

Adherence of Primary Care Providers to Practice Guidelines for Common Pediatric Conditions in Urban, Rural, and Remote Sites in the Philippines: A Cross-Sectional Study

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ABSTRACT

Background. Evaluation of primary care allows for identification of problems in the healthcare system, such as poor health outcomes, inappropriate health services, overuse of unnecessary resources, or underuse of recommended strategies. Assessment of adherence to existing clinical practice guidelines as quality indicators is critical for evaluating the effectiveness of primary care and shaping healthcare policies.

Objectives. To determine the adherence of primary care providers to existing practice guidelines for common pediatric concerns in remote, rural, and urban areas in the Philippines.

Methods. This cross-sectional study included data from the electronic medical records (EMR) of patients aged 19 years and below who consulted at the three pilot sites of the Philippine Primary Care Studies (PPCS) from January to December 2019. Relevant demographic data and quality indicator measures (e.g., immunization history, adolescent smoking history, medication and supplement prescription) were extracted from the EMR by the PPCS data management team. Adherence to existing guidelines on pediatric history taking and management of common illnesses (e.g., diarrhea, upper respiratory tract infections, malnutrition) was evaluated.

Results. This study included 8,724 pediatric patients seen across the three pilot sites from January to December 2019. Immunization history was taken in only 0.4% of pediatric patients. Smoking history was taken in only 6.8% of adolescent patients. Zinc was prescribed in only 40.1% of patients with diarrhea. No infants were prescribed with vitamin A, while iron was prescribed in only 2.5% of children and 3% of adolescent females. In contrast to the recommendations of existing guidelines, antibiotics were prescribed in 38.5% of patients with AGE and 62.5% of patients with viral URTI. Montelukast was prescribed as first-line asthma treatment in 4.7% of cases. Multivitamins were prescribed in 57.2% of all pediatric patients.

Conclusions. Overuse of inappropriate medications and underuse of appropriate interventions were observed in this study. There was low adherence to evaluation of pediatric immunization history, adolescent smoking history, zinc supplementation for diarrhea, and iron and



eISSN 2094-9278 (Online)
Published: November 29, 2024
<https://doi.org/10.47895/amp.vi0.8371>
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vitamin A supplementation among identified vulnerable population groups. Over prescription of the following were observed: (1) antibiotics for acute gastroenteritis and probable viral URTI, (2) multivitamins for the general pediatric population, and (3) montelukast among newly diagnosed asthma patients.

Keywords: pediatrics, primary health care, quality indicators, electronic medical records

INTRODUCTION

Background of the Study

The Philippine healthcare system has been struggling with inequitable distribution and access across all age groups. The inequity may have stemmed from healthcare resource shortage, policy fragmentation, and varying administrative opinions among local government units in a decentralized health system.¹ To address the identified barriers, the Philippine Primary Care Studies (PPCS) implemented a more holistic primary care system in three pilot areas: a rural site, a remote site, and an urban site.² A strong primary care system is associated with more equitable distribution of healthcare services compared to a healthcare system that focuses on specialized care.³ Studies have shown inverse associations between the strength of a country's primary care system and all-cause mortality, all-cause premature mortality, and cause-specific premature mortality.³

The provision of high-quality primary care entails not only good implementation of services, but also quality assessment and monitoring. Quality of care was defined by the Institute of Medicine (IOM) as the degree to which health services increase the likelihood of desired outcomes and are consistent with current professional knowledge.⁴ Evaluation of quality of care is done using quality of care indicators, which includes adherence to existing clinical practice guidelines, and, when no local guidelines apply, implementation of programs from local and international organizations such as the World Health Organization (WHO), United Nations Children's Fund (UNICEF), Centers for Disease Control and Prevention (CDC), Department of Health (DOH), Philippine Pediatric Society (PPS), American Academy of Pediatrics (AAP), Global Initiative for Asthma (GINA), Society of Adolescent Medicine of the Philippines, Inc. (SAMPI), Philippine Academy of Pediatric Pulmonologists, and Philippine Society of Pediatric Gastroenterology, Hepatology, and Nutrition (PSPGHN).⁵⁻²¹ Assessment of quality of care allows for identification of problems in the healthcare system, such as poor health outcomes, inappropriate health services, overuse of unnecessary resources, or underuse of recommended strategies. Quality of care assessment is critical when evaluating the effectiveness of primary care and shaping policy.

Electronic medical records (EMRs) were developed and implemented by PPCS across the pilot sites for cost-

effective and secure use of information and communication technologies. The EMRs also served as reliable data sources for monitoring quality of care with parameters which could be gathered from the history, physical examination, and management provided.

This study evaluated primary care in the PPCS pilot areas in terms of adherence to practice guidelines for common pediatric concerns as quality indicators. Infants, children, and adolescents constitute one of the vulnerable population groups served by the healthcare system. Ensuring proper healthcare delivery towards the pediatric population reflects the quality of the healthcare system in a community.

OBJECTIVES

This study aimed to determine the adherence of primary care providers to practice guidelines for common pediatric concerns in remote, rural, and urban sites in the Philippines. Specifically, it aimed:

1. To compare the clinical evaluation of pediatric patients to existing clinical practice guidelines or recommendations for standard of care by:
 - Obtaining immunization history among all pediatric patients
 - Obtaining smoking history of adolescent patients
2. To compare the prescribing patterns for common childhood illnesses to existing clinical practice guidelines or recommendations for standard of care in the study population focusing on:
 - Prescription of zinc for diarrhea
 - Prescription of multivitamins to malnourished patients
 - Prescription of micronutrients to vulnerable age groups
 - Non-prescription of antibiotics for viral upper respiratory tract infection (URTI)
 - Non-prescription of antibiotics for acute, non-bloody diarrhea
 - Non-prescription of montelukast to newly diagnosed asthma patients

METHODS

Study Design

This cross-sectional study included review of data from the EMR of patients aged below 19 years old who consulted at the three pilot sites (urban, rural, and remote) from January to December 2019. Total enumeration was done. All consulting pediatric patients during this period were included in this study.

Demographic and clinical data were gathered by trained healthcare professionals at the three sites and encoded into the EMR. Relevant demographic data and quality indicator measures including immunization history, adolescent smoking history, and medication and supplement prescription were extracted from the EMR by the PPCS data management team.

Table 1. Quality of Care Indicators, Operational Definitions, and Practice Guidelines/Recommendations

Quality indicators	Operational definition	Clinical Practice Guideline reference	Recommendations of the guidelines
Obtain immunization history in all pediatric patients	Immunization history of pediatric patients (0-19 years old) reflected in the EMR regardless if with complete or incomplete vaccinations.	<ul style="list-style-type: none"> Philippine Pediatric Society Recommendations for Preventive Pediatric Health Care 2018¹⁵ 	Immunization history must be updated in each clinic visit.
Obtain smoking history in all adolescent patients	History of smoking among adolescents reflected in the EMR regardless of actual smoking status.	<ul style="list-style-type: none"> Society of Adolescent Medicine, Philippines Incorporated¹⁹ Philippine Pediatric Society Recommendations for Preventive Pediatric Health Care 2018¹⁵ 	Health screening and preventive services for adolescents by use of the HEEADSSS (Home, Education/ Employment, Eating, Activities, Drugs/Alcohol/Tobacco, Sexuality, Suicidality/Depression, Safety) Tool must be done annually.
Zinc prescription for diarrhea	Prescription of zinc sulfate for patients >6 months old with diarrhea.	<ul style="list-style-type: none"> DOH Clinical Practice Guidelines on the Management of Acute Infectious Diarrhea¹¹ PSPGHN Guidelines for Healthcare professionals on the treatment of acute gastroenteritis with no signs of dehydration²⁰ 	Zinc supplementation at 20mg/day is recommended to be routinely given for 10-14 days as adjunctive therapy for acute infectious diarrhea in children >6 months old
No antibiotics prescription for AGE	No prescription of antibiotics for pediatric patients with AGE. A diagnosis of AGE was made for patients presenting with loose stools which were non-bloody and with a duration of less than 14 days.	<ul style="list-style-type: none"> DOH Clinical Practice Guidelines on the Management of Acute Infectious Diarrhea¹¹ PSPGHN Guidelines for Healthcare professionals on the treatment of acute gastroenteritis with no signs of dehydration²⁰ 	Antibiotics are recommended only for those with infectious diarrhea which is bloody or lasting more than 14 days. It is not recommended for acute non-bloody diarrhea.
No antibiotics prescription for viral URTI	No prescription of antibiotics for those diagnosed with viral URTI. URTI was diagnosed in patients presenting with cough or colds which may or may not be associated with fever. URTI may include both those with viral or bacterial etiology. The likelihood of a viral URTI based on duration of symptoms is more probable if the URTI symptoms is less than 4 days.	<ul style="list-style-type: none"> American Academy of Pediatrics Principles of Judicious Antibiotic Prescribing for Upper Respiratory Tract Infections in Pediatrics 2013¹⁶ DOH National Antibiotic Guidelines 2019¹² 	70% of upper respiratory tract infections (common cold, nonspecific upper respiratory tract infection, acute cough illness, and acute bronchitis) in the pediatric population are caused by self-limiting viruses. Management should focus on symptomatic relief. Antibiotics should not be prescribed for these conditions.
Non-prescription of montelukast as first-line treatment for newly diagnosed asthmatic children	Non-prescription of montelukast, a leukotriene receptor antagonist (LTRA), as the first-line drug for those newly diagnosed with asthma. Patients without any note of asthma in the history of present illness, past medical history, and previous diagnoses in the EMR shall be considered newly diagnosed cases.	<ul style="list-style-type: none"> Global Initiative for Asthma - Global Strategy for Asthma Management and Prevention 2021¹⁸ PAPP Clinical Practice Guidelines for Pediatric Asthma 2021²¹ 	Preferred treatment is low dose combination ICS-formoterol taken as needed for relief of symptoms or as maintenance therapy. LTRA is considered only as another controller option starting at Step 2, not as initial treatment.
Multivitamins prescription for children with malnutrition and vitamin deficiencies	Prescription of multivitamins to pediatric patients with malnutrition, as defined as Z scores <-2 for weight for length/height (up to 5 years old) or BMI for age (5 to 18 years old).	<ul style="list-style-type: none"> American Academy of Pediatrics Committee on Nutrition¹⁷ 	Vitamin supplementation is indicated in children with malnutrition and vitamin deficiencies, not in children eating a balanced diet.
Micronutrient supplementation for vulnerable age groups	Prescription of iron to pediatric patients less than 5 years old and adolescent girls aged 10-19 years old. Vitamin A supplementation in infants 6-11 months and 12-59 months old.	<ul style="list-style-type: none"> DOH Guidelines on Vitamin A and Iron supplementation¹⁴ WHO Guidelines on Daily Iron supplementation in infants and children⁸ DOH Expanded Garantisadong Pambata¹³ DOH Guidelines on Vitamin A and Iron supplementation¹⁴ WHO Guidelines on Vitamin A supplementation in infants and children 6-59 months of age⁷ DOH Expanded Garantisadong Pambata¹³ 	Iron supplementation is recommended in low-birth-weight infants starting at 2-6 months, infants 6-11 months, children 1-5 years old, and adolescent girls aged 10-19 years old. Vitamin A supplementation is recommended in infants 6-11 months, and 12-59 months.

Data Analysis

Microsoft Excel was used to compile the extracted data. Data was checked for completeness and consistency prior to data analysis. Descriptive statistics was used, with continuous variables reported as means and standard deviation (SD), and categorical variables as frequencies and percentages.

Adherence to quality indicators was assessed based on recent guidelines on pediatric history taking and management of common illnesses such as diarrhea, upper respiratory tract infections, and malnutrition (Table 1). Adherence was computed as the observed number of events (pertaining to prescription of necessary drugs, non-prescription of unnecessary drugs, or evaluation of relevant clinical history) divided by the ideal number of events based on the existing guidelines (n/N).

Ethical Considerations

Informed consent for involvement in PPCS-related researches was obtained prior to the patients' consultation. Ethical approval was granted for the Philippine Primary Care Studies with study protocol code UPMREB 20-15-489-01. All data were anonymized to ensure protection of the participants' privacy and confidentiality. All data were

stored in a password-protected laptop accessible only to the study investigators. Data will be destroyed three years after completion of the study.

RESULTS

This study included a total of 8,724 pediatric patients seen across the three pilot sites (Table 2). The male to female ratio of patients is 0.9-1:1 in all study sites. The mean age of the patients is 8 years old (SD = 8).

Quality Indicators in History Taking

Immunization history was reflected in the EMR in only 0.4% of the pediatric patients seen in the three study sites (Table 3). Infants younger than 1 year old were seen with the highest rate of recorded immunization history at 0.9%. Among the study sites, the remote site had the highest rate of evaluation of immunization history at 0.6% of all consults, followed by the rural site at 0.4%. In the urban site, no patient received evaluation of his/her immunization history.

Smoking history was evaluated and recorded in the EMR in 6.8% of consults among the adolescent patients (Table 4).

Table 2. Summary of Patient Demographics across Sites

Variables	Urban (N=1,304) n (%)	Rural (N=5,485) n (%)	Remote (N=1,935) n (%)	Total (N=8,724) n (%)
Sex				
Female	688 (52.8)	2,721 (49.6)	928 (48.0)	4,337 (49.7)
Male	616 (47.2)	2,764 (50.4)	1,007 (52.0)	4,387 (50.3)
Age				
<1 year old	18 (1.4)	679 (12.4)	184 (9.5)	881 (10.1)
1-4 years old	103 (7.9)	1,780 (32.5)	613 (31.7)	2,496 (28.6)
5-9 years old	181 (13.9)	1,514 (27.6)	505 (26.1)	2,200 (25.2)
10-19 years old	1,002 (76.8)	1,512 (27.6)	633 (32.7)	3,147 (36.1)

Table 3. Evaluation of Immunization History of Pediatric Patients

Variables	Urban		Rural		Remote		Total	
	n/N	%	n/N	%	n/N	%	n/N	%
Age group								
<1 year old	0/18	0	8/679	1.2	0/184	0	8/881	0.9
1-4 years old	0/103	0	12/1,780	0.7	2/613	0.3	14/2,496	0.6
5-9 years old	0/181	0	0/1,514	0	3/505	0.6	3/2,200	0.1
10-19 years old	0/1,002	0	1/1,512	0.1	7/633	1.1	8/3,147	0.3
Total	0/1,304	0	21/5,485	0.4	12/1,935	0.6	33/8,724	0.4

n - Observed number of patients with evaluation of immunization history

N - Ideal number of patients with evaluation of immunization history

Table 4. Evaluation of Smoking History of Adolescent Patients

Variables	Urban		Rural		Remote		Total	
	n/N	%	n/N	%	n/N	%	n/N	%
Smoking history recorded	3/1,002	0.3	190/1,512	12.6	21/633	7.4	214/3,147	6.8

n - Observed number of patients with evaluation of smoking history

N - Ideal number of patients with evaluation of smoking history

Quality Indicators in Prescribing Based on Standard Guidelines

Prescribing patterns for common childhood illnesses were compared to existing clinical practice guidelines and recommendations. The summary of findings can be seen in Table 5.

Zinc Prescription in Diarrhea

A total of 429 patients, aged more than 6 months old, presented with diarrhea during the specified study duration. Of the 429 patients, 40.1% were prescribed zinc. The remote site showed the highest adherence to zinc prescription with an adherence rate at 72.3%. The lowest adherence rate was seen in the urban site at only 1.3%.

Non-prescription of Antibiotics for AGE

A total of 192 patients were diagnosed with AGE, of which 74 patients (38.5%) were prescribed antibiotics. There were 118 patients not prescribed with antibiotics, with an overall adherence rate of 61.5%. The most common antibiotic prescribed was cotrimoxazole (trimethoprim/sulfamethoxazole). The remote site had the highest adherence rate at 94.1%, while the rural site showed the lowest adherence rate at 45.9%.

Non-prescription of Antibiotics for Viral URTI

A total of 2,378 patients were diagnosed with probable viral URTI. Of the 2,378 patients, 892 were not prescribed

antibiotics, yielding an overall adherence rate of 37.5%. There were 1,486 patients (62.5%) who were prescribed with antibiotics. The most common antibiotics prescribed were amoxicillin and cephalexin. The remote site showed the highest adherence rate at 90.2%, while the rural site showed the lowest adherence rate at 17.3%.

Non-prescription of Montelukast as First-line Treatment for Asthma

There were 363 patients who were newly diagnosed with asthma within the study duration. The overall adherence rate was high at 95.3%. Only 4.7% were prescribed with montelukast as first-line medication.

Vitamin Supplement Prescription

Of the 8,724 pediatric patients, multivitamins were prescribed to 4,994 (57.2%). Malnutrition was diagnosed in only four patients across the three sites; all four were prescribed multivitamins. However, it was noted that in 1,240 patients (14.2%), anthropometric measurements were incomplete and did not allow for classification of nutritional status.

A total of 3,267 patients aged 6 months to 5 years old were included in the study. There were no patients prescribed with vitamin A in the three study sites. Iron supplement prescription was seen in 2.5% of patients younger than 5 years old. Among the 2,589 female adolescents included in the study, 3.1% were prescribed iron supplements.

Table 5. Adherence to Recommended Prescribing Patterns in the Three Primary Care Sites

Variables	Urban		Rural		Remote		Total	
	n (N)	%	n (N)	%	n (N)	%	n (N)	%
Zinc prescription for patients >6 months old with diarrhea	1 (80) ^a	1.3	137 (302) ^a	45.4	34 (47) ^a	72.3	172 (429) ^a	40.1
No antibiotic prescription for patients diagnosed with AGE	14 (19) ^b	73.7	56 (122) ^b	45.9	48 (51) ^b	94.1	118 (192) ^b	61.5
No antibiotic prescription for patients diagnosed with viral URTI	260 (357) ^c	72.8	282 (1633) ^c	17.3	350 (388) ^c	90.2	892 (2378) ^c	37.5
No prescription of montelukast as first-line medication for patients with newly diagnosed asthma	15 (16) ^d	93.8	171 (175) ^d	97.7	161 (173) ^d	93.1	346 (363) ^d	95.3
Multivitamin prescription for children with malnutrition and vitamin deficiencies	178 (0) ^e	>100	4386 (2) ^e	>100	430 (2) ^e	>100	4994 (4) ^e	>100
Vitamin A prescription for patients 6 months to 4 years and 11 months old	0 (110) ^f	0	0 (2083) ^f	0	0 (1074) ^f	0	0 (3267) ^f	0
Iron supplement prescription for patients 6 months to 4 years and 11 months old	1 (110) ^f	0.9	56 (2083) ^f	2.7	24 (1074) ^f	2.2	81 (3267) ^f	2.5
Iron supplement prescription for adolescent females	2 (890) ^g	0.2	71 (1511) ^g	4.7	6 (188) ^g	3.2	79 (2589) ^g	3.1

*Denominators used are as follows:

^a Number of patients >6 months old who had diarrheal symptoms

^b Number of patients diagnosed with acute gastroenteritis

^c Number of patients diagnosed with viral upper respiratory tract infection

^d Number of newly diagnosed asthma patients

^e Number of patients diagnosed with malnutrition

^f Pediatric patients aged 6 months to 4 years and 11 months old with recorded consults regardless of diagnosis/chief complaint

^g Female adolescent patients aged 10 to 19 years old with recorded consults regardless of diagnosis/chief complaint

DISCUSSION

Quality Indicators in History Taking

Immunization History

A complete pediatric history includes prenatal and birth history, developmental history, feeding history, immunization history, social history, and environmental history.¹⁹ At each clinic visit, the immunization history must be updated, as recommended by the Philippine Pediatric Society.¹⁵

Data across the three sites showed that immunization history was elicited in only less than 1% of the pediatric patients seen, mostly in infants younger than 1 year old. Vaccine recommendations and schedules in the Philippines are made by the Pediatric Infectious Disease Society of the Philippines (PIDSP) Committee on Immunization, then approved by the Philippine Pediatric Society (PPS) and Philippine Foundation for Vaccination (PFV).¹⁹ Vaccine administration involves proper timing and intervals between doses. It is therefore imperative that immunization history be taken at every visit, to ensure completeness and proper timing of vaccine administration based on the national recommendations. Including a field for immunization history in the EMR would prompt the healthcare worker to ask and document more consistently each patient's immunization status, and provide the necessary vaccines when necessary.

Tobacco Smoking History among Adolescents

The complete adolescent history includes screening for risks and protective factors by use of the HEEADSSS tool (H-home, E-education/employment, E-eating, A-activities, D-drugs/alcohol/tobacco, S-sexuality, S-suicidality/depression, S-safety).¹⁵ The Society of Adolescent Medicine, Philippines, Inc. recommends annual health screening for adolescents.¹⁹

Only 6.8% of the adolescent patients were asked about and had smoking history recorded in the EMR across all sites. The urban site had the least number of recorded smoking history in the EMR at 0.3%.

Adolescents' rapid physical, cognitive, and psychosocial changes warrant screening for risky behaviors that may potentially lead to harm.¹⁹ Tobacco smoking has been known to cause numerous illnesses; hence, smoking history is vital for anticipatory guidance and counseling in adolescents. The HEEADSSS tool, which includes tobacco smoking history, is integral in every adolescent's annual visit. Integrating the HEEADSSS tool in the EMR would help the healthcare worker take the adolescent history more completely and efficiently, as well as identify red flags for intervention more easily.

Quality Indicators in Prescribing Based on Standard Guidelines

Zinc Prescription for Diarrhea

According to the WHO, more than 1.5 million children under five die every year due to acute diarrhea.⁹ This can be

alleviated by prevention and treatment of dehydration with ORS and fluids, breastfeeding, continued feeding, selective use of antibiotics, and zinc supplementation for 10–14 days.⁹ Zinc supplementation is useful in treating acute and persistent diarrhea since intestinal losses of zinc are increased in diarrhea. This is particularly relevant in developing countries where zinc deficiency is more prevalent.^{20,22}

The DOH Clinical Practice Guidelines on the Management of Acute Infectious Diarrhea recommends zinc supplementation at 20 mg/day for 10–14 days to be given as adjunctive therapy for acute infectious diarrhea in children >6 months old. Zinc supplementation has been proven to shorten the duration of diarrhea, reduce frequency of stools, and prevent recurrence of diarrhea.^{9,11,20} However, zinc supplementation is not routinely given in children <6 months old with acute infectious diarrhea since it may lead to persistent diarrhea.¹¹

A total of 429 patients aged more than 6 months had diarrhea within the study period. Only 40.1% were prescribed zinc. This shows under-prescription of zinc for diarrhea, taking into consideration the DOH and WHO/UNICEF recommendations.

Antibiotic Prescription for Acute Gastroenteritis

Rotavirus and other viruses are the most common cause of acute diarrhea in the pediatric population.¹¹ In the Philippines, rotavirus is the most common cause of acute diarrhea, accounting for 7–34% of cases, followed by *Escherichia coli* (9.1–15%), *Salmonella* (5.4–15%), and *Shigella* (3–4.8%). The three bacteria are also the three leading causes of bloody diarrhea.¹¹ Viruses are self-limiting; hence, the primary management for acute diarrhea is rehydration. Routine empiric antibiotic therapy is not recommended for acute gastroenteritis.^{9–11,20}

Antibiotics may be recommended, however, in cases of cholera, bloody diarrhea, laboratory proven and symptomatic infection with *Giardia duodenalis*, diarrhea associated with other acute bacterial infections, and immunocompromised patients.^{9–11,20}

Of the 192 patients presenting with non-bloody loose stools for less than 14 days who were diagnosed as acute gastroenteritis, 74 (38.5%) were prescribed antibiotics. This shows overutilization of antibiotics in these patients.

It is estimated that only 3–15% of cases of diarrhea would necessitate antibiotic use. Empiric antibiotics for prolonged diarrhea (>14 days) include metronidazole and cotrimoxazole, but these are not warranted for acute gastroenteritis.²⁰ The DOH, PSPGHN, WHO/UNICEF, and CDC do not recommend routine antimicrobial therapy for AGE, as majority of the causes are self-limiting. Routine antimicrobial use is ineffective and may lead to increased antimicrobial resistance.^{9–11,20}

Antibiotic Prescription for URTI

Most upper respiratory tract infections in the pediatric population, estimated at 70%, are caused by viruses—

rhinoviruses, adenoviruses, parainfluenza viruses, respiratory syncytial virus, influenza virus, human metapneumoviruses, and human bocaviruses.^{16,23} They are usually self-limiting and require supportive therapy. Antibiotics are not recommended for these patients. In the United States, more than 1 in 5 pediatric ambulatory visits result in an antibiotic prescription. Inappropriate antibiotic prescription for URTI of viral origin is common in ambulatory care.¹⁶

A total of 5,156 patients were diagnosed with URTI. Based on presenting symptoms and duration of illness, 2,378 (46%) of the patients were assessed to have probable viral cause of URTI. Of the 2,378 patients, 62.5% were prescribed antibiotics. This shows that there was an over-prescription of antibiotics for URTI.

Indications for antibiotic use include: (1) acute otitis media, presenting as otalgia and/or fever lasting for more than 48 hours, (2) acute bacterial sinusitis, presenting as purulent nasal discharge and fever for more than three days, and (3) acute tonsillopharyngitis, presenting as tonsillar exudates and fever.^{12,16} Overuse of antibiotics may lead to adverse drug events, unnecessary medical costs, and antibiotic resistance. Several signs and symptoms of bacterial URTI overlap with those of viral origin. It is crucial to differentiate between the two by use of established clinical criteria, laboratory tests, and other diagnostic procedures as deemed necessary.

Montelukast Prescription as First Line for Patients Diagnosed with Asthma

LTRAs such as montelukast target one part of the inflammatory pathway in asthma.¹⁸ In younger children, LTRA is used as an alternative option for controller therapy.¹⁸

The Philippine Academy of Pediatric Pulmonologists (PAPP) Clinical Practice Guidelines for Pediatric Asthma 2021 adopted the clinical pathways for pharmacologic treatment entirely from the 2021 Global Initiative for Asthma (GINA) guidelines without substantial changes. The GINA guidelines provided a more comprehensive discussion of the latest evidence on asthma management; hence, this was used as reference in this study.

According to the 2021 GINA guidelines, inhaled corticosteroids (ICS) should be initiated as soon as possible after the diagnosis of asthma is made.¹⁸ Low dose ICS markedly reduces asthma hospitalizations and death, prevents severe exacerbations, reduces symptoms, improves lung function, and prevents exercise-induced bronchoconstriction.¹⁸ Early treatment with low dose ICS is associated with better lung function than if symptoms have been present for more than 2-4 years.¹⁸

When starting treatment in children, the preferred controller is low dose ICS taken whenever SABA is taken, while reliever is as-needed short acting beta-2 agonist (or low dose ICS-formoterol for Maintenance and Reliever Therapy or MART).¹⁸ Asthma treatment in adolescents has two different tracks: Track 1 uses as-needed low dose ICS-formoterol for symptom relief and regular daily

treatment (MART) in steps 3-5, while Track 2 uses ICS for the controller therapy and as-needed short acting beta 2-agonists (SABA) for reliever therapy.¹⁸ Treatment can be stepped up or down along one track, using the same reliever at each step, or it can be switched between tracks according to the individual patient's needs.¹⁸ In both tracks, LTRA is considered only as second-line option for controller therapy.¹⁸ LTRA is less effective than ICS, especially in exacerbation reduction.¹⁸ Montelukast is an LTRA that is associated with increased risk of neuropsychiatric events; its risks and benefits should be considered prior to prescription.¹⁸

A total of 363 patients were newly diagnosed to have asthma, of which 4.7% were prescribed montelukast as the first-line medication. This shows that there was an over-prescription of montelukast. A possible reason for the non-adherence to the recommendation of avoiding montelukast as first-line treatment is compliance to medications, since montelukast is more easily administered orally in single daily doses compared to ICS.²⁴

Multivitamin Supplement Prescription

A balanced diet remains the best source of vitamins particularly for children's growth and development.²⁵ The AAP does not recommend vitamin and mineral supplementation for healthy children who are eating a varied diet.¹⁷ Vitamin supplementation is indicated in children with malnutrition and vitamin deficiencies because of reduced intake, due to reduced availability of certain foods, restrictive diets, or malabsorption.^{5,25}

Anthropometrics give an objective basis of a patient's nutritional status. In children aged 6-59 months, moderate acute malnutrition is defined as moderate wasting or mid-upper-arm circumference (MUAC) of 115-125mm, while severe acute malnutrition is defined by a very low weight-for-height/weight-for-length, or clinical signs of bilateral pitting edema, or a very low mid-upper arm circumference.^{5,6}

Data from the 2018 Expanded National Nutrition Survey (ENNS) by the Department of Science and Technology-Food and Nutrition Research Institute (DOST-FNRI) show that the prevalence of acute malnutrition (defined as being underweight) was higher among children 1-5 years old (20.1 to 21.9%) than infants 0-11 months (10.2-14.7%).²⁶ More children in rural areas were underweight, with 22.6% of preschool children and 28.2% of school-aged children. In contrast, in urban areas, 15.4% of preschool children and 21.2% of school-aged children, were underweight.

Stunting was more commonly observed among children 1 to 2 years old (36.6%), adolescents 16 to 19 years old (30.3%), those from rural areas (22.6%), and those belonging to households in the poorest wealth quintile (42.4%). The prevalence of wasting was also higher in rural areas (11.8%) than urban areas (10.6%) and among adolescents belonging to households in the poor to poorest wealth quintiles (11.3% and 13.3%).²⁶

More than half of the patients (57.2%) were prescribed multivitamins, but only four patients across the three pilot sites were diagnosed with malnutrition. Taking into consideration that 14.2% of the patients had incomplete anthropometric measurements during consultation, and the latest prevalence data from the 2018 ENNS, malnutrition may have been underreported in this study. However, even if all those who had incomplete anthropometric data turned out to have malnutrition, the pattern of prescribing multivitamins still shows significant overutilization of unnecessary drugs. The available educational material concerning vitamin supplements may sometimes create confusion for both clinicians and patients, leading to the risk of attributing beneficial properties and overlooking side effects of these supplements. Thus, overuse of multivitamins is common in the pediatric field.²⁵

Supplementation in the Vulnerable Age Groups

Micronutrient malnutrition—particularly Vitamin A deficiency (VAD) and iron deficiency anemia (IDA)—is a persistent public health problem.¹⁴ These micronutrient deficiencies result in learning disabilities, mental retardation, poor health, blindness, and premature death among children.¹⁴ Last 2018, the overall anemia prevalence in the Philippines was 11.3%, indicating that it is a mild public health concern. The highest prevalence of anemia is seen in infants 6 months to less than 1 year old at 48.2%, and is classified as a severe public health concern.²⁶ On the other hand, the overall prevalence of VAD among 6 months to 5 years old children is 16.9%, which indicates that it is a moderate public health concern. The highest prevalence of VAD was noted among 1 year old children at 22.2%, indicating that it is a severe public health concern for this age group.²⁶

Iron supplementation is recommended in low birthweight infants starting at 2 months of age until 6 months, infants 6-11 months, children 1-5 years old, and adolescent girls aged 10-19 years old. Likewise, vitamin A supplementation is recommended in infants 6-11 months, and children 12-59 months.¹⁴ The DOH Expanded Garantisadong Pambata Services Package includes routine iron and vitamin A supplementation in these vulnerable age groups.

Infants and children have increased vitamin A requirements for rapid growth and protection against infections. Vitamin A deficiency may cause visual impairment, as well as increased risk of illness and mortality from measles and diarrhea.⁷ Vitamin A supplementation improves gut integrity and plays a vital role in innate and adaptive immunity, thus reducing susceptibility to diarrhea and other infections.⁷ As recommended by DOH, supplementation of Vitamin A 100,000 IU single dose is given to all children 6-11 months old, then 200,000 IU twice a year every 6 months for all children 12-59 months old.¹⁴

Not a single patient was prescribed vitamin A in all the study sites. Vitamin A is underused among the vulnerable age groups across all sites, despite WHO and DOH recommendations for universal vitamin A supplementation.

Infants use iron stored during the last months of gestation to produce red blood cells in the first months after birth.⁸ At 4-6 months of age, these stores become depleted. More pronounced depletion of iron stores occur when there are inadequate iron stores due to low birth weight and prematurity, increased requirements from rapid growth and erythropoiesis, inadequate iron from the diet, and blood loss due to intestinal parasitic infections.⁸ As children undergo rapid growth, there is a concomitant increase of red blood cells and high iron requirements.⁸ Iron deficiency is the most common nutritional cause of anemia, with infants, preschool children, adolescents, and women of childbearing age are at greatest risk.⁷

WHO recommends daily iron supplementation in infants and young children aged 6-23 months, preschool-age children aged 24-59 months, and children 60 months and older, to prevent iron deficiency anemia.⁸ Daily iron supplementation is recommended by DOH as follows: starting at 2 to 6 months for low birthweight infants, infants 6-11 months, children 1-5 years old, and adolescent girls 10-19 years old.¹⁴

Only 2.5% of infants and young children, and 3.1% of female adolescents were prescribed iron supplements. Iron, like vitamin A, is also underused among the vulnerable age groups across all sites, despite WHO and DOH recommendations. It is therefore recommended that the identified vulnerable groups be given iron supplements to prevent iron deficiency anemia.

Comparison of Different Sites

Based on data gathered, notable differences were seen in the prescription practices across the three sites. Adherence to zinc prescription for AGE was lowest in the urban site. Over-prescription of antibiotics for AGE and viral URTI was highest in the rural site. Immunization history and smoking history were not routinely taken in all sites, with the lowest adherence rate in the urban site.

The theoretical basis and clinical significance of the indicators included in this study need to be emphasized to the health care workers in the primary care settings. Targeted focused group discussions may be done in the sites to identify barriers in prescription of zinc in the urban site and to identify the factors contributing to the over-prescription of antibiotics and multivitamins in the rural site. Guidelines on prescription need to be reviewed and refresher courses may be offered to the physicians to minimize inappropriate prescriptions. Patient and parental education in the community may also improve reporting of pertinent history, as well as mitigate patient or parental expectations of receiving a drug prescription for every consult done.

Use of EMR as Quality Monitoring Tool

EMR is a tool designed to facilitate the process of data collection in a structured fashion, therefore minimizing errors. EMRs also enable immediate data transmission and

Table 6. Summary of Study Results and Level of Underuse or Overuse Based on Recommendations and Guidelines

Quality indicators	Study Results	Overuse or Underuse
<i>Immunization History</i>	Immunization history seen in 0.4% of pediatric patients	Underuse
<i>Smoking History</i>	Smoking history seen in 6.8% of adolescent patients	Underuse
<i>Zinc prescription in diarrhea</i>	Zinc prescribed in 40.1% of those with diarrhea	Underuse
<i>No antibiotic prescription for AGE</i>	Prescription of antibiotics in 38.5% of those with AGE	Overuse
<i>No antibiotic prescription for viral URTI</i>	Prescription of antibiotics in 62.5% of those with viral URTI	Overuse
<i>No prescription of montelukast as first-line asthma treatment</i>	Prescription of montelukast as first-line asthma treatment in 4.7% of cases	Overuse
<i>Multivitamins prescription for children with malnutrition or vitamin deficiencies</i>	Prescription of multivitamins in 57.2% of all pediatric patients	Overuse
<i>Supplementation of micronutrients for vulnerable population</i>	No infants were prescribed with vitamin A Iron was prescribed in 2.5% of children and 3% of adolescent females	Underuse

easier monitoring of the quality of a site's health system. Data obtained from EMRs can be compared to current guidelines to allow for assessment of quality of care. Overuse of inappropriate medications or diagnostics, and underuse of appropriate interventions can easily be identified upon tabulation of interpreted data. Table 6 summarizes the adherence to practice guidelines based on the quality indicators evaluated in this study.

Limitations

The study was conducted in three pilot primary care sites in the Philippines where several interventions were implemented as part of the PPCS program, including health financing, augmentation of health human resources, implementation of EMR, community engagement, and provision of access to a clinical decision support tool. Thus, results of this study cannot be generalized to other healthcare settings.

Another limitation is that the data was extracted retrospectively from the EMR. Quality of the data is highly dependent on the completeness and accuracy of the data encoded into the EMR. Other characteristics of study participants, including specific details on the clinical consult and social factors, which may be possible confounders affecting adherence to guidelines, were not recorded in the EMR. Furthermore, the reasons for prescription or non-prescription of certain drugs, as well as the absence of specific parts of the history could not be explored. Analysis of the effect of possible confounders on adherence to guidelines is also beyond the scope of this study. Future research that explores reasons for non-adherence to guidelines and factors affecting adherence are needed.

CONCLUSION AND RECOMMENDATIONS

Evaluation of pediatric primary care can be assessed using data from patient records by assessing adherence to practice guidelines as quality indicators. Adherence reflects the consistency of healthcare practices with current professional recommendations and guidelines. In this study, adherence to

guidelines in specific areas in history taking and management of common cases seen in primary care was evaluated.

Overuse of inappropriate medications and underuse of appropriate interventions were observed in this study. Among the indicators included, there was low adherence to evaluation of immunization history among pediatric patients, smoking history among adolescents, zinc supplementation for diarrhea, and iron and vitamin A supplementation among the identified vulnerable population groups. There was an apparent overuse or over-prescription of antibiotics for acute gastroenteritis and probable viral URTI, multivitamins to the general pediatric population, and montelukast among newly diagnosed asthma patients. Review of practices and focused training of personnel are recommended to address the gaps.

Regular assessment of healthcare practices through EMR evaluation is prudent to allow for effective resource distribution and for identification of gaps in knowledge and practices that need to be rectified. Overuse and underuse of services cause wastage of resources and lead to inefficient health service delivery. Objective reviews of pertinent indicators can serve as basis for directing policies on prioritization of necessary services, therefore allowing for better allocation of limited resources.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

This study was funded by the Philippine Department of Health (DOH), Philippine Health Insurance Corporation (PhilHealth), Philippine Council for Health Research and Development (PCHRD), University of the Philippines Center for Integrative and Development Studies (UP CIDS), and University of the Philippines Emerging Interdisciplinary Research Program (UP EIDR).

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