



Evaluation of Prescribing Patterns for Pediatric Community-Acquired Pneumonia in the Outpatient Department of a Tertiary-Care Medical Center in the Philippines

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OBJECTIVES: This study evaluated the antibiotic prescribing patterns in pediatric patients in the Out Patient Department (OPD) of the Philippine Children's Medical Center (PCMC) where it may encourage drug monitoring and improvement in the utilization of antibiotics in the department.

MATERIALS AND METHODS: A descriptive, cross-sectional study involving patient encounters selected using convenience sampling was conducted at the outpatient department of PCMC. All previously healthy pediatric patients aged 3 months to 18 years diagnosed with pediatric community-acquired pneumonia (PCAP) with no known acute and chronic co-morbidities were included. The observed values of the antibiotic prescribing indicators were compared with the optimal values recommended by the World Health Organization (WHO), and the Index of Rational Drug Prescribing (IRDP) was calculated.

RESULTS: A total of 600 patients diagnosed with PCAP were included in the study seen at the PCMC OPD from January 2020 to July 2022. Ninety-six percent of the patient encounters had at least one antibiotic prescribed ($SD \pm 0.20$). The average number of medicines prescribed per patient encounter was 2.05 ($SD \pm 0.85$). Of these, 100% were prescribed by generic name and were prescribed from the essential drug list. The most commonly prescribed medications were antibiotics (43.17%) with co-amoxiclav (42.93%), amoxicillin (37.76%), and cefuroxime (7.59%) being the top three commonly prescribed antibiotics.

CONCLUSION: With respect to the IRDP, PCMC scores well with 3.16 where the most rational score is 4. However, this study highlights the high occurrence of prescribing antibiotics in the institution.

KEYWORDS: *Antibiotic prescribing pattern, Outpatient department, Pediatrics, WHO indicators*

INTRODUCTION

While antibiotics remain to be one of the greatest advances in medicine, the method and manner of their use, if not observed properly, could result in problems that might affect the health of humanity as a whole. Currently, the issue of antibiotic resistance has become one of the major concerns of experts in the field of medicine, and this is brought about by the practices in prescribing patterns that

involve antibiotics. To give a better perspective, in 2014 alone, 266.1 million courses of antibiotics were dispensed to outpatients in U.S. community pharmacies. This equates to more than 5 prescriptions written each year for every six people in the United States. At least 30% of antibiotics prescribed in the outpatient setting are unnecessary, meaning that no antibiotic was needed at all.

Total inappropriate antibiotic use, inclusive of unnecessary use and inappropriate selection, dosing and duration, may approach 50% of all outpatient antibiotic use. [1] Thus, appropriate antibiotic prescribing must be strongly encouraged among healthcare professionals. Appropriate antibiotic prescribing means antibiotics are only prescribed when needed, and when needed, the right antibiotic is selected and prescribed at the right dose and for the right duration. Appropriate antibiotic prescribing should be in accordance with evidence-based national and local clinical practice guidelines, when available.

Relating to the issue of antibiotic resistance, this study finds it significant to evaluate the prescribing patterns for one of the most common diseases in PCMC where antibiotics are prescribed: Pediatric Community-Acquired Pneumonia (PCAP). According to Philippine Children's Medical Center's (PCMC) 2019 annual report, pneumonia has always been in the top three cases when it comes to admission. It is also in the top three causes of mortality from 2017 to 2019. There have been 517 admitted cases of pneumonia in 2017, 722 in 2018, and 957 in 2019. [2] Nationwide, pneumonia consistently places within the top five causes of mortality from 2017 to 2019. [3, 4, 5]

This study specifically covers the Out Patient Department (OPD) of PCMC because there is no antimicrobial stewardship program, unlike for inpatients where antibiotic surveillance is regularly conducted. With no antimicrobial stewardship program, the OPD of PCMC is more vulnerable to prescribing patterns that might contribute to the aggravation of antibiotic resistance. Consequently, this study assessed the antibiotic prescribing patterns in pediatric

patients in the OPD of PCMC where it may encourage drug monitoring and improvement in the utilization of antibiotics in the department. Moreover, this study aimed to describe the antibiotic prescribing pattern in PCAP in the OPD of PCMC and assessed the level of adherence of physicians to the available local clinical practice guidelines in prescribing antibiotics. Ultimately, this study may serve as a reference that may be used to evaluate the need to establish an antimicrobial stewardship program in the OPD of PCMC.

METHODOLOGY

This research used a cross-sectional, descriptive study design with a quantitative approach. This study was conducted at the OPD of PCMC which is manned by resident physicians. PCMC tertiary medical center for children is located in Quezon City, Philippines. It is a referral center for pediatric cases from primary and secondary health facilities nationwide. It also serves as a training institution which offers training programs for medical and allied healthcare providers.

The study population included all previously healthy pediatric patients aged 3 months to 18 years diagnosed with PCAP seen at the OPD of PCMC from January 2020-July 2022 with no known acute and chronic co-morbidities. Six hundred encounters were included as recommended by the World Health Organization (WHO) in investigating prescribing practices of a facility. A convenience sampling was used. [6]

A research assistant reviewed charts of the target population. The charts were physical charts obtained from face-to-face encounters of physician and patient at the OPD.

A data collection tool was used to collate the gathered information on 1) patient demographics (i.e., age, sex), 2) prescribing indicators: number of medicines prescribed per patient encounter, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed, percentage of drugs prescribed by generic name, and percentage of drugs prescribed from the essential drugs list (EDL), and 3) pharmacologic data (drug class, route, dose, frequency, and duration).^[7] The research assistant was trained on the use of the data collection tool and was supervised during data collection.

WHO defines rational use of medicines as giving the right medicine, for the right patient, at the right dose, for the right duration, and at the right (lowest) cost to them and their community. WHO in collaboration with the International Network of Rational Medicine Use (INRDU) has developed a group of indicators to assess the use of antibiotics in health facilities namely, prescribing indicators, facility indicators and patient care indicators^[8]. This study focused on the following prescribing indicators^[9]: 1) average number of medicines prescribed per encounter which describes the extent of polypharmacy, 2) percentage of encounters with an antibiotic prescribed which describes the frequency of antibiotic prescribing among healthcare providers, 3) percentage of encounters with an injection prescribed which describes the frequency with which injectable forms of medicines are prescribed, 4) percentage of drugs prescribed by generic name which describes the tendency of healthcare providers to prescribe medicines using generic name, and 5) percentage of drugs prescribed from the EDL which describes the prescribing practices conformance to the drug use policy.

The observed values of the antibiotic prescribing indicators were compared with the optimal values recommended by the WHO. An index system developed by Zhang and Zhi was used to compute for the optimal index for each indicator^[10]. The optimal index for all indicators was set at 1. The values closer to 1 indicated rational drug use. The Index of Rational Drug Prescribing (IRDP) was calculated by adding the index values of all prescribing indicators^[10]. The optimal values and indices are seen in Table 1.

Table 1. Optimal Values and Indices of the Drug Prescribing Indicators

Prescribing Indicator	Optimal Value ^[11]	Optimal Index ^[12]
Average number of medicines prescribed per encounter	1.6 – 1.8	1
Percentage of encounters with an antibiotic prescribed	20 – 26.8	1
Percentage of encounters with an injection prescribed	13.4 – 24.1	1
Percentage of drugs prescribed by generic name	100	1
Percentage of drugs prescribed from the EDL	100	1

Based on the index system of Zhang and Zhi^[10], the calculation of non-polypharmacy, rational antibiotic and injection safety indices, the following formula was used:

$$Index = \frac{Optimal\ Value}{Observed\ Value}$$

RESULTS

While the generic name and essential drugs list indices were computed using the following formula:

$$Index = \frac{Observed\ Value}{Optimal\ Value}$$

All the observed indices were compared with the optimal indices indicated by the WHO. The institution's IRDP was calculated by adding all of the observed indices and was likewise compared with the optimal IRDP.

This study complied with the Data Privacy Act of 2012 and National Ethical Guidelines for Health and Health-related research. Patient data was kept confidential by controlling access to digital and physical documents. On data analysis, each chart was identified by a specific number, and names and/or initials of patients were not used.

After thorough data cleaning, a total of 600 patients diagnosed with PCAP were included in the study. Among these, majority were male (61.33%) and belonged to the age group 1 to 5 years (57.17%).

Table 2. Clinico-Demographic Data of Patients with PCAP seen at the OPD of PCMC, January 2020 – July

Sex	N (%)
Male	368 (61.33)
Female	232 (38.67)
Age	N (%)
3 to 12 months	163 (27.17)
1 to 5 years	343 (57.17)
>5 years	94 (15.67)

The average number of drugs given per patient was 2.05 (SD ± 0.85). Of the total 1332 prescribed drugs, the most common were antibiotics

(43.17%) followed by antipyretics (26.80%), then vitamins and minerals (12.16%).

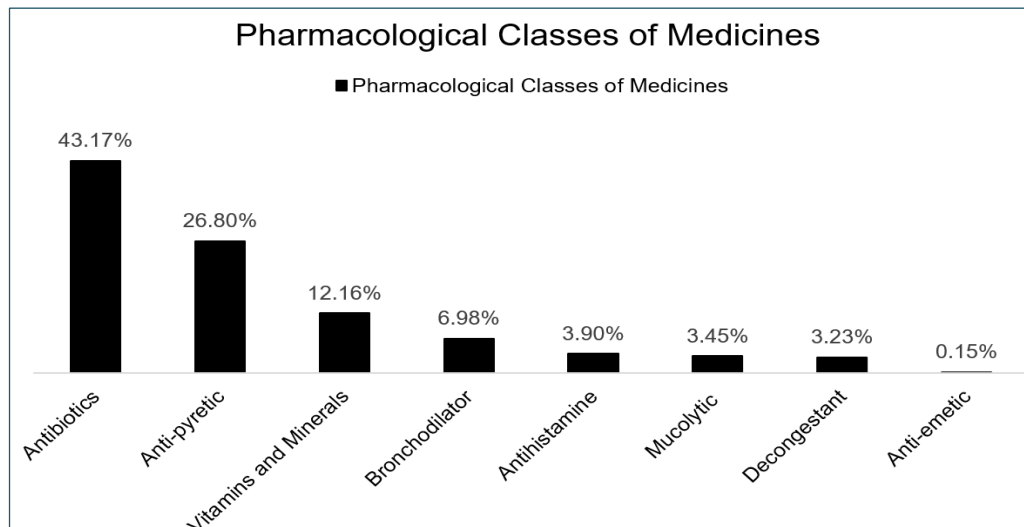


Figure 1. Pharmacological Classes of Medicines prescribed at the OPD of PCMC, January 2020 – July 2022

The most prescribed antibiotic was co-amoxiclav (42.93%) followed by amoxicillin (37.76%) then cefuroxime (7.59%) (Figure II).

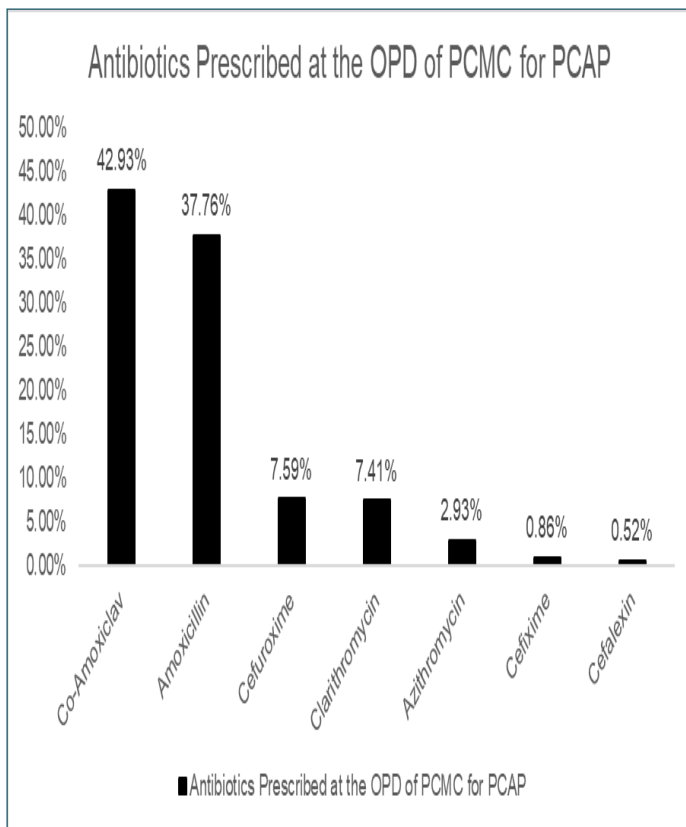


Figure 2. List of Antibiotics Prescribed at the OPD of PCMC for PCAP, January 2020 – July 2022

The average number of medicines prescribed per encounter was 2.05 (SD \pm 0.85). Of the 600 patient encounters, 96% had at least one antibiotic prescribed (SD \pm 0.2) and none had an injection prescribed (Table 3). All medications were prescribed by generic name and were from the essential drugs list.

In this study, a zero occurrence of prescribing of injection was not included in the computation for IRDP since the observed value serves as the denominator in arriving at the injection safety index. A zero denominator would yield an undefined value therefore, this indicator has been removed from this study's IRDP and 4 would be the most rational in-

dex. The calculated IRDP of PCMC was 3.16. Rational antibiotic index had the lowest values (0.28) followed by polypharmacy index (0.88) (Table 4). Moreover, the generic name index and essential drugs list index attained the optimal index.

Prescribing	Observed	Optimal
Average number of medicines prescribed per encounter	2.05	1.6 – 1.8
Percentage of encounters with an antibiotic prescribed	96	20 – 26.8
Percentage of encounters with an injection prescribed	0	13.4 – 24.1
Percentage of drugs prescribed by generic name	100	100
Percentage of drugs prescribed from the EDL	100	100

Table 3. Drug Prescribing Indicators at the OPD of PCMC with their corresponding Indices

Drug Prescribing indicator	PCMC Index	Optimal Index
Polypharmacy index	0.88	1
Rational antibiotic index	0.28	1
Injection safety index	-	1
Generic name index	1.00	1
Essential drugs list index	1.00	1
IRDP	3.16	5

Table 4. IRDP

DISCUSSION

Our results indicate that the common prescribed antibiotics at the OPD of PCMC for children diagnosed with PCAP are co-amoxiclav, amoxicillin and cefuroxime. The findings in this study are consistent with other studies where amoxicillin was the most common antibiotics prescribed to manage PCAP^[13,14] In some studies among Asian countries, there is an overuse of broad-spectrum therapy^[15-18]. This antibiotic prescribing pattern at our institution as well as in the entire country remains to be studied since as of this writing, the author has yet to encounter any research tackling the overuse of broad-spectrum therapy. This prescribing pattern may be attributed to the fact that PCAP Clinical Practice Guidelines (CPG) recommend the use of the above-mentioned antibiotics in treating PCAP.

As evident from the results of this study, the most prescribed antibiotics at the OPD of PCMC for PCAP patients, namely 1) co-amoxiclav; 2) amoxicillin; and 3) cefuroxime, are consistent with the recommended antibiotics under the PCAP CPG. It is worth noting that in this study, out of the three most prescribed antibiotics for PCAP patients, only Co-Amoxiclav did not meet the PCAP CPG recommended dosage. Results actually show that prescriptions for co-amoxiclav are underdosed at 40mg/kg/day whereas the PCAP CPG recommends 80-90mg/kg/day^[19]. It is important to follow the proper dosage and duration of antibiotics to prevent the consequences of under- and over-dosing. Aside from adherence to the local CPG, it is also important to look into local antibiotic resistance pattern in order to prescribe the proper antibiotic for each patient.

The results of this study also show that the average number of medicines prescribed per en-

counter is higher than the acceptable range (2.05 vs 1.6-1.8) based on reference values developed for the WHO^[11]. Aside from the high average number of medicines prescribed per patient, the data gathered for this study also show that the percentage of encounters with antibiotics prescribed exceeds the acceptable range as well. These indicators point to polypharmacy which is prescribing more medicines than are clinically indicated or the use of an excessive number of inappropriate medicines. Polypharmacy must be addressed because polypharmacy consequently increases health care costs while also prolonging the duration of treatment due to possible adverse reactions and drug interactions^[12].

There was also no encounter in PCMC where an injection was prescribed. This is a good prescribing indicator because it eliminates injections which, if used irrationally, may be a cause for public health concern. This is because injections have contributed to increasing hospital waste where waste management systems are not fully efficient, incurs necessary pain to patients and likewise exposes them to the possible spread of infections like HIV/AIDS, hepatitis, and abscesses and promote microbial resistance, muscle contractures, and nerve injury^[12].

Furthermore, PCMC prescribes generic drugs in all of the encounters included in this study as shown by the observed value of 100. This is beneficial to patients because generic prescribing has been found to reduce the cost of medicines and prevent errors and confusion in writing and dispensing prescriptions^[20]. Similarly, the percentage of medicines prescribed from the essential drugs list in this study shows a 100 observed value, meaning that all prescriptions consist only of medicines coming from the essential drug list^[21]. Corollary, this indicates

that the prescribers in PCMC are well aware of the essential drug list for children.

Interestingly, analyzing the data with respect to the Index of Rational Drug Prescribing (IRDP), it may be said that PCMC as an institution scores well with 3.16 where the most rational score is 4. However, PCMC's IRDP must be accorded an in-depth examination because while the numerical value of PCMC's IRDP point to it being rational, closer scrutiny of the individual indices making up the IRDP would show that PCMC scores low on the index of rational prescribing of antibiotics. This means that there is a high occurrence of prescribing antibiotics in the institution. The danger here is that children are actually at risk of mortality due to otherwise treatable infections due to the development of resistance to antibiotics^[12].

We were able to provide information on PCMC's rational pediatric prescribing which can be the baseline for future assessments in terms of monitoring prescribing trends and addressing the situation if needed. However, this must still be regarded as a purely descriptive study, where data might not be able to encapsulate and consider all the factors present such as how appropriately medications were prescribed with regard to specific diseases. This study also did not investigate other factors which can contribute to the choice of antibiotics, such as previous intake of antibiotics, and the level of resistance of organisms in the area. Therefore, this study offers a first step toward improved adherence to recommendations, which may help lower management costs and delay the evolution of resistant microbes. Large, well-designed multicenter trials are therefore required to assess the efficacy of guide-

lines in childhood PCAP and the degree to which they are followed.

CONCLUSION

The prescribing pattern for PCAP in the OPD of PCMC is rational as evident from the high IRDP (3.16 out of 4). However, it is important to note that there is a high occurrence of antibiotic prescribing in the institution at 96% with a corresponding low rational antibiotic index of 0.28. Based on these findings, we recommend that further studies be done to investigate the factors contributing to the over-prescribing of antibiotics in PCMC.

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