing well compared to the region possibly due to prescribers and patients beliefs and attitudes about the relative efficacy of oral medicines versus injections, inexistence of financial incentives for prescribers to give injections rather than oral formulations and availability of alternative oral formulations.

In the hospitals studied, only 75% of medicines were prescribed in generic names, while the WHO target is 100%. Other sub-Saharan African countries have shown a range of 45.2% to 98.7% of medicines prescribed by generic name.^[2,3,4,5] We hypothesize that some prescribers may prefer using brand names while prescribing as they are easier to memorize and are in some cases actively promoted by pharmaceutical representatives. Moreover, for the case of resource poor settings where access to medicines is restricted to the essential medicines prescribed in generic names and supplied through the public supply chain, patients may have difficulties in searching for drugs that are written with brand names.^[12] as well as higher costs where both generic and brand name are available.

The aggregate percentage of medicines prescribed from the National Medicines Essential List was 70.5%, which is also

lower, compared to WHO standards. Studies in sub-Saharan Africa report a wide range in the proportion of medicines prescribed from the National Essential Medicines List between 22.4% to 96.6%.^[2,3,5,13,14] Factors such as diverse educational background of prescribers, staff turnover and non-adherence to treatment protocols may have contributed to that trend.

The National Essential Medicines List is the list of all health commodities that are used to treat or manage common or readily encountered diseases in a specific country at a particular facility-level. It is important to note, however, that the PIH-IMB-supported district hospitals also serve specialized needs beyond the current national scope of district hospitals in the fields of non-communicable diseases, oncology and neonatology, introducing medicines that are not yet on the National Essential Medicines List. In Rwanda, the current National Essential Medicine List was published in 2010, and the Ministry of Health is currently working with clinicians, stakeholders and development partners to develop the 6th edition of the National Essential Medicine List and the 1st edition of the Pediatric National Essential Medicines List in order to meet the evolving needs of the Rwandan population. Future iterations are likely to include some of these additional specialized care health commodities.

DTCs, which have been promoted by the MOH for implementation at all district hospitals in Rwanda, are a recommended forum through which all healthcare stakeholders can participate in decisions related to medicines use, particularly in developing and revising formularies, evaluating medicines use and implementing quality improvement initiatives.^[15] In Rwanda, DTCs have a mandate to effectively promote the rational use of medicines and are regularly found in developed settings.^[16,17] Furthermore, the establishment of DTCs has been advocated by WHO as one of the twelve key interventions to promote rational medicine use.^[11] While we lack data on the performance of DTCs in Rwanda, strengthening them may contribute to ensuring the best prescribing practices at health facilities.

CONCLUSION

Based on WHO guidelines, our findings show rational prescribing practices in relation to the number of medicines per encounter and the percentage of encounters with an injection prescribed. However, prescribing behaviors in the prescription of antibiotics, medicines in generic names and medicines from the National Essential Medicines List are outside the WHO ranges. Identification of the root causes of problems related to prescribing need to be further studied in order to propose and deliver quality improvement initiatives. In particular, assessment to determine if the prescribing decisions follow best practice guidelines would be informative. Further monitoring and evaluation of prescribing practices could be considered for incorporation into the national strategy as part of regular clinical audits. Findings from this study can be used by clinicians, researchers, academics, policymakers and partner organizations to plan for multifaceted interventions that

have proved useful and effective in promoting rational use of medicines. Those interventions include problem-based learning, Drug and Therapeutics Committees, regular review and updating of the National Essential Medicines List and Standard Treatment Guidelines, continuous professional development for healthcare providers and ensuring availability and affordability of essential medicines.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

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Table 1. Basic characteristics of the sample of patient encounters

Description	n	Percentage
Patient's age		N=313
0-14 years	58	18.5
15-29 years	94	30.0
30-44 years	87	27.8
45-59 years	39	12.5
≥60 years	35	11.2
Patient's gender		N=321
Male	165	51.4
Female	156	48.6
Definitive diagnosis		N=290
Infectious diseases	77	26.5
Cardiovascular diseases	22	7.6
Entero-gastric diseases	36	12.4
Endocrinal diseases	4	1.4.
Respiratory diseases	10	3.4
Neurologic diseases	16	5.5
Malaria	5	1.7
Dermatologic diseases	9	3.1
Gyneco-obstetrical diseases	8	2.8
Injuries	19	6.5
Others	84	28.9
Received a medical prescription?		N=321
Yes	273	85.0
No	48	14.9
Provider type		N=321
Medical Doctor	319	99.4
Nurse	2	0.6

Table 2. Core prescribing pattern indicators across three District Hospitals compared to WHO targets

Prescribing patterns	Butaro			Kirehe			Rwinkwavu			All hospitals			WHO
	N	Mean or %	95% CI	N	Mean or %	95% CI	N	Mean or %	95% CI	N	Mean or %	95% CI	Targets
Average number of medicines prescribed per patient encounter (mean, 95% CI)	107	1.6	1.4-1.8	107	1.7	1.5-2.0	107	2.1	1.9-2.0	321	1.8	1.7-2.0	1.6-1.8
Percentage of encounters with an antibiotic prescribed (%; 95% CI)	107	32.7	23.7-41.7	106	40.6	31.0-50.0	107	38.3	29.0-47.7	320	37.2	31.9-42.5	20.0-26.8
Percentage of encounters with an injection prescribed (%; 95% CI)	107	2.8	0.4-6.0	107	3.7	0.0-7.4	106	15.0	8.2-22.0	320	7.2	4.3-10.0	13.4-24.1
Percentage of medicines prescribed in generic names [†] (%; 95% CI)	171	77.2	70.2-83.3	186	72.6	65.6-78.9	230	75.2	69.1-80.7	587	75.0	71.2-78.4	100.0
Percentage of medicines prescribed from the National Medicines Essential List or formulary [†] (%; 95% CI)	171	67.8	60.3-74.8	186	68.8	61.6-75.4	230	73.9	67.7-79.5	587	70.5	66.7-74.2	100.0

[†] The denominator is any prescription with possibility for more than one prescription per patient.

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