Prescribing Patterns in a Primary Care Service in a Rural Site in the Philippines from April 2019 to March 2020 – A Cross-sectional Study

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ABSTRACT

Background. Appropriate use of medication is an important indicator of quality healthcare delivery among children. Previously published studies on drug utilization involved Filipino households in general and were conducted in the 1990s. No recent Philippine studies have been conducted that focus on drug utilization in children.

Objective. To describe the current prescribing patterns in one primary care service in a rural site in the Philippines using the World Health Organization (WHO) prescribing indicators.

Methods. A cross-sectional study was conducted by review of electronic medical records of patients seen at the primary care facility under the Philippine Primary Care Studies (PPCS) rural site from April 2019 to March 2020. Out of 9,930 total encounters, 623 patient encounters with prescriptions for pediatric patients were included in the study through systematic sampling. The average number of drugs per encounter, percentage of drugs prescribed by their generic names, percentage of encounters with prescribed antibiotics, percentage of encounters with prescribed injections, and percentage of drugs prescribed from the Philippine Drug Formulary were calculated. Values were compared to the cut-offs considered "good practice" for outpatient care in the WHO manual: (1) an average number of less than two drugs per encounter; (2) less than 30% of encounters are prescribed with antibiotics; (3) less than 20% of encounters are prescribed with injections; (4) 100% of drugs are prescribed by generic name; and (5) 100% of drugs are from the formulary.

Results. On the average, three drugs were prescribed per encounter. Most patient encounters (80.9%) involved antibiotics prescription — higher than the WHO standard value of 30%. All drugs were prescribed by generic name and were prescribed from the formulary. Only 0.5% of encounters were prescribed injections, all of which were administered through the intramuscular route. Of the 1,962 prescriptions generated, antibiotics was the most prescribed medication (25.7%). The most common diagnosis was infectious in nature (88.8%).

Conclusion. The primary care service achieved the WHO standard values in terms of prescribing by injections and

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by generic names. There was a high rate of antibiotic prescriptions at 83%, and a high average number of drugs prescribed per encounter, exceeding the WHO standard value.

Keywords: prescription patterns, drug prescribing indicators, irrational drug use, primary care

INTRODUCTION

Appropriate use of medications is of utmost importance in delivering quality healthcare among children. If not used appropriately, medications can lead to adverse consequences such as increased morbidity and mortality, reduced resource availability, increased cost, and psychosocial issues.[1]

The use of drugs is said to be rational if appropriate drugs are prescribed for appropriate indications to appropriate patients who are well-informed and appropriately monitored.[1] "Irrational drug prescribing" is defined as "prescribing that fails to conform to good standards of treatment."[2] According to studies, over 50% of medications are prescribed or supplied wrongly worldwide.[3] A World Health Organization (WHO) survey revealed that in developing countries, less than 40% of primary care patients in public health institutions and 40% in the private sector are treated according to established treatment standards.[4] Polypharmacy (use of five or more prescriptions), insufficient dosage, improper indications, excessive use of injections when oral treatments would be more appropriate, and self-medication are a few factors that contribute to the problem of irrational drug prescribing.[2]

Negative effects from drug misuse include rising antibiotic resistance, an increase in blood-borne infections, and increased adverse drug reactions (ADRs). Drug misuse significantly contributes to unnecessary medical expenses. In low- and middle-income countries (LMICs), 70 to 75 percent of all healthcare costs are related to medications. According to the WHO, 50 to 70 percent of these drug prescriptions are unnecessary.[4]

Children are particularly susceptible to the negative effects of medications due to their unique pharmacokinetics and pharmacodynamics.[5] In a review of 80 studies reporting ADRs in children, Smyth et al. observed that the incidence of an ADR leading to hospital admission ranged from 0.4% to 10.3%.[6] According to another study, 71% of ADRs in children necessitated hospital admission, accounting for 4% of all admissions in a major children's hospital in the United Kingdom.[7]

Underprescribing includes non-prescription of necessary medications, prescription of insufficient dosages, or inadequate treatment duration. On the other hand, overprescribing describes situations in which a medication that is not recommended is prescribed; if it is indicated, the course of treatment is prolonged, or the dosage is inappropriately high. Examples of overprescribing in children include provision of antibiotics for 21 days for a minor infection that should be treated for 7 days only, or prescription of antibiotics for viral infections.[1] Both under- and over-prescription of drugs has a particularly negative impact on children.

Due to the growing public health concern of drug misuse, the WHO created prescribing indicators detailed in the WHO manual to support good medical practice.[8] WHO prescribing indicators considered "good practice" for outpatient care include: (1) an average number of less than two drugs per encounter; (2) less than 30% of encounters are prescribed with antibiotics; (3) less than 20% of encounters are prescribed with injections; (4) 100% of drugs are prescribed by generic name; and (5) 100% of drugs are from the formulary.[2]

Several studies have evaluated the prescribing patterns in children using these WHO indicators. A February 2022 cross-sectional study done in outpatient clinics in Lebanon uncovered several good prescribing practices: an ideal generic prescribing pattern (100%) and quantity of medications (average of 1.8) prescribed to children per visit. A study by Aldabagh in 2022 showed good clinical practice in terms of prescription of antibiotics: 19.5% of encounters had antibiotics prescribed. However, there was subpar use of drugs in the formulary (47.7%), and overuse of injectables (44.8%) especially in endocrine clinics.[2] A study in an Indian pediatric outpatient clinic reported similar results of over-prescription of antibiotics (60%). The study noted inadequate labeling (almost 50% used brand names), with an average of 3.4 drugs prescribed per encounter. Prescribing from the formulary for children was assessed as fair, while use of injections was low.[9] One 2006 retrospective study from Nepal evaluated prescribing patterns among hospitalized patients. Results showed a trend towards polypharmacy, with an average of 4.5 drugs prescribed per admission. Almost 70% of admissions were prescribed antibiotics.[6] Across these studies, there is consistent evidence to suggest that the prescribing practices of healthcare professionals in children need improvement in the five areas as defined by the WHO indicators.

Previously published Philippine studies on drug utilization involve households in general and were conducted in the 1990s.[10] No recent Philippine studies have been conducted focusing on drug utilization in children. The Philippine Primary Care Studies (PPCS) was established in 2016 to investigate how certain interventions can improve primary care delivery system to address the issues that cause healthcare access disparities. The main goal of this program is to identify the healthcare effects of an outpatient primary care system through pilot studies in a rural, remote (Geographically Isolated and Disadvantaged Areas), and urban setting. In the rural site, the primary care system was established through a service delivery network (SDN) composed of the rural health unit (RHU) and 14 barangay health stations (BHS). The primary care facility was supported by a robust electronic medical record system (EMR) that tracked patient visits and provider workloads, diseases, management, and health expenditures.

One of the program's outcome measures is quality of care which can be measured by how medications are prescribed. This paper evaluates the prescribing patterns of healthcare professionals for pediatric patients in a primary care service in a rural site from April 2019 to March 2020. The duration of the study was one year, as recommended in the WHO Manual, to minimize bias brought by seasonal variations or interruptions in the drug supply cycle. A primary care service was selected as the study unit, as recommended by the WHO. The prescribing indicators are more useful in outpatient settings and in primary care facilities where the drug use patterns are less complex, compared to inpatient and referral hospital settings.

The present study is significant as it assessed the prescribing patterns of a primary care facility in the Philippines using the WHO prescribing indicators. The study can offer baseline data on prescribing practices and assess whether the facility's performance satisfies the standards established by the WHO. Interventions can be directed towards specific areas of drug prescription practices where performance is found to be subpar. The same WHO drug prescription indicators can be used to gauge the success of an intervention after implementation. This study also demonstrated how the EMR can be used to track healthcare quality, measured as prescribing patterns, in a primary care.

The primary objective of the study was to describe the current prescribing patterns using the WHO prescribing indicators in one rural primary care facility using data gathered from its EMR from April 2019 to March 2020. Secondary objectives were: (1) to identify the most prescribed medications in pediatric outpatients; (2) to determine the most common diagnoses, both infectious and non-infectious; and (3) to identify areas that need improvement with regard to the rational use of medicines among pediatric patients in one primary care service in a rural site.

METHODS

Study Design

A cross-sectional study was conducted through review of the EMR. Using all encounters with prescriptions for pediatric patients (aged less than 19 years) seen in the rural primary care facility from April 2019 to March 2020 as a sampling frame, systematic sampling was done. The systematic sampling technique was recommended in the WHO Manual for drug utilization studies.[8]

The rural primary care facility was in Samal, Bataan, a fourth-class municipality with approximately 36,000 residents across 14 barangays. This facility provided healthcare services through one Rural Health Unit (RHU) and 14 barangay health stations (BHS). Doctors, nurses, and midwives provided services in the RHU; nurses and midwives primarily handled the BHS.

An encounter is defined in this study as a clinical encounter where a patient is diagnosed and prescribed with medications. Sampling was done using the following steps: (1) identification of total number of encounters over the study; and (2) total number of encounters was divided by the desired sample size to obtain the sampling interval. A minimum of 600 encounters was recommended by the WHO with the goal of estimating percentage indicators that summarize values for the sample as a whole with 95% confidence interval ±7.5%. The sampling interval in this study was computed as 9,930 / 600 = 16.

The sampling list was sorted chronologically. The starting point was the first encounter recorded in the EMR. Every 16th encounter from the starting record was selected. This sampling procedure was controlled for seasonal effects and different timings of consult in a day. All records identified through systematic sampling were included in the study; there was no exclusion criteria.

Study Procedure

Data was collected from the EMR by the data manager of the PPCS team using Microsoft Excel. The data manager and PPCS team members were oriented beforehand by the primary investigator to ensure research objectives were well-communicated. Data collected include anonymized patient ID, encounter ID, visit number, birthdate, age, sex, consultation time, diagnosis, and medications.

Data extraction was done by the primary investigator and the PPCS data management team following the sample data collection form recommended in the WHO manual. Any missing data was to be encoded as "not reported." Data was analyzed by the primary investigator. Antibiotics are defined in this study as all drugs listed in the National Antibiotic Guidelines 2018 Manual prepared by the Department of Health (DOH). Generics name is defined in this study as product names listed in the Philippine Drug Formulary 8th edition prepared by the DOH in 2017. Diagnosis is defined in this study as the disease listed via ICD-10 codes. Diagnoses were classified as infectious and non-infectious. Non-infectious diagnoses were further categorized into respiratory, nephrology, cardiology, gastroenterology, hematology-oncology, dermatology, trauma, pregnancy-related, and others. Each clinical encounter was assigned a sequence number to ensure confidentiality. The data was stored in the data encoders' laptops which were secured by a password accessible to them only.

Data Analysis

Categorical data such as sex, diagnosis, and types of drugs were presented using frequencies and percentages. Continuous data were presented using mean and standard deviation (SD). The WHO indicators were calculated based on the WHO Manual, as shown in Figure 1.

Ethical Considerations

The University of the Philippines Manila Research Ethics Board (UPMREB) granted ethical clearance for the

1. Average number of drugs per encounter

$$\text{Average number of drugs per encounter} = \frac{\text{Total number of drug products}}{\text{Total number of patient encounters}}$$

2. The percentage of encounters with antibiotics prescribed

$$\text{\% encounters with antibiotics prescribed} = \frac{\text{Number of patient encounters during which an antibiotic is prescribed}}{\text{Total number of patient encounters}} \times 100$$

3. The percentage of drugs by generic name

$$\text{\% drugs by generic name} = \frac{\text{Number of drugs prescribed by generic name}}{\text{Total number of drugs prescribed}} \times 100$$

4. The percentage of encounters with an injection in prescription

$$\text{\% encounters with an injection prescription} = \frac{\text{Number of patient encounters during which an injection is prescribed}}{\text{Total number of patient encounters}} \times 100$$

5. The percentage of drugs in prescription from the formulary

$$\text{\% of drugs in prescription from the essential drug list} = \frac{\text{Number of products in the prescription from the essential drug list}}{\text{Total number of drugs prescribed}} \times 100$$

Figure 1. Formula used in calculating the WHO indicators as written in the WHO manual.

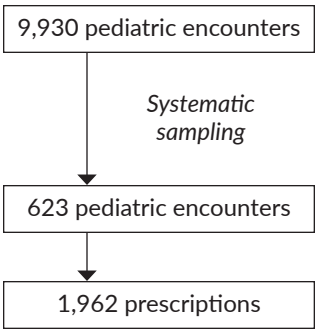

Figure 2. Study flow diagram.

Philippine Primary Care Studies with study protocol code UPMREB 20-15-489-01. Anonymity was guaranteed by using arbitrary alphanumeric identifiers. Names and contact details were excluded from the data collection.

RESULTS

This study included 623 encounters with prescriptions for pediatric patients. A total of 1,962 prescriptions were generated from the 623 patient encounters, since there were encounters with more than one prescription (Figure 2). There was no missing data in this study. The data collected from the EMR all came from "required" fields, meaning these fields are needed to be answered to close the record.

Among the 623 encounters, almost half involved male patients (52.8%, n=329). The mean age was 5.4 years old (SD 4.5), with 296 encounters (47.5%) involving patients aged 1 to 4 years. Table 1 shows the sociodemographic characteristics of pediatric patients.

Among the 623 encounters, 553 (88.8%) were diagnosed to have an infectious condition. Among the non-infectious diagnoses, allergy and gastrointestinal concerns were the most common. Table 2 shows the distribution of all diagnoses seen in the study.

Table 1. Sociodemographic Characteristics of Pediatric Patients Included in the Study (N=623)

Parameter	N (%)
Sex	
Male	329 (52.8)
Female	294 (47.2)
Age	
Less than 1 year old	39 (6.3)
1 to 4 years old	296 (47.5)
5 to 9 years old	176 (28.3)
10 to 14 years old	78 (12.5)
15 to 18 years old	34 (5.4)

Table 2. Frequency Distribution of Diagnoses Seen in a Primary Care Service at a Rural Site (N=623)

Diagnosis	N (%)
Infectious	553 (88.8)
Non-infectious	70 (11.2)
Allergy	16 (2.6)
Gastrointestinal	16 (2.6)
Respiratory	11 (1.8)
Trauma	6 (1.0)
Pregnancy-related	6 (1.0)
Others	5 (0.8)
Hematology Oncology	4 (0.6)
Dermatology	3 (0.5)
Nephrology	2 (0.3)
Endocrinology	1 (0.2)

Table 3. Frequency Distribution of the Prescribed Medications (N=1962 prescriptions)

Drug Name	N (%)
Antibiotics	504 (25.7)
Antihistamine	344 (17.5)
Analgesics	332 (17.0)
Multivitamins	317 (16.3)
Lagundi	138 (7.0)
Ascorbic acid	130 (6.6)
Bronchodilator	124 (6.3)
Dicycloverine	23 (1.2)
Oral Rehydration Solutions	19 (1.0)
Ferrous salt	14 (0.7)
Calamine lotion	7 (0.3)
Vaccines	4 (0.2)
Topical Corticosteroids	3 (0.15)

Table 4. Frequency Distribution of Number of Drugs Prescribed per Encounter (N=623)

Number of drugs per encounter	N (%)
0	0
1	41 (6.6)
2	141 (22.6)
3	223 (35.8)
4	134 (21.5)
5 and above	84 (13.5)

Table 5. Drug Core Prescribing Indicators

Parameter	Study Sample Value	WHO Standard Value	Standard Achieved?
Average number of drugs per encounter	3	<2.0	No
Percentage of encounters with antibiotics	80.9%	<30%	No
Percentage of encounters with injection	0.5%	<20%	Yes
Percentage of drugs prescribed by generic name	100%	100%	Yes
Percentage of drugs from the formulary	100%	100%	Yes

Of the 1,962 prescriptions generated, antibiotics were the most prescribed (25.7%), followed by antihistamines (17.5%), analgesics (17%), and multivitamins (16.3%). Table 3 shows the frequency distribution of the prescribed medications among the 1,962 prescriptions. Out of the 623 patient encounters, 504 (80.9%) involved antibiotics prescription.

Table 4 shows the frequency distribution of the number of drugs prescribed per encounter. All encounters resulted in at least 1 drug prescribed. The most common number of drugs prescribed per encounter was 3 drugs (35.8%), followed by 2 drugs (22.6%) and 4 drugs (21.5%). Polypharmacy (prescription of 5 or more drugs) was noted in 13.5% of encounters. The average number of drugs per encounter was three.

Only 3 encounters (0.5%) involved prescription of injections, all of which were administered through the intramuscular route (i.e., tetanus vaccine is given via intramuscular route for cases of animal scratch and/or bites). All drugs were prescribed by generic name. All drugs were prescribed from the formulary. Table 5 shows the calculated value per prescribing indicator for the primary care service compared to the standard value set by the WHO. Two prescribing indicators did not meet the WHO standard value. The average number of drugs per encounter was greater than 2, and the percentage of encounters with antibiotics was greater than 30%.

DISCUSSION

This study evaluated the prescribing patterns of physicians in one primary care service based in a Philippines rural site. The primary care service was able to achieve the WHO standard values for three drug prescribing indicators, namely: percentage of encounters with injection, percentage of drugs from the formulary, and percentage of drugs prescribed by generic name. The WHO standard values for two indicators, average number of drugs per encounter less than 2 and encounters prescribed with antibiotics less than 30%, were not met. These two areas may benefit from interventions such as capacity-building activities of healthcare providers, and patient and parent health education strategies to improve rational use of medications among pediatric patients.

In this study, the encounters most commonly involved children aged 1 to 4 years (47.5%). This is similar to results of Sharma's study in 2016 where 66.1% of prescriptions were for the said age group.[11] This may be due to the fact that these age groups are more vulnerable to injury and acquiring infections.

Antibiotics were the most frequently prescribed medications in this study. They were also the most frequently prescribed in a study on patients aged <5 to >64 conducted in Ethiopia last 2015.[12] A prospective observational study in India conducted among 62 children in 2021 also reported that antibiotics were the drug classes most frequently administered.[13] A cross-sectional study conducted in Sierra Leone among pediatric patients in 2015 showed that the most prescribed medicines were vitamins (85.4%). This was closely followed by antibiotics (83.0%), nonsteroidal anti-inflammatory drugs (NSAIDS) (79.6%), and antimalarials (79.6%).[14] In contrast, a 2016 study in India among children reported that antibiotics ranked as 4th most prescribed medication. The most prescribed drug was paracetamol, followed by chlorpheniramine maleate, and oral rehydration salts.[5]

The frequent prescription of antibiotics in the pediatric population may be because acute respiratory tract infections and nose infections are the most frequent conditions affecting children.[15] In this study, majority of the diagnoses (88.8%) were infectious in nature. This finding is similar to the prospective study carried out in an outpatient clinic in India last 2016, which reported that most pediatric patients had respiratory tract infections, followed by diarrhea, viral pyrexia, epilepsy, and folliculitis.[5]

First WHO indicator: Average number of drugs per encounter

In this study, an average of three medicines were prescribed per patient encounter. This is similar to other studies reporting the average number of drugs per prescription at 3.77, 3.3, and 3.32.[14,16,17] In contrast, some studies have reported lower average number of medicines per prescription at 2.55, 2.4, and 2.6.[18-20]

The average number of three drugs per clinical encounter is above the recommended value set by the WHO. The availability of unnecessary and irrational drug combinations, aggressive drug promotion, and aggressive

marketing strategies of pharmaceutical companies may be some factors that contribute to increased drug prescriptions. Other factors include patients' unrealistic expectations and demands for immediate relief. There were no encounters where a drug was not prescribed, which may be due to some patient's expectations that when they see a doctor, they will always get a prescription to relieve symptoms or resolve their disease. Polypharmacy has a negative impact on treatment outcomes. It also diminishes compliance and inflates the cost of medicines; thereby, causing a burden on patients and the country's healthcare system. It is crucial to institute local rules and practices into place to rationalize the use of drugs.

Second WHO indicator: Percentage of encounters with antibiotics

The percentage of encounters with antibiotics was 83%, much higher than the recommended value of 30% by the WHO. The high percentage of antibiotic prescription is consistent with the leading diagnosis, since infection constituted majority of the consults. However, it is important to consider that most of the pediatric infections are viral in nature and do not need antibiotics.

This percentage is comparable to the values obtained in earlier research on drug usage. A 2015 study in Ethiopia among patients aged <5 and >64 years reported that 46% to 85% of prescriptions were antibiotics.[12] Similar antibiotic prescription rates among children were also reported in other LMICs such as Sudan (81.3%), India (81.1%), and Nigeria (71.1%). In higher-income nations, the antibiotic prescription rates among children varied widely from 18.5% in Saudi Arabia, 44.6% in the United Arab Emirates, and 85% in Jordan.[11]

Third WHO indicator: Percentage of encounters with injections

This study shows that 0.48% of encounters have prescribed injections which are all intramuscular in nature. Improper prescription of injections may cause unnecessary pain among pediatric patients. Overuse of injections rather than available, suitable oral dose forms also raises healthcare expenses and increases the risk of iatrogenic infections.

The low prescription of injections in this study is comparable to a 2016 study conducted in Pakistan.[21] This may be because injectable medicines are more commonly reserved for emergency cases, and therefore prescribed by the emergency department. In contrast, other studies report that injections were prescribed at an average of 61% of patient encounters.[22]

Fourth WHO indicator: Percentage of drugs prescribed by generic name

Using the generic name helps in establishing better communication among healthcare workers. In this study, all prescriptions were written in generic names, which meets the WHO standard value of 100%. The WHO Drug Use Indicators Manual prerequisite in computing the percentage of drugs prescribed by generic name is that investigators must be able to observe the actual names used in the prescription. In the EMR used in the primary care facility, drug products are listed using the generic name. The prescriptions would then be automatically generated and reach pharmacies through the SDN. This is one distinct advantage of using the EMR, since all prescriptions generated from the EMR would contain the generic name.

In other studies, the percentage of medications prescribed by generic name was 49.3% in Sudan, 68.9% in Nigeria, and 95.8% in Ethiopia.[23] The wide variation among these countries is reflective of the laws governing prescription writing. The 100% use of generics name in this study complies with Republic Act No. 6675 or the "Generics Act of 1988," which states the importance "to promote, encourage and require the use of generic terminology in the importation, manufacture, distribution, marketing, advertising and promotion, prescription and dispensing of drugs." On the other hand, Sudan has no legal provisions in place to prescribe by generic name in the public or private sector.[24] Likewise, Nigeria is yet to institutionalize the generic medicine prescribing even though legislation exists.[25]

Fifth WHO indicator: Percentage of drugs from the formulary

This study exhibited the acceptable value of 100% prescription of drugs from the formulary. This value is higher than those observed in other countries such as India (24%).[11] Prescribing drugs from the national formulary encourages the selection of medicines that are affordable and appropriate for local patterns of illness prevalence and drug resistance; thus, promoting rational prescribing. It promotes the use of well-known and affordable medications, resulting in a fair and sustainable access to goods, improved long-term pharmaceutical supply, and quality health care. In the EMR used, only drugs that belong to the Philippine Drug Formulary are listed in the system. Healthcare providers who choose drugs that do not belong to the formulary need to input these manually. The cost of this non-formulary drug would not be covered by the health package and would be shouldered by the patients. Thus, this study demonstrates that incorporating only formulary drugs in the EMR successfully resulted in the achievement of the WHO standard of 100% prescription of formulary drugs.

Limitations

The result of this study was based on and limited to the EMR in one primary care facility in a rural site. The results are dependent on the accuracy of reporting and documentation in the said registry. Moreover, since the setting of the study was a single health facility, its conclusions may not be applicable to the other primary care facilities. The research only measured drug use at a certain time frame and did not evaluate the quality of diagnosis.

CONCLUSION

The drug-prescribing patterns of the primary care service in this study generally fared well compared to the WHO standard. The primary care service achieved the WHO standard values for percentage of encounters with injection (<20%), percentage of drugs from the formulary (100%), and percentage of drugs prescribed by generic name (100%). The most common prescribed drug was antibiotics, and the most common diagnosis was infectious in nature. The average number of antibiotics encountered per prescription in this study was high at 83% versus the WHO standard value of 30%. The average number of drugs per encounter was also high. Improvement in these two areas (rational prescription of antibiotics and prescription of appropriate number of drugs) is needed.

Recommendations

This study contributes to the local and international literature by evaluating medicine use in the context of primary care service—a point of first contact with the health system. The results of the study can be used to initiate discussions with the public about the benefits and risk of medicines. They may also contribute to the training of medical students on rational drug use. The results can also guide the local government in ensuring proper budget allocation for the most prescribed medications in the area where the study was conducted. The information gathered in the present study can also aid healthcare professionals who are responsible for supervising the quality of medical care provided. Overall, the present study can serve as a foundation for future strategies aimed at ensuring safe and effective drugs for use in sick infants, children, and adolescents.

Disclaimer

Views expressed by the authors in the submitted article are their own and not an official position of the institution or funder.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors have no conflicts of interest to declare.

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