Assessment of rational use of medicines for chronic non-communicable diseases: A cross-sectional design in a public access clinic in Jamaica

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Abstract

Background: Rational use of medicines (RUM) offers a cost-saving strategy to maximize therapeutic outcomes. The aims of this study were to assess RUM for chronic non-communicable diseases (NCDs) using the World Health Organization's (WHO) prescribing indicators in a public access facility and to evaluate the alignment of the use of drugs with therapeutic recommendations/guidelines.

Design and methods: In this retrospective cross-sectional study, prescriptions of adult patients containing at least one drug for chronic NCDs, filled between January and July 2019 were reviewed using the WHO prescribing indicators for RUM. Data were analyzed and expressed as descriptive statistics. Associations were determined using chi-square tests, correlations using Pearson's correlation and medians compared using Mann-Whitney U test. For all analyses, significance was determined at $p < 0.05$.

Results: Of the 571 prescriptions reviewed, most were for female, elderly patients with mean age of 69 years, predominantly with hypertension and/or diabetes. Polypharmacy was noted for 53.6% of prescriptions, primarily in elderly patients ($p < 0.001$), with the median number of five drugs prescribed and three dispensed. Of the drugs prescribed, 76.6% used generic prescribing, 63.3% were dispensed as written and 3.9% were antibiotics prescribed mainly for asthmatic patients ($\chi^2 = 74.9$, $p < 0.001$). Drugs prescribed for NCDs were aligned to therapeutic guidelines, but a significantly higher proportion of diabetes medications, (metformin and gliclazide), and cardiovascular medications (enalapril and losartan), were not dispensed as written ($\chi^2 = 40.0$, $p = 0.007$).

Conclusion: This research indicates that there is positive alignment with recommended therapeutic guidelines, however, based on WHO prescribing factors, strategies to improve RUM in this setting are highly recommended.

Keywords

Rational use of medicine, WHO prescribing indicators, non-communicable diseases, Jamaica

Introduction

Rational use of medicines (RUM) is the efficient use of health resources, with the selection of appropriate medications based on diagnosis or clinical needs, and administration at the right dose and frequency in a cost-effective manner.[1] This can be summarized as the ABCs of RUM, which are: **A**ppropriate diagnosis, based on sound therapeutic guidelines, **B**est drug indicated for the diagnosis using efficacy, safety, and cost data, **C**andidate is suited to receive the selected drug, with no clear contraindications

for use of the drug, **D**rug dose, route of administration and duration are correct, **E**ducation of patient on the drug

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prescribed, and **F**ollow-through with patient adherence to treatment as prescribed.

RUM is an essential element in achieving quality of health care for patients and the community. Implementation of RUM practices can improve resource allocation to minimize health costs.[2] With RUM, prescribing patterns will be more predictable, forecasting becomes easier and more accurate, thus making quantification, procurement, and budgeting more reliable.[3] WHO reported that irrational use of medicines is more prevalent in developing and transitional countries,[4–6] with its occurrence manifesting as irrational use of antibiotics, greater polypharmacy, short consultation, and dispensing times, compared to developed countries. Despite these occurrences, there was almost 100% generic prescribing, a desirable prescribing indicator. Irrational use of medicines is a global problem, which occurs because of incorrect prescribing, dispensing, inappropriate sale of medication, and poor patient adherence to the drug prescribed.[1] This traverses many extremes, from failure to prescribe in accordance with clinical guidelines, to the practice of polypharmacy, where too many medicines are prescribed per patient.

The implications of irrational use of medicine faced by Jamaica and other developing countries, are compounded by increased health expenditures from the rise in chronic NCDs, which are recognized as a global problem with high levels of mortality and morbidity.[2,7,8] In Jamaica, the national health and lifestyle survey reported a general increase in the prevalence of NCDs with hypertension increasing from 25.2% in 2007–8 to 31.5% in 2017–18 and diabetes from 7.8% in 2007–8 to 10% in 2017–18.[7] This is cause for national concern as the country is a small developing state with limited economic resources. It was projected that the global disease burden of NCDs, would increase, resulting in the WHO framing the reduction in the prevalence of NCDs as a vital economic investment.[9] The United Nations also raised the importance of reducing the prevalence of NCDs by including its reduction as one of the 2030 Sustainable Development Goals.[10]

The increased prevalence of chronic NCDs as reported in the health and lifestyle survey in Jamaica and a contracting economy, further accelerated by the Covid-19 pandemic, warrants an evaluation of rational use of medicines and drug use compliance with therapeutic guidelines. This study is the first rational use of medicine documented for Jamaica and is novel as it incorporates alignment of recommended therapeutic guidelines as part of RUM. Another value of this study is the identification of the chronic NCDs mostly associated with irrational use of medicines in Jamaica.

As such, the objectives of this study was to assess the rational use of medicines in chronic NCDs using the WHO core indicators, to evaluate the alignment of the use of the drugs with therapeutic recommendations from local and international organizations and propose strategies for adherence to RUM best practices.

Design and methods

Study design

A quantitative retrospective cross-sectional design was used to evaluate RUM based on WHO core prescribing and facility indicators.[1] Prescribing indicators were identified from reviews of prescriptions filled at a not-for-profit public access pharmacy between January and July 2019. A period prior to the COVID-19 pandemic was chosen, as regular clinic operations were disrupted due to the effects of the pandemic. Consecutive non-random sampling of prescriptions filled during the period under review was conducted until the sample size was achieved. The primary outcome was assessment of prescribing indicators which included, number of medicines prescribed per patient, drugs prescribed by generic name, prescribed drugs on the national formulary of vital, essential, necessary (VEN) drug list, types of drugs prescribed, quantity of drugs prescribed, noting dose and frequency, and number of drugs dispensed. The secondary outcome was evaluation of alignment of treatment to the recommended therapeutic guidelines. Key definitions and calculations that were used in protocol are as recommended in WHO guidelines.[11]

Inclusion Criteria: Outpatient prescriptions of adult patients with at least one drug used for chronic non-communicable diseases such as cardiovascular diseases, diabetes, cancers, chronic obstructive pulmonary disease, and asthma with or without other drugs were included in this study.

Exclusion criteria: Prescriptions that did not include treatment of chronic non-communicable diseases and pediatric prescriptions were excluded from the study.

Setting

This facility was chosen because it patterns the government pharmacy system and makes available to patients, affordable drugs on the government vital, essential, and necessary (VEN) drugs list, as well as other drugs purchased under tender and outside of tender. The Jamaican VEN list is equivalent in function to the WHO Essential Medicines List to guide the use of drugs in the public sector. Also, this facility receives prescriptions throughout the corporate area, and can provide information on different prescribing patterns and RUM by primary and secondary care physicians.

Participants

Prescriptions of adult patients containing at least one drug used during the study period for the following chronic

non-communicable diseases: cardiovascular diseases, diabetes mellitus, cancers, chronic obstructive pulmonary disease (COPD), and asthma, were extracted from the physical prescription database for study inclusion. The sample size was determined according to the WHO guidelines for investigating RUM in facilities.[11] However, based on the number of prescriptions filled by the chosen facility, and accounting for missing information on the prescriptions, a higher minimum sample size of 500 was used.

Statistical analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 22. Descriptive data were expressed as frequencies and medians and interquartile ranges. Associations were determined using chi-squared tests and correlations using Pearson's correlation. Median number of drugs was compared using the Mann-Whitney U test. For all analyses conducted, significance was determined at $p < 0.05$.

Results

A total of 571 prescriptions were reviewed for analysis with patient demographics summarized in Table 1. The mean age of patients at the clinic pharmacy was 69 years, ranging from age 15 to 98 years (Table 1) with majority of the patients being elderly (≥65 years).

Most of the prescriptions were written by primary care physicians (94.7%). Of the chronic non-communicable diseases identified for study inclusion, the prescriptions were mainly written for hypertension and other NCDs as shown in Table 1. Most participants had a combination of chronic NCDs (56.6%), with hypertension and diabetes mellitus being the most prevalent comorbidities ($n = 221$, 68.4%). This combination was further complicated by dyslipidemia in a total of 126 patients (39.0%). There were 3.9% of prescription encounters with antibiotics.

Results of the analysis of WHO prescribing indicators (Table 2) showed that whilst a few prescriptions had up to 11 drugs, the median number of drugs per prescription was 5. Majority of the drugs prescribed were dispensed, with a median of 3 drugs dispensed per script/patient. Polypharmacy (≥5 drugs) was noted on 53.6% of prescriptions, with most of the drugs prescribed being on the VEN list. The drugs were primarily written by the generic name.

Most of the drugs prescribed were dispensed as written with the reasons the drugs were not dispensed as written summarized in Table 2. Drug strength was missing for 27.0% of key drugs used in the management of the chronic NCDs assessed. These drugs include anti-asthmatic drugs (e.g. salbutamol and montelukast), combination drugs such as amiloride/hydrochlorothiazide, perindopril/indapamide, and one antibiotic, azithromycin.

Table 1. Patient demographics and prevalence of chronic non-communicable diseases in a privately funded public access clinic pharmacy in Kingston, Jamaica.

Prescription data	Prescription review ($n = 571$)
Number of prescriptions reviewed, n	571
Gender, n (%)	
Male	156 (27.3)
Female	360 (63.1)
Unavailable	55 (9.6)
Age in years, mean ± SD	68.9 ± 13.1 (min 15, max 98)
Available, n (%)	329 (57.5)
Missing, n (%)	242 (42.4)
Age groups, years ($n = 329$)	
≤30	5 (1.5)
31–40	8 (2.4)
41–50	9 (2.7)
51–60	54 (16.4)
61–70	98 (29.8)
71–80	95 (28.9)
81–90	45 (13.7)
91–100	15 (4.6)
Age category, ($n = 329$)	
≥65 years, n (%)	217 (66.0)
<65 years, n (%)	112 (34.0)
Prescribing Physician's post, n (%)	
General practitioner	541 (94.7)
Consultant/specialist	30 (5.3)
Chronic conditions, n (%)	
Hypertension	499 (87.4)
Heart failure	49 (8.6)
Dyslipidemia	129 (22.6)
Diabetes mellitus	281 (49.2)
Asthma/COPD	28 (4.9)
Breast cancer	2 (0.4)
Other	59 (10.3)
Antibiotic encounters[a]	22 (3.9)
Morbidity	
Single morbidity[b]	248 (43.4)
Multimorbidity[c]	323 (56.6)

COPD: chronic obstructive pulmonary disease.
[a]Antibiotic encounters, prescriptions with one or more antibiotics.
[b]Single morbidity, presence of only one of conditions being investigated.
[c]Multimorbidity, presence of more than one of the conditions being investigated.

Treatment of the targeted chronic NCDs was assessed and results summarized in Table 3. For hypertension, the most frequently prescribed drug therapeutic classes were thiazide diuretics, mainly hydrochlorothiazide (HCTZ) and indapamide and calcium channel blockers (CCBs), specifically amlodipine and nifedipine. Five percent of patients were prescribed a combined drug formulation comprising of a thiazide diuretic with either an ACE inhibitor (e.g. perindopril/indapamide), an ARB (e.g. valsartan/HCTZ), or a

Table 2. Frequencies and percentages of prescribing indicators in a privately funded public access clinic in Kingston, Jamaica.

Prescription data	Statistics	
	Prescriptions reviewed ($n=571$)	Total drugs ($n=2766$)
Prescribing information, median (IQR)		
Number of drugs per prescription ($n=2766$)	5 (3)	2766
Number of drugs dispensed ($n=2067$)	3 (3)	2067 (74.7)
Number of drugs not dispensed (699)	1 (2)	699 (25.3)
Polypharmacy[a] (≥5 drugs)	Min: 1; max: 11	
Prescribed drugs	306 (53.6)	
Dispensed drugs	169 (29.6)	
Prescribing from VEN list		
Yes	—	2670 (96.5)
No	—	96 (3.5)
Prescribing drug name ($n=2766$)		
Generic, n (%)	561 (98.2)	2119 (76.6)
Brand, n (%)	365 (63.9)	647 (23.4)
Dispensed drugs ($n=2067$)		
Number of drugs dispensed as written, n (%)	500 (87.6)	1308 (63.3)
Number of drugs not dispensed as written, n (%)	403 (70.6)	759 (36.7)
Reasons for not dispensing as written ($n=759$)		
Brand dispensed instead of generic written	—	3 (0.4)
Generic dispensed instead of brand written	—	191 (25.2)
Shorter duration/fewer drugs dispensed	—	135 (17.8)
Longer duration/more drugs dispensed	—	30 (4.0)
Lower strength dispensed	—	326 (43.0)
Higher strength dispensed	—	149 (19.6)
Drugs with missing strengths	—	241 (31.8)

IQR: interquartile range; VEN: Vital, Essential, Necessary.
[a]Polypharmacy, five or more drugs written on a prescription.

CCB (e.g. amlodipine/indapamide). For heart failure patients, the main therapeutic class was beta blockers, primarily carvedilol. The other drugs classes prescribed in the treatment of heart failure are noted in Table 3.

Metformin and sulfonylurea were prescribed for the majority of patients, with gliclazide being the preferred sulfonylurea. A total of 75 patients with diabetes were prescribed a combined drug formulation consisting of a dipeptidyl peptidase-4 (DPP-4) enzyme inhibitor and metformin. All patients with dyslipidemia were treated using statins, specifically simvastatin, rosuvastatin, and atorvastatin. The two patients with breast cancer were treated using the aromatase inhibitor, anastrozole. The "other" conditions category and prescribed drug class are noted in Table 3.

The data were analyzed for association between drugs being dispensed as written and health conditions (Table 4). Drugs being dispensed as written was significantly associated with the condition being treated. A significantly higher proportion of prescriptions for diabetic medications were not dispensed as written ($\chi^2=40.0$, $p=0.007$). This was noted mainly on prescriptions for metformin (85.6%), gliclazide (46.0%), and glibenclamide (7.1%); where a lower strength was dispensed to be doubled to meet the prescribed strength of the drug. This is because the prescriptions were usually written for strengths of ≥1000, 120, and 10 mg for metformin, gliclazide, and glibenclamide, respectively, but the strengths available for each, based on the VEN list are 500, 60, and 5 mg, respectively (Table 4).

A high proportion of medications for hypertension and heart failure were also not dispensed as written (71.8%). This was mainly noted on prescriptions for enalapril, losartan, HCTZ, carvedilol, and indapamide. Enalapril and losartan were mainly prescribed at 20 and 100 mg, but the strengths dispensed were usually lower at 10 and 50 mg respectively. This was the opposite for HCTZ and carvedilol, which were generally prescribed at a strength of 12.5 and ≤6.25 mg respectively but dispensed at a higher strength of 25 mg each, with the intent for the tablet to be broken to meet the prescribed strength of the drug. Indapamide was generally written as the originator brand and was responsible for the majority of the cases of drugs that were dispensed as generic instead of the brand as written.

As summarized in Table 4, chi-square analysis showed that antibiotic prescriptions were significantly associated with chronic asthma ($\chi^2=74.9$, $p<0.001$). Chi-square analysis also showed that the post of the physician managing the patient was significantly associated with elderly patients (≥65 years).

Table 3. Classes of medications prescribed for chronic NCDs at a privately funded public access clinic pharmacy in Kingston, Jamaica.

Drug classes (n = 571)	Frequency, n (%)
Hypertension (n = 499)	
ACE inhibitor	208 (41.7)
ARB	198 (39.7)
Beta blocker	60 (12.0)
CCB	317 (63.5)
Thiazide diuretic	320 (64.1)
Combined drug[a]	25 (5.0)
Heart failure (n = 49)	
ACE inhibitor	16 (32.7)
ARB	11 (22.4)
Beta blocker	34 (69.4)
Cardiac glycoside	3 (6.1)
Loop diuretic	10 (20.4)
Spironolactone	4 (8.2)
Vasodilator	7 (14.3)
Dyslipidemia (n = 129)	
Statin	129 (100.0)
Diabetes mellitus (n = 281)	
Alpha-glucosidase inhibitor	13 (4.6)
Biguanide	275 (97.9)
Insulin	65 (23.1)
Sulfonylurea	169 (60.1)
Thiazolidinedione	60 (21.4)
Combined drug[b]	75 (26.7)
Asthma/COPD (n = 28)	
Beta-2 agonist	27 (96.4)
Montelukast	5 (17.9)
Salmeterol + Fluticasone propionate	1 (3.6)
Prednisolone	1 (3.6)
Breast cancer (n = 2)	
Aromatase inhibitor	2 (100.0)
Other (n = 59)	
Antiplatelet	44 (74.6)
Anti-inflammatory/analgesic	30 (50.8)
Anti-allergy	13 (22.0)
Antifungal	9 (15.3)
BPH	25 (42.4)
PPI	10 (17.0)
Thyroid	2 (3.4)
Vascular	20 (33.9)
Vitamins/minerals	26 (44.1)

ACE: angiotensin converting enzyme; ARB: angiotensin receptor blocker; BPH: benign prostatic hyperplasia; CCB: calcium channel blocker; PPI: proton pump inhibitor.
[a]Combined drug for hypertension: Thiazide + ACE inhibitor, or ARB, or CCB.
[b]Combined drug for diabetes mellitus: dipeptidyl peptidase-4 (DPP-4) enzyme inhibitor + Metformin.

There was no significant difference between physician post and number of drugs prescribed ($p = 0.324$). However, the Mann-Whitney U comparison of independent samples showed that patients aged 65 years and above were prescribed a significantly higher number of drugs compared to patients below 65 years (Table 5). This was further supported by the significant and moderately positive correlation between age and number of drugs prescribed ($r = 0.24$, $p < 0.001$).

A summary of RUM indicators is provided in Table 6. Based on the prescribing indicators studied, only one was achieved (antibiotics encounter), with a second target, prescribing from the VEN (essential) drug list being 3.5% off the 100% target. All other factors were outside of the WHO optimal value.

Discussion

The aims of this study were to assess RUM for chronic NCDs using WHO prescribing indicators; evaluate the alignment of the use of the drugs with therapeutic recommendations from local and international organizations and propose strategies for adherence to RUM practices. Comparable to other studies, there were more female patients than males, with about one quarter of the prescription encounters being for male patients.[12,13] Most of the patients in the study population were elderly (≥65 years) with only 34% being in the working age group. This may be related to selection of patients with NCDs as other studies have found greater prevalence of NCDs in the older/retired population (≥65 years).[14,15]

Most of the prescribed drugs were dispensed (74.7%), which is similar to that seen in other low to middle income countries.[5,16] This alludes to general compliance with prescribed drugs, but the non-adherence to WHO rational use of medicines 100% prescription filling standard may be due to patient non-compliance because of increased pill burden present in patients with multimorbidity.[17–19] The 76.6% generic prescribing was below the 100% standard for RUM, however, the drugs prescribed by brand were primarily for drugs on the VEN list or drugs still under patent with no generic option available. Whilst this lower rate of generic prescribing does not adhere to RUM, the local government policy allows for generic substitution of brand drugs written on prescriptions, if a generic is available.[20] There was 96.5% prescribing compliance to the VEN list and this compares well with the 100% adherence recommended by WHO.[11] This is also comparable to results from studies in other low to middle income countries.[4,5] Encouragingly, antibiotic encounters for this patient population were low (3.9%) and well within the RUM guidelines of less than 30%.[11] Overuse of antibiotics has been linked to an increase in antimicrobial resistance and has the potential to cause widespread suffering and mortality.[21]

Majority of the drugs prescribed were dispensed as written, with those not dispensed as written being mainly due to strength modifications. Drug strength modification is the main alteration reported for prescriptions of older

Table 4. Chi-square analysis of associations between health conditions, drugs dispensed as written, and antibiotics prescribed.

Prescription data	Drugs dispensed as written, n (%)		Chi-square analysis (χ^2, p)
	Yes (n = 500)	No (n = 71)	
Conditions			
Hypertension	448 (89.6)	51 (71.8)	40.0, 0.007*
Heart failure	46 (9.2)	3 (4.2)	
Dyslipidemia	119 (23.8)	10 (14.1)	
Diabetes mellitus	242 (48.4)	39 (54.9)	
Asthma/COPD	27 (5.4)	1 (1.4)	
Cancer	1 (0.2)	1 (1.4)	
Antibiotic	19 (3.8)	3 (4.2)	
	Antibiotic prescribed, n (%)		
	Yes (n = 22)	No (n = 549)	
Conditions			
Hypertension	16 (72.7)	483 (88.0)	74.9, <0.001*
Heart failure	0	49 (8.9)	
Dyslipidemia	0	129 (23.5)	
Diabetes mellitus	8 (36.4)	273 (49.7)	
Asthma/COPD	6 (27.3)	22 (4.0)	
Cancer	0	2 (0.4)	
	Prescribing Physician's post, n (%)		
	GP (n = 316)	Consultant (n = 13)	
Age category (n = 329)			
≥65 years, n (%)	204 (64.6)	13 (100.0)	7.0, 0.008*
<65 years, n (%)	112 (35.4)	0	

COPD: chronic obstructive pulmonary disease; GP: general practitioner.
*Significant associations at $p < 0.05$.

Table 5. Comparisons of the number of drugs prescribed between categories of age and Physician's post.

Prescription data (n = 571)	Number of drugs prescribed	Mann-Whitney U test p
	Median (IQR)	
Age category (n = 329)		
≥65 years (n = 217)	6 (3)	<0.001*
<65 years (n = 112)	4 (3)	
Pearson's correlation (r, p)	0.24, <0.001*	
Prescribing Physician's post		
General Practitioner (n = 541)	5 (3)	0.324
Consultant (n = 30)	6 (2)	

IQR: interquartile range; r: Pearson's coefficient for the correlation between age and number of drugs prescribed.
*Significant associations at $p < 0.05$.

patients.[22] Diabetes drugs were significantly associated with not being dispensed as written. This was noted with metformin and gliclazide which were the most frequently prescribed diabetic drugs. These drugs were mostly prescribed at higher strengths than available on the VEN list. This suggests that the disease severity was generally high in the study population, requiring higher doses. In some cases, higher drug strengths were available but the dose form on the VEN list was lower, requiring doubling of the available dose strength to equate to the prescribed strength. A similar pattern was seen for treatment of hypertension. Most studies reported irrational use in broad treatment categories but did not indicate the drugs associated with irrational use nor describe dose modification as the reason for

Table 6. Comparison of study rational use of medicine with WHO (1985) guidelines.

Factor	WHO value	Study value
Average number of drugs/prescriptions	1.6–1.8	5
Proportion of generic prescribing (%)	100	76.6
Proportion of antibiotic encounters (%)	<30	3.9
Percentage drugs dispensed (%)	100	74.7
Percentage drugs prescribed from VEN list (%)	100	96.5

VEN: vital, essential, necessary; WHO: World Health Organization.

irrational use.[4–6,16,23] This practice of dose modification causes higher pill burden and has implications for patients' adherence to treatment due to confusion, frustration, and doubting the effectiveness of treatment caused by the number of pills prescribed.[17,24] These factors can lead to poor compliance to drug treatment and affect quality of life from increased morbidity and mortality in patients with NCDs.[25]

Non-communicable diseases can have tremendous impact on a country's economy, with the impact in low to middle income countries being three times that of high income countries,[14,26] and is the cause of death in 30–69 years olds in these countries.[15,27] Cardiovascular diseases, specifically hypertension, accounted for the majority of the NCDs in this study, with more than half of the patients having multimorbidity, defined as having more than one comorbid condition.[28] Multimorbidity is linked to age and also has attendant issues such as high polypharmacy with increased risk of adverse drug events, poor patient compliance, and added healthcare costs.[15,18,19] In this study the prevalence of multimorbidity was high (56.6%), as was the degree of polypharmacy (53.6%), which was above the optimal number of drugs (≤2) recommended by WHO for RUM.[29] This was expected in the older study population and comparable to other reports on the average drug use in chronic NCDs in low to middle income countries.[19,30] NCDs with its higher drug usage was noted as a major public health burden by the Ministry of Health and Wellness in Jamaica, which added to the country's cost of care.[14,31] The high prevalence of encounters/prescriptions for hypertension drugs was expected since Jamaica has a 30% prevalence of hypertension in the general population.[10] The Jamaica Health and Lifestyle Survey (JHLSIII) reported that adherence to lifestyle changes to assist in the management of NCDs like hypertension and diabetes may be low, as 70% of the population did not have adequate resources to consume sufficient or nutritious foods and only 16% engaged in moderate physical activity as recommended by WHO.[10] This therefore means that the modest reductions in disease severity due to lifestyle intervention is unlikely to be met, leading to greater dependence on drug therapy. The high level of prescriptions from general practitioners aligns with international consensus that multimorbidity is best treated in a primary care setting, which allows for the holistic approach to patient treatment rather than symptomatic management by different specialists.[32,33]

In accordance with local and international guidelines, the majority of patients with diabetes were treated using metformin and patients with cardiovascular diseases were treated with either a thiazide diuretic, calcium channel blocker (CCB), or angiotensin modifying drug (ACE inhibitor or ARB). This is in alignment with treatment guidelines recommended for Black populations.[34,35] Whilst this is not a direct RUM indicator, it speaks to adherence to therapeutic guidelines for effective management of patients, which is a part of rational use of medicines. Additionally, the high use of angiotensin modifying drugs may be related to the high comorbid presence of diabetes, as ACE inhibitors are associated with cardiovascular benefits, delay in new onset diabetes and renal protection in at risk patients.[36–38] A combined drug formulation is generally associated with better compliance from reduced pill burden and could be used with great efficacy in a multimorbidity population.[39] Despite this, only 5% of patients with hypertension and 26.7% of patients with hyperglycemia were treated with a combined drug formulation.

Overall, the use of drugs in this clinic setting in Jamaica was not rational based on WHO standards, as four of the prescribing factors to ascertain rational use were not met. However, prescribing based on the VEN (essential) drug list was not significantly below the WHO standard. Also, prescribing using the generic name of the drug, although not achieved, would be mitigated as the Generic Law in Jamaica requires that the generic drug instead of the brand can be dispensed at the pharmacy.[20] A value of this study is in the evaluation of adherence to therapeutic guidelines as a part of rational use of medicines and the noting of the impact of multimorbidity on prescribing indicators. The limitations of the study include use of one site and as such the data cannot be extrapolated to the entire country. Another limitation is selection of chronic non-communicable diseases which are associated with multiple drug treatments which may affect the number of drugs prescribed per patient (prescription encounters) and hence cannot be extrapolated to the general population.[18,19] The information gathered is valuable but would be better supported by data from the government pharmacy database.

The study recommendations are that patient prescriptions be assessed for relevance of drugs with use of fixed dose combination formulations to reduce pill burden and polypharmacy. The VEN list should carry all forms of the drug with procurement based on drug use patterns, so that the frequently used strengths are available to reduce the need to double pills or cut pills to meet the dose requirement. Despite the Generic Drug Law, physicians should be encouraged to prescribe by generic name, as generic drugs may become available for brand name drugs without their knowledge. The notable difference between percentage dispensed versus drugs prescribed indicates a need for more patient education on the benefits of adherence to treatment for improved treatment outcomes.

Conclusion

In conclusion, rational use of medicines was low in this setting, with four of the five prescribing indicators being assessed for RUM not achieved. The average number of drugs per encounter/prescription being less than 1.8, all drugs prescribed by generic name, all drugs on the prescription being dispensed and only drugs on the VEN list being prescribed were outside of the WHO RUM standard. Drugs being prescribed only from the VEN (essential) drug list was slightly outside of the 100% requirement of the WHO standard. Only the number of antibiotic encounters (3.9%) achieved the RUM target of less than 30%. There was adherence of drugs prescribed with the recommendations from international and local therapeutic committees. This can be used as a proxy for rational use of medicines as the therapeutic recommendations are made for efficient management of disease states based on the efficacy and safety data to achieve best outcomes for patient management. Rational use of medicines in this setting can be improved through reduction in the number of drugs per prescription. However, multimorbidity and polypharmacy are prevalent in the older population within this clinic setting and would affect the ability to achieve the WHO standard for 1.8 drugs per prescription. In this regard, greater use of combined formulations may be employed to reduce pill burden and increase compliance. Whilst prescribing by generic name is suboptimal, majority of the prescribed were on the VEN list. Physicians may not be concerned about the use of the generic or brand name as the Generic Law in Jamaica allows for generic substitution at the pharmacy.

Author contributions

DWA contributed to the design of the study, data collection, interpretation, and writing of the manuscript. PTB contributed to the statistical oversight of the study, data collection, analysis, interpretation, and writing of the manuscript. MW contributed to data collection, writing, and review of the manuscript. LB contributed to data collection, writing, and review of the manuscript. JBC contributed to data collection, writing, and revision of the manuscript. All authors have read and approved the final manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval and consent to participate

This study was reviewed and approved by the University of Technology, Jamaica Ethics Committee [protocol Number: 2021/09/UtechJa./773] and the Ministry of Health & Wellness South Regional Health Authority Ethics Committee and permission granted from the Foundation for International Self Help Board. Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

Patient consent for publication

Not applicable.

Significance for public health

This study incorporates alignment of recommended therapeutic guidelines with rational use of medicines (RUM) to describe the first RUM literature for Jamaica. A value of this study is the identification of chronic non-communicable diseases that are mostly associated with irrational use of medicines, as seen by multiple drug treatments that contributes to an increased number of drugs per encounter/prescription. Of the WHO prescribing factors assessed, only the antibiotic encounter was within the RUM optimal recommendation. As such, strategies to improve adherence to RUM are highly recommended in this setting to maximize therapeutic outcomes and enhance efficient use of health resources.

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Availability of data and materials

Data are available upon reasonable request. The datasets used and/or analyzed for the current study are only available in compliance with the Jamaica Data Protection Act.

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