

# Retrospective review of medicine utilization for noncommunicable diseases in three public sector pharmacies in Jamaica

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**Suggested citation** Wynter-Adams DM, Thomas-Brown PG, Bromfield L, Williams M, Bunting-Clarke J. Retrospective review of medicine utilization for noncommunicable diseases in three public sector pharmacies in Jamaica. *Rev Panam Salud Publica*. 2024;48:e18. <https://doi.org/10.26633/RPSP.2024.18>

## ABSTRACT

**Objective.** The rational use of medicines offers a cost-saving strategy to maximize therapeutic outcomes for developing and developed countries. The aim of this study was to evaluate the rational use of medicines for selected noncommunicable diseases (NCDs) at three pharmacies at public hospitals in Jamaica using the World Health Organization's (WHO's) prescribing indicators.

**Methods.** In this retrospective cross-sectional study, prescriptions for adult outpatients containing at least one medicine for cardiovascular disease, diabetes, cancer, chronic obstructive pulmonary disease or asthma that were filled between January and July 2019 were reviewed using WHO's prescribing indicators for the rational use of medicines. Data were analyzed and expressed as descriptive and inferential statistics. For all analyses conducted, significance was determined at  $P < 0.05$ .

**Results.** A total of 1500 prescriptions covering 5979 medicines were reviewed; prescriptions were mostly written for female patients aged 42–60 years. Polypharmacy was observed in 35.6% (534) of prescriptions, and there was an average of 4 medicines per prescription, with a maximum of 17. Most of the prescriptions at each site were filled, with the main reason for not dispensing a medicine being that it was out of stock. Generic prescribing was high for all sites, accounting for more than 95% (5722) of prescribed medicines. There was full compliance with prescribing according to the WHO Model List of Essential Medicines at two of the sites, but it was just off the target at Site 1, by 1.4%.

**Conclusions.** The WHO guidelines for the rational use of medicines were followed with respect to the proportion of medicines prescribed from the WHO Model List and the proportion of antibiotics prescribed. The number of medicines per prescription and the proportion of medicines prescribed by generic name did not meet the WHO criteria. However, prescribing was aligned with treatment guidelines for the selected NCDs.

## Keywords

Drug utilization evaluation; noncommunicable diseases; drugs, essential; therapeutic uses; cost savings; sustainable development.

The rational use of medicines (RUM) is the cost-effective use of medicines based on making a correct diagnosis and correctly administering them, according to prescribing guidelines (1). In 2012, the World Health Organization (WHO) noted that 50% of patients do not take their medications as they should, and

the economic challenges of developing countries may pose financial issues, leading to the suboptimal health management of patients (2). The challenges faced by developing countries are compounded by increased health expenditures from the rise in noncommunicable diseases (NCDs) (2, 3). In 2022, it was

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projected that the global burden of NCDs combined with mental disorders, HIV infection and tuberculosis would increase from 64% in 2008 to 74% in 2022, placing tremendous burdens on low-and- middle-income countries, which account for 77% of all deaths from NCDs, and widening health and economic disparities (4). This increase introduces the possibility of polypharmacy from disease burden, which is a prescribing indicator for RUM. Other RUM prescribing indicators include the overuse of antibiotics, the prescription of generic medicines and prescribing from the WHO Model List of Essential Medicines. Polypharmacy and the irrational use of medicines have cost implications because using medicines that are not necessary may deplete stocks and increase patient morbidity as a result of the inappropriate use of medicines or medicine-related problems, such as interactions among medicines and noncompliance with medication. Increased morbidity can affect productivity, and this represents a cost to a country. Nonadherence to treatment guidelines has been singled out as a major contributor to the global problem of the irrational use of medicines (5). This can lead to an increase in morbidity and mortality from poor control of chronic diseases, ultimately increasing economic costs to an individual and a country (6). Adherence to treatment guidelines as a RUM strategy is important, especially in developing states where the prevalence of NCDs is increasing more than in developed countries (7, 8).

Several of the strategic recommendations from WHO to improve RUM have been implemented by Jamaica through the establishment of a national benefits program in 2003 that is responsible for procuring and subsidizing medicines (9). A quality audit of the program's effectiveness could provide evidence for its continuation or improvement and also document best practices, which could contribute to regional and international discourse on RUM. This aligns with recommendations made by the Pan American Health Organization that countries monitor and evaluate RUM to conserve resources and that these actions should be supported by a procurement system that is guided by evidence-based treatment guidelines (8). In Jamaica, the current benefits program is administered in compliance with the country's Generic Drug Law (enacted in 1993), which allows for the substitution of a generic medicine in a prescription that is written for a brand name medicine (10).

## SIGNIFICANCE OF THE RESEARCH

As a developing country, Jamaica must balance the cost and effectiveness of medicines while managing limited financial resources. One method used in Jamaica to achieve this is a health management system that has a national patients' benefits system run by a statutory body set up through an act of Parliament (9). The Standards and Regulation Division of the Ministry of Health and Wellness places medicines on the list of Vital, Essential And Necessary (VEN) medicines (11), based on recommendations from medical consultants who are guided by recommendations from international bodies, such as the International Society of Hypertension, American Diabetes Association, the European Association for the Study of Diabetes and the American College of Cardiology. The medicines are not placed in a hierarchical list, so doctors may prescribe based on their own evaluation. The increased prevalence of NCDs in Jamaica warranted an evaluation of RUM and whether the medicines are used in alignment with therapeutic guidelines.

An evaluation of RUM may also yield valuable information about the effectiveness of the patients' benefits program and also assist in the development of strategies to encourage adherence to RUM. The other studies found in the literature for Jamaica evaluated RUM in the public sector and a privately funded public access clinic (12, 13).

The objectives of this study were to use WHO's prescribing indicators to assess RUM in public hospitals for selected NCDs and to evaluate the alignment of the use of the medicines with therapeutic recommendations from WHO and other international organizations.

## MATERIALS AND METHODS

### Study design

Using a retrospective cross-sectional design, anonymized prescription data were collected from the National Health Fund database, as per Jamaica's Data Protection Act (2020) (14). The data set consisted of information about gender, age, name of the medicine and the quantity of medication dispensed from prescriptions filled between January and July 2019 on the National Health Fund prescription platform used by government pharmacies. A period prior to the pandemic was chosen because hospital clinics' regular operations were altered due to the effects of the pandemic. Consecutive, nonrandom prescriptions filled during the study period were sampled until the sample size of 500 was achieved from the prescription database provided by each facility. The primary outcome measures were prescribing indicators, including the number of medicines prescribed per patient; the presence of the prescribed medicines in the national formulary of VEN medicines; the class of medicines prescribed; the quantity of medicines prescribed, including the dose and frequency; the number of medicines dispensed per prescription; the percentage of medicines dispensed as prescribed; and the percentage of prescriptions that had an antibiotic included, referred to as a prescription encounter (1). The secondary outcome was to determine whether the treatment was aligned with the recommended therapeutic guidelines. The outcome measures were grouped into the preselected NCDs, namely cardiovascular disease, diabetes, cancer, chronic obstructive pulmonary disease and asthma, at each site.

The likelihood of the same patient being counted twice (i.e. double-dipping) during the period under review was reduced by filtering data to remove patients with the same profile. To ensure that the sample size was adequate, the study used a minimum sample size of 388 at Site 1 (in an urban area) and Site 2 (in a rural area) and 384 at Site 3 (also in a rural area). This was determined based on the monthly average number of prescriptions processed at each of the facilities, which were 13 500 at Site 1, 13 000 at Site 2 and 9 500 at Site 3, using a 95% confidence interval and a 5% margin of error. The sample size was adequate to give 80% power.

The sample size was calculated using Slovin's formula:  $n = N / (1 + Ne^2)$ , where  $n$  is the number of samples,  $N$  is the total population and  $e$  is the error margin/margin of error.

### Settings

The study design was previously reported in Wynter-Adams et al. in 2022 (13), with the main modification being the review of anonymized data from three public hospital pharmacies that are

used as both referral and teaching hospitals, and serve urban and rural areas in Jamaica. These government facilities stock more of the affordable medicines on the government's VEN list of medicines than other facilities do. The list is similar to WHO's Model List of Essential Medicines, and it guides the use of medicines in the public sector. These hospitals were chosen because they are involved in training undergraduate and postgraduate medical professionals and can provide information about prescribing patterns for physicians in primary and secondary care. The hospitals are also the implementation sites for RUM by doctors doing internships.

## Outpatient prescriptions

Information was taken from prescriptions for adult outpatients that contained at least one medicine used for the selected NCDs. Data about prescribing indicators were collected from prescription databases using the variables previously described. The groups of NCDs used in the statistical analyses were created using the pharmacological class of the medicine, the dose of the medicine and the dosing frequency, according to therapeutic guidelines.

WHO's 1993 guidelines were used for key definitions and calculations in the protocol (15).

**Core indicators of the rational use of medicine.** The prescribing indicators were used to calculate the percentage of polypharmacy, the percentage adherence to prescribing by generic name and the percentage adherence to prescribing medicines from the VEN list, as per WHO's 1993 guidelines (15), by using the average number of medicines dispensed per encounter (i.e. per prescription), with combination medicines counted as one medicine, and the percentage of medicines dispensed from the VEN list of medicines.

**Inclusion criteria.** All medicines dispensed for adult outpatients used to treat NCDs – such as cardiovascular diseases, diabetes, cancers, chronic obstructive pulmonary disease (COPD) and asthma – regardless of whether they were dispensed with other medicines were included in this study.

**Exclusion criteria.** Medicines not used to treat a chronic NCD were excluded.

**Missing data.** No data were missing because complete data fields are required for processing a prescription in the government pharmacy system.

## Statistical analyses

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) software, version 23. Descriptive data were expressed as means, standard deviations and frequencies. Associations were determined using the  $\chi^2$  test, and correlations were determined using Pearson's correlation. The mean numbers of medicines per prescription were compared using the one-way analysis of variance (ANOVA) test, followed by Tukey's Honest Significant Difference post hoc test. For all analyses, significance was determined at  $P < 0.05$ .

## Ethics approval

This study was approved by the University of Technology, Jamaica Research Ethics Committee, reference number

2021/05/FOSS/107. Ethics approval was also received from the Ministry of Health and Wellness and the South and South East Regional Health Authorities. Permission to access the data was received from the National Health Fund Research Committee.

## RESULTS

The sample size was achieved in 3 days for Sites 1 and 2 and in 7 days for Site 3. Data for 1500 prescriptions covering 5979 medicines were reviewed, with information about 500 prescriptions retrieved from each of the three public hospital pharmacies included in this study (Figure 1). Demographic information about outpatients at the three sites is presented in Table 1. Hypertension, diabetes mellitus and dyslipidemia were the most prevalent comorbidities. There was no significant difference between the sites in the prevalence of any disease state.

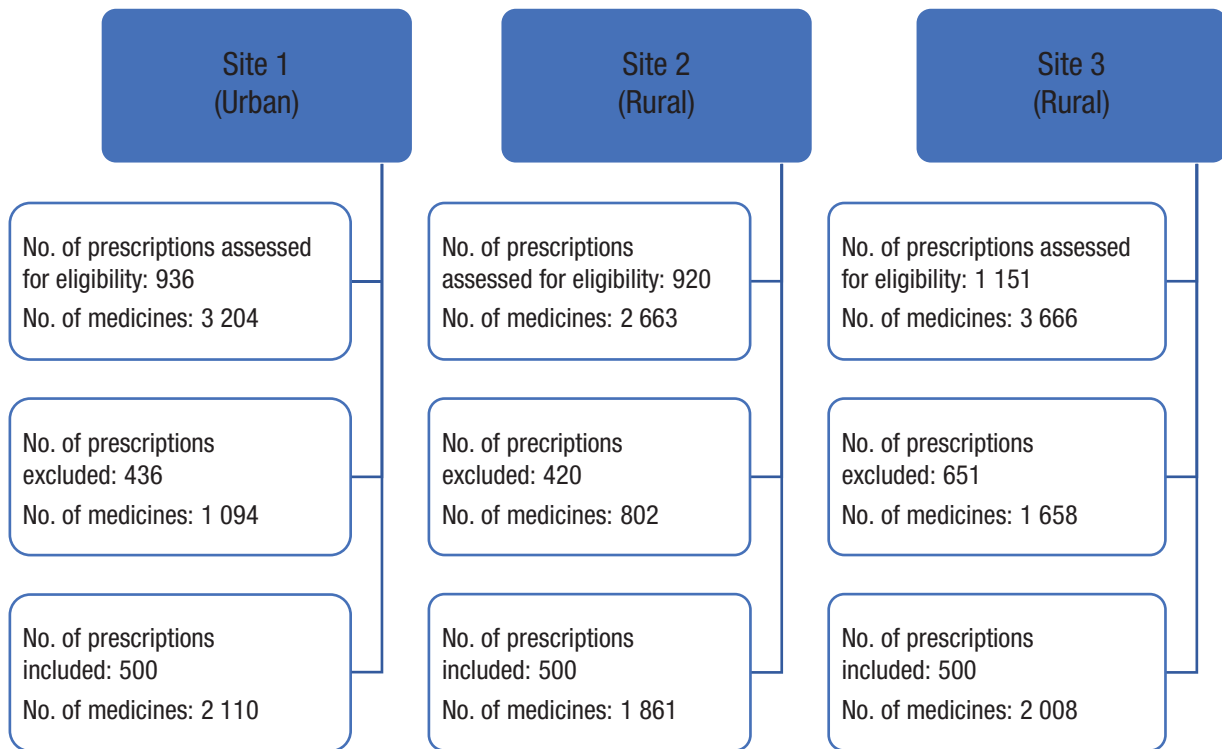
The analysis of prescribing indicators (Table 2) showed that a maximum of 17 medicines were included in one prescription, with an average of 4 medicines per prescription for each site. Polypharmacy (i.e. the prescribing of  $\geq 5$  medicines) was highest for Site 1 (41.2% [206/500] of prescriptions) and lowest for Site 2 (29.8% [149/500]). The main reason why medicines were not dispensed was because the medicine was out of stock. Medicine-related problems, such as an incorrect medicine for the patient's profile or an outdated prescription, were noted as two reasons why medicines were not dispensed (Table 2).

A summary of the RUM indicators compared with WHO's guidelines is provided in Table 3 (16). Based on the prescribing indicators studied, only the percentage of antibiotics per prescription was achieved for all sites; prescribing from the VEN list was accomplished at Sites 1 and 2. Values for all other indicators were outside of WHO's optimal value, but not significantly so.

Treatment of the targeted NCDs was assessed, and the results are summarized in Table 4. For hypertension, the most frequently prescribed class of medicine was calcium channel blockers. Most patients with heart failure were treated with a loop diuretic; patients with diabetes were mainly treated with the biguanide metformin. The category for other conditions mainly included antiplatelet medicines and anti-inflammatory, analgesic and anti-arthritis medicines.

One-way ANOVA was performed to compare the mean number of medicines prescribed for NCDs at each site. Means were significantly different among the sites: Site 1 ( $F = 16.00$ ,  $P < 0.001$ ), Site 2 ( $F = 10.15$ ,  $P < 0.001$ ) and Site 3 ( $F = 13.78$ ,  $P < 0.001$ ) (data not shown). Tukey's test for multiple comparisons found that, on average, at Sites 2 and 3, significantly more medicines were prescribed to patients with heart failure compared with those with all other chronic conditions. However, for Site 1, patients with heart failure were prescribed significantly more medicines compared only with patients with hypertension ( $P = 0.003$ ) and asthma or COPD ( $P = 0.001$ ) (data not shown). Additionally, all patients at Site 1 were prescribed significantly more medicines compared with patients with breast or prostate cancer.

Prescriptions for treating NCDs were significantly associated with gender, polypharmacy and prescriptions that had an antibiotic included. At Site 1, more males presented with asthma or COPD and cancer, while more females presented with dyslipidemia and diabetes ( $\chi^2 = 20.26$ ,  $P = 0.001$ ). At Site 2 ( $\chi^2 = 17.19$ ,  $P = 0.004$ ) and Site 3 ( $\chi^2 = 10.11$ ,  $P = 0.039$ ) more males presented

**FIGURE 1. Prescriptions for medicines used to treat selected noncommunicable diseases from a national database for pharmacies at three public hospitals, Jamaica, 2019**

Source: Figure developed by the authors based on the results of their study.

with asthma or COPD and diabetes, while more females presented with hypertension and dyslipidemia.

Polypharmacy was significantly associated with treatment for NCDs, being more prevalent at Site 1 among patients with heart failure, dyslipidemia and diabetes ( $\chi^2 = 42.30$ ,  $P < 0.001$ ) and at Site 3 ( $\chi^2 = 10.04$ ,  $P = 0.040$ ), but at Site 2 it was more prevalent among patients with heart failure and diabetes ( $\chi^2 = 25.34$ ,  $P < 0.001$ ). Prescriptions for antibiotics were significantly associated with chronic asthma or COPD at all three sites: Site 1 ( $\chi^2 = 27.01$ ,  $P < 0.001$ ), Site 2 ( $\chi^2 = 11.17$ ,  $P = 0.048$ ) and Site 3 ( $\chi^2 = 27.38$ ,  $P < 0.001$ ).

Medicine not being dispensed as prescribed was significantly associated with the condition being treated. A significantly higher proportion of prescriptions for medications for diabetes and anticancer agents were not dispensed as written at Site 1 ( $\chi^2 = 112.37$ ,  $P < 0.001$ ). At the other sites, all medicines that were not dispensed as prescribed were medications for diabetes: Site 2 ( $\chi^2 = 34.46$ ,  $P < 0.001$ ) and Site 3 ( $\chi^2 = 12.17$ ,  $P = 0.016$ ).

Similarly, at Site 1, the absence of generic prescribing was significantly associated with the NCD being treated ( $\chi^2 = 12.14$ ,  $P = 0.033$ ), specifically for medicines for diabetes and dyslipidemia. At the other sites, all medicines without generic prescribing were antihypertension medicines: Site 2 ( $\chi^2 = 7.89$ ,  $P = 0.162$ ) and Site 3 ( $\chi^2 = 6.88$ ,  $P = 0.142$ ); however, the association was not significant.

Only Site 1 did not meet the criteria of 100% prescribing only from the VEN list, and this was significantly associated with the NCDs being treated at that site. A significantly higher proportion of prescriptions for antidiabetes and anticancer

medications were not prescribed according to the VEN list ( $\chi^2 = 24.93$ ,  $P < 0.001$ ). There was no comparison for Sites 2 and 3, as those sites attained the 100% target.

## DISCUSSION

### Assessing the rational use of medicines

The demographics of the outpatients whose prescriptions were included in the study were comparable to those from other studies in that mostly females were seeking care (17); this may also be related to the increasing prevalence of NCDs among women (18). All prescriptions exceeded WHO's recommendations of including two or fewer medicines per prescription, and this may be related to the moderate prevalence of comorbidities among patients with NCDs. The relatively younger age of outpatients with NCDs was similar to that seen in other studies and reflects the increasing prevalence of NCDs (16), but it was lower than the average age reported at a public access clinic in Jamaica (13). The higher prevalence of NCDs in the middle-aged population (i.e. aged 40 to 65 years) has economic implications, as the working-age group has higher economic productivity, which could be adversely affected by their health status (19). However, the increasing prevalence of NCDs across all age groups, with the greatest increase among those who are middle-aged, may be related to modifiable risk factors, such as having a sedentary lifestyle and poor eating habits (19-21). The Jamaica Health and Lifestyle Survey 2016-2017 reported that 82% of Jamaicans engaged in less physical

**TABLE 1. Patient demographics and prevalence of selected noncommunicable diseases at pharmacies in three public hospitals, Jamaica, 2019**

Prescription data <sup>a</sup>	Public hospital pharmacy		
	Site 1	Site 2	Site 3
No. of prescriptions reviewed	500	500	500
Gender of patients			
Male	142 (28.4)	118 (23.6)	129 (25.8)
Female	358 (71.6)	382 (76.4)	371 (74.2)
Mean (SD) age (years)	53.6 (15.5)	52.1 (18.0)	55.3 (15.5)
Range (minimum, maximum)	0, 96	0, 98	0, 98
Age group (years)			
≤ 20	11 (2.2)	35 (7.0)	10 (2.0)
21–40	83 (16.6)	71 (14.2)	66 (13.2)
41–60	241 (48.2)	239 (47.8)	238 (47.6)
61–80	143 (28.6)	134 (26.8)	160 (32.0)
> 80	22 (4.4)	21 (4.2)	26 (5.2)
Age category (years)			
< 65	390 (78.0)	383 (76.6)	365 (73.0)
≥ 65	110 (22.0)	117 (23.4)	135 (27.0)
Noncommunicable disease			
Hypertension	303 (60.6)	387 (77.4)	370 (74.0)
Dyslipidemia	171 (34.2)	118 (23.6)	180 (36.0)
Diabetes mellitus	157 (31.4)	178 (35.6)	193 (38.6)
Asthma or COPD	98 (19.6)	73 (14.6)	55 (11.0)
Heart failure	64 (12.8)	39 (7.8)	5 (1.0)
Breast or prostate cancer	34 (6.8)	1 (0.2)	0
Other	321 (64.2)	324 (64.8)	364 (72.8)
Antibiotic encounters <sup>b</sup>	25 (5.0)	20 (4.0)	29 (5.8)
Morbidity			
Single <sup>c</sup>	274 (54.8)	267 (53.4)	277 (55.4)
Multi <sup>d</sup>	226 (45.2)	233 (46.6)	223 (44.6)

COPD: chronic obstructive pulmonary disease; SD: standard deviation.

<sup>a</sup> Values are number (%) unless otherwise indicated.<sup>b</sup> Antibiotic encounters refer to prescriptions with one or more antibiotics.<sup>c</sup> Single morbidity refers to the presence of only one of the conditions being investigated.<sup>d</sup> Multimorbidity refers to the presence of more than one of the conditions being investigated.**Source:** Table prepared by the authors based on the results of their study.

activity than recommended by WHO for health benefits (3, 22). In 2021, WHO also reported that the greatest impact of NCDs was seen among those in the productive-or working-age group, and other studies have noted the possibly devastating effect on the economies of developing countries (8, 19, 20).

The main reason for medicines not being dispensed was because they were out of stock, and this has implications for RUM adherence, especially for patients who are of working age and may have difficulty taking time off to return to fill a prescription. Medicine stock-outs can increase treatment default, leading to increased risks of poorer health and economic outcomes (23). The low number of medicine-related problems given as the reason for not dispensing a prescription could be related to careful prescribing by physicians or to pharmacists' not documenting these, which is outside the scope of this study.

While the proportion of prescribing generics (at about 96%) was outside the recommendation for 100% prescribing of generics, the provisions of the Generic Drug Law within the Pharmacy Act should ensure that a generic medicine is dispensed once it is available (10). This is a cost-saving strategy employed by the Jamaican government that can be adapted

**TABLE 2. Prescribing indicators at pharmacies in three public hospitals, Jamaica, 2019**

Prescription data <sup>a</sup>	Public hospital pharmacy		
	Site 1	Site 2	Site 3
Prescribing information			
Total no. medicines prescribed	2 110 (100.0)	1 861 (100.0)	2 008 (100.0)
Total no. medicines dispensed	1 651 (78.2)	1 745 (93.8)	1 803 (89.8)
Total no. medicines not dispensed	459 (21.8)	116 (6.2)	205 (10.2)
Reason for not dispensing a medicine	459	116	205
Out of stock	399 (86.9)	35 (30.2)	192 (93.7)
Already dispensed	1 (0.2)	2 (1.7)	0
Duplicate medicine	12 (2.6)	29 (25.0)	0
Not requested by patient	14 (3.1)	35 (30.2)	5 (2.4)
Non-stock item	8 (1.7)	0	0
Incorrect medicine or patient profile	0	8 (6.9)	0
Outdated prescription	0	6 (5.2)	1 (0.5)
No reason stated	34 (7.4)	1 (0.9)	7 (3.4)
Mean (SD) no. of medicines/prescription	1, 17	1, 12	1, 16
Range (minimum, maximum)	4.2 (2.7)	3.7 (2.0)	4.0 (2.3)
Prescribed	3.3 (2.1)	3.5 (2.0)	3.6 (2.0)
Dispensed			
Polypharmacy <sup>b</sup> (n = 500)			
Yes	206 (41.2)	149 (29.8)	179 (35.8)
No	294 (58.8)	351 (70.2)	321 (64.2)
Medicines dispensed as prescribed	1 651	1 745	1 803
Yes	1 432 (86.7)	1 503 (86.1)	1 476 (81.9)
No	219 (13.3)	242 (13.9)	327 (18.1)
Prescribed from VEN list			
Yes	2 080 (98.6)	1 861 (100.0)	2 008 (100.0)
No	30 (1.4)	0	0
Generic prescribed			
Yes	2 027 (96.1)	1 796 (96.5)	1 899 (94.6)
No	83 (3.9)	65 (3.5)	109 (5.4)

SD: standard deviation; VEN: vital, essential, necessary.

<sup>a</sup> Values are number (%) unless otherwise indicated.<sup>b</sup> Polypharmacy indicates ≥ 5 medicines included on one prescription.**Source:** Table prepared by the authors based on the results of their study.

by other developing countries to increase compliance with the generic prescribing RUM indicator. Another Jamaican study of RUM (13) found that prescriptions not written for generic medicines were on patent and, therefore, there was no generic option. If this is taken into account, this would increase adherence to the RUM generic prescribing indicator.

Most medicines were dispensed as written, and those that were not were associated with diabetes mellitus across all three sites and cancer at Site 1. In 2012, Guidoni et al. reported dose modifications in patients treated with the biguanide metformin or a sulfonylurea (24). Although the reasons for modifications were not stated, this study found that the modifications were necessary because only certain dose formulations were available on the VEN list, thus requiring either breaking a tablet or doubling the strength to meet dose requirements. An assessment of frequently used formulations and of disease burden in the population should guide the selection of formulations for the VEN list because dose modifications can introduce confusion and increase nonadherence and the risk of adverse effects.

Despite moderate levels of comorbidity, the use of tablets with combined medications was unexpectedly low. Combined therapy offers the advantage of reducing the pill burden, especially when there is a moderate-to-high prevalence of comorbidity, as seen in the study population. A higher pill burden can

**TABLE 3. Comparison of the rational use of medicines at pharmacies in three public hospitals, with interpretation of World Health Organization (WHO) guidelines (16), Jamaica, 2019**

Factor	WHO value	Study value		
		Site 1	Site 2	Site 3
Average no. of medicines/prescription	1.6–1.8	4.2	3.7	4.0
% generics prescribed	100	96.1	96.5	94.6
% of antibiotic encounters <sup>a</sup>	< 30	5.0	4.0	5.8
% of medicines dispensed	100	78.2	93.8	89.8
% of medicines prescribed from VEN list	100	98.6	100.0	100.0

VEN: vital, essential, necessary.

<sup>a</sup> Antibiotic encounters refer to prescriptions with one or more antibiotics.**Source:** Table prepared by the authors based on the results of their study.

introduce irrational use as a result of nonadherence to medication schedules due to uncertainty regarding the effectiveness of the medicine, nonacceptance of the diagnosis or the futility of managing the disease if several medicines are needed (25).

The higher frequency of polypharmacy in cases of heart failure probably relates to the complexity of the disease, which requires multiple medicines for symptomatic management and to reduce disease progression (26). The high degree of polypharmacy in patients with dyslipidemia and diabetes was due to comorbidity, which suggests the need for supplemental measures to reduce disease impact. Based on the sedentary lifestyle and unhealthy diet of the Jamaican population (3), patients could be targeted for lifestyle interventions, which are recognized as a cost-saving strategy to reduce the health and economic impact of NCDs (7, 27, 28). Addressing individual dietary and physical activity needs, fitness level and health status are key to achieving the 2030 Sustainable Development Goals of reducing the burden of NCDs and premature death (4, 28).

### Treatment and alignment with guidelines

Compliance with treatment guidelines can be considered a secondary measurement of RUM since guidelines are based on effective management of a disease. The most frequently prescribed therapeutic classes for treating hypertension were aligned with international guidelines that recommended calcium channel blockers as monotherapy or in combination for persons of African descent, who formed the majority of the study population (29).

Although the Jamaican VEN list did not provide a treatment algorithm for heart failure, patients were treated primarily with loop diuretics (78.1%), followed by a dual action  $\beta$ -blocker (54.7%) and then angiotensin modulators (35.9%), all of which are compliant with the treatment schedule for heart failure (30).

The results of this study showed adherence to treatment guidelines for dyslipidemia (31), diabetes (32), asthma (33), breast cancer (34) and prostate cancer (35). Adherence to the National Comprehensive Cancer Network guidelines was assumed for breast cancer as information about patients' menopausal status was not available (34).

The use of selected chronic NCDs was a study limitation because these diseases are usually associated with multiple medications, which may contribute to polypharmacy and increase the number of medicines per prescription. Another limitation

**TABLE 4. Classes of medications prescribed for chronic noncommunicable diseases at pharmacies in three public hospitals, Jamaica, 2019**

Disease and class of medication	No. (%) per public hospital pharmacy <sup>a</sup>		
	Site 1	Site 2	Site 3
Hypertension	303	387	370
ACE inhibitor	80 (26.4)	141 (36.4)	63 (17.0)
Angiotensin receptor blocker	85 (28.1)	99 (25.6)	127 (34.3)
$\beta$ -blocker	45 (14.9)	56 (14.5)	35 (9.5)
Calcium channel blocker	177 (58.4)	157 (40.6)	197 (53.2)
Thiazide diuretic	113 (37.3)	166 (42.9)	150 (40.5)
Other diuretic	1 (0.3)	13 (3.4)	24 (6.5)
$\alpha_2$ agonist	4 (1.3)	21 (5.4)	13 (3.5)
Vasodilator <sup>b</sup>	8 (2.6)	4 (1.0)	4 (1.1)
Combined medicine <sup>c</sup>	18 (5.9)	5 (1.3)	7 (1.9)
Heart failure	64	39	5
ACE inhibitor	13 (20.3)	18 (46.2)	1 (20.0)
Angiotensin receptor blocker	10 (15.6)	3 (7.7)	0
$\alpha$ - or $\beta$ -blocker	35 (54.7)	23 (59.0)	2 (40.0)
Cardiac glycoside	6 (9.3)	10 (25.6)	3 (60.0)
Loop diuretic	50 (78.1)	32 (82.1)	3 (60.0)
Aldosterone antagonist	19 (29.7)	11 (28.2)	4 (80.0)
Vasodilator <sup>b</sup>	4 (6.3)	12 (30.8)	1 (20.0)
Dyslipidemia	171	118	180
Statin	170 (99.4)	118 (100.0)	180 (100.0)
Combined medicine <sup>d</sup>	1 (0.6)	0	0
Diabetes mellitus	157	178	193
$\alpha$ -glucosidase inhibitor	15 (9.6)	3 (1.7)	38 (19.7)
Biguanide (metformin)	97 (61.8)	118 (66.3)	99 (51.3)
Insulin	70 (44.6)	73 (41.0)	49 (25.4)
Sulfonylurea	58 (36.9)	65 (36.5)	90 (46.6)
Thiazolidinedione	34 (21.7)	14 (7.9)	28 (14.5)
DPP-4 inhibitor	1 (0.6)	0	0
Combined medicine <sup>e</sup>	1 (0.6)	0	0
Asthma or COPD	98	73	55
Inhaled $\beta_2$ agonist	91 (92.9)	69 (94.5)	54 (98.2)
Inhaled muscarinic antagonist	9 (9.2)	2 (2.7)	1 (1.8)
Inhaled corticosteroid	34 (34.7)	55 (75.3)	18 (32.7)
Mucolytic	10 (10.2)	2 (2.7)	8 (14.5)
Combined medicine <sup>f</sup>	52 (53.1)	20 (27.4)	27 (49.1)
Breast or prostate cancer	34	1	0
Aromatase inhibitor	14 (41.2)	0	0
Antiandrogen	4 (11.8)	0	0
Antiestrogen	2 (5.9)	1 (100.0)	0
GnRH agonist	18 (52.9)	0	0
Other	321	324	364

ACE: angiotensin-converting enzyme; COPD: chronic obstructive pulmonary disease; DPP-4: dipeptidyl peptidase-4; GnRH: gonadotropin-releasing hormone.

<sup>a</sup> Reflects multiple number of medicines per patient for each disease class.<sup>b</sup> Vasodilators are hydralazine for hypertension and glyceryl trinitrate for heart failure.<sup>c</sup> This refers to a thiazide diuretic plus an angiotensin receptor blocker.<sup>d</sup> This refers to a statin plus ezetimibe.<sup>e</sup> This refers to a biguanide plus a DPP-4 inhibitor.<sup>f</sup> This refers to a long-acting  $\beta_2$  agonist plus a corticosteroid.**Source:** Table prepared by the authors based on the results of their study.

was the assumption that the medicines prescribed complied with recommendations for the disease diagnosed and that there were no prescription errors related to the prescribed medicine and the diagnosis. Another limitation is the lack of consideration of the individuality of the patient and the physician's duty of care to manage each patient based on the patient's unique set of conditions. In this study, strategies recommended to encourage adherence to RUM include prescribing generic versions even when there is only one manufacturer in the marketplace, as this ensures compliance when medicines come off patent. The WHO guidelines consider combination medicines as one medicine and, therefore, to meet the guideline of including

fewer than two medicines per prescription, more combination medicines need to be utilized. This will reduce polypharmacy and increase medication compliance.

Offering regular educational sessions and updates to treatment guidelines, with published algorithms strategically placed in hospitals and pharmacies and distributed electronically, may increase adherence to therapeutic recommendations for NCDs. Ensuring access to medicines to treat NCDs as included in government policy, such as in the National Health Fund Act and the Generic Drug Law in Jamaica, is a strategy targeted to foster RUM that can be adopted by other low- and middle-income countries. The availability of cost-effective medicines is a secondary RUM indicator that can aid in reducing the impact of NCDs. Another strategy is to implement exercise clinics to complement nutrition clinics to reduce disease impact and possibly pill burden. Researchers have noted the health and economic effects of physical activity and healthy diet on disease burden (27, 36).

## Conclusions

In summary, there was adherence to RUM with respect to the proportion of medicines prescribed from the VEN list and the proportion of antibiotics prescribed. The number of medicines per prescription did not meet the WHO criterion, which may be due to the frequency of comorbidities. The proportion of medicines prescribed by their generic name did not meet the criteria in the guidelines, but this may possibly have been mitigated

by the law encouraging generic prescribing in Jamaica. In general, prescribing was aligned with treatment guidelines for the NCDs included in this study.

**Authors' contributions.** DMWA contributed to designing the study, interpreting the data, and writing and revising the manuscript. PGTB contributed to the statistical oversight of the study, the analysis and interpretation of data, and writing and reviewing the manuscript. MW contributed to writing and reviewing the manuscript. LB contributed to writing and reviewing the manuscript. JBC contributed to the writing and reviewing the manuscript. All authors have read and approved the final manuscript.

**Acknowledgements.** The authors thank the National Health Fund, which provided the anonymized pharmacy data from the three study sites.

**Conflicts of interest.** None declared.

**Funding.** No funding was received for this study.

**Disclaimer.** Authors hold sole responsibility for the views expressed in the manuscript, which may not necessarily reflect the opinion or policy of the *Revista Panamericana de Salud Pública/Pan American Journal of Public Health* or the Pan American Health Organization.

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Manuscript submitted 27 September 2023. Revised version accepted for publication on 15 December 2023.



## Revisión retrospectiva del uso de medicamentos para enfermedades no transmisibles en tres farmacias del sector público de Jamaica

### RESUMEN

**Objetivo.** El uso racional de los medicamentos proporciona una estrategia de ahorro de costos para maximizar los resultados terapéuticos tanto en los países en desarrollo como en los países desarrollados. El objetivo de este estudio fue evaluar el uso racional de medicamentos para algunas enfermedades no transmisibles (ENT) seleccionadas en tres farmacias de hospitales públicos de Jamaica, usando los indicadores de prescripción de la Organización Mundial de la Salud (OMS).

**Métodos.** En este estudio transversal retrospectivo se examinaron las prescripciones realizadas a pacientes ambulatorios adultos que incluían al menos un medicamento para enfermedades cardiovasculares, diabetes, cáncer, enfermedad pulmonar obstructiva crónica o asma, dispensadas entre enero y julio del 2019, utilizando los indicadores de prescripción para el uso racional de medicamentos de la OMS. Los datos se analizaron y expresaron mediante estadística descriptiva e inferencial. Para todos los análisis realizados se estableció un nivel de significación de  $p < 0,05$ .

**Resultados.** Se examinó un total de 1 500 prescripciones que incluían 5 979 medicamentos; la mayor parte de ellas correspondían a pacientes de sexo femenino de 42 a 60 años. Se observó que había polimedición en el 35,6% (534) de las prescripciones, con un promedio de 4 y un máximo de 17 medicamentos por receta. En todos los centros se dispensó la mayor parte de los medicamentos prescritos, y el motivo principal para no hacerlo fue la falta de existencias del medicamento en cuestión. La prescripción de genéricos fue elevada en todos los centros y supuso más del 95% (5 722) de los medicamentos prescritos. En dos centros la prescripción se realizó en su totalidad de acuerdo con la Lista Modelo de Medicamentos Esenciales de la OMS, pero en el centro 1 no se alcanzó el objetivo por un 1,4%.

**Conclusiones.** Se siguieron las directrices de la OMS para el uso racional de medicamentos en cuanto a la proporción de medicamentos prescritos de la Lista Modelo de la OMS y la proporción de antibióticos prescritos. El número de medicamentos por receta y la proporción de medicamentos prescritos mediante su nombre genérico no cumplieron con los criterios de la OMS. Sin embargo, las prescripciones estaban en consonancia con las directrices de tratamiento de las enfermedades no transmisibles seleccionadas.

### Palabras clave

Revisión de la utilización de medicamentos; enfermedades no transmisibles; medicamentos esenciales; usos terapéuticos; ahorro de costo; desarrollo sostenible.

## Revisão retrospectiva do uso de medicamentos para doenças não transmissíveis em três farmácias da rede pública na Jamaica

### RESUMO

**Objetivo.** O uso racional de medicamentos é uma estratégia de contenção de custos para maximizar os resultados terapêuticos em países desenvolvidos e em desenvolvimento. O objetivo deste estudo foi avaliar o uso racional de medicamentos para algumas doenças não transmissíveis selecionadas em três farmácias de hospitais públicos na Jamaica a partir dos indicadores de prescrição preconizados pela Organização Mundial da Saúde (OMS).

**Métodos.** Estudo transversal retrospectivo que avaliou receitas médicas de pacientes ambulatoriais adultos contendo pelo menos um medicamento prescrito para doença cardiovascular, diabetes, câncer, doença pulmonar obstrutiva crônica ou asma e dispensadas entre janeiro e julho de 2019. A avaliação foi realizada a partir dos indicadores de prescrição preconizados pela OMS para o uso racional de medicamentos. Os dados obtidos foram analisados por meio de estatísticas descritivas e inferenciais. O nível de significância de  $p < 0,05$  foi adotado em todas as análises.

**Resultados.** Ao todo, foram analisadas 1 500 receitas médicas compreendendo 5 979 medicamentos. Em sua maioria, as receitas foram prescritas para pacientes do sexo feminino com idades entre 42 e 60 anos. A polifarmácia foi observada em 35,6% (534) das receitas; em média, foram prescritos 4 medicamentos, até um máximo de 17. As farmácias estudadas dispensaram a maior parte dos medicamentos receitados. O principal motivo para não fornecer algum medicamento foi o desabastecimento. O percentual de medicamentos genéricos foi alto em todos os locais, representando mais de 95% (5 722) do volume receitado. Houve plena observância da Lista Modelo de Medicamentos Essenciais da OMS nas receitas analisadas em dois dos locais estudados, e observância quase completa (diferença de 1,4%) no local 1.

**Conclusões.** As diretrizes da OMS de uso racional de medicamentos foram cumpridas no que se refere ao percentual de medicamentos receitados de acordo com a Lista Modelo da OMS e o percentual de antibióticos receitados. Os critérios da OMS não foram cumpridos quanto ao número de medicamentos por receita e ao percentual receitado usando o nome genérico. Porém, os medicamentos foram receitados de acordo com as diretrizes terapêuticas para as doenças não transmissíveis selecionadas.

### Palavras-chave

Revisão de uso de medicamentos; doenças não transmissíveis; medicamentos essenciais; usos terapêuticos; redução de custos; desenvolvimento sustentável.