



(RESEARCH ARTICLE)



An evaluation of outpatient pediatric asthma prescribing patterns in the United States

Lejla Cukovic, Elizabeth Sutherland, Sandi Sein, Damaris Fuentes, Huma Fatima, Anwar Oshana and Ateequr Rahman *

Rosalind Franklin University, College of Pharmacy, North Chicago, Illinois, 60064, United States of America.

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Abstract

Pediatric asthma is often under-diagnosed and under-treated, resulting in a lack of concentration, difficulty sleeping, and tiredness. The Global Initiative for Asthma (GINA) guidelines recommended that children should be prescribed maintenance inhalers along with rescue inhalers. Concurrent use of rescue and maintenance inhalers were considered appropriate use for this study. The aim of the study was to determine the prevalence of inappropriate prescribing patterns against various patient and prescriber demographic factors. A total of 2,264 patients meeting the inclusion criteria for ICD 10 codes, J45.20 - J45.52 and age less than 18 were extracted from the 2018 National Ambulatory Medical Care Survey (NAMCS), which captures ambulatory services offered in physicians' offices directly engaged in patient care. This data is collected by the National Center of Health Statistics (NCHS), a division of the CDC. The data were analyzed using descriptive analysis, two-tailed t-tests, and ANOVA with an alpha significance level at 0.05. The majority of the pediatric patient population was in the age range of 17-18 years old. Overall, more patients were prescribed inappropriately (68.3%) as compared to appropriate prescribing (31.7%). Inappropriate prescribing was seen more for patients with Medicaid (24.8%) and self-payment (38.2%) as compared to other types of payment ($p= 0.052$). General practice/ family physicians (35.1%) and nurse practitioners (20.9%) prescribed more inappropriately as compared to other prescribers. ($p= 0.001$). Patients from the Southern region of the U.S. were prescribed more inappropriately compared to the other regions in the U.S. ($p= 0.205$). This study concluded that a significant number of pediatric asthma patients across all demographics were not appropriately prescribed inhalers, thus not adhering to GINA guidelines. Appropriate prescribing and adhering to guidelines would prevent morbidity, mortality and improve the patient's quality of life, thereby saving healthcare costs.

Keywords: Ambulatory Care; Pediatric Asthma; Prescribing Patterns; Asthma Guidelines

1. Introduction

Pediatric asthma is a serious public health problem around the world. The World Health Organization estimated that approximately 300 million people currently have asthma worldwide, and this number is currently rising at a rapid rate¹. Nearly 250,000 people die prematurely each year from asthma, and most of all these deaths are preventable². Globally, death rates from asthma in children range from 0 to 0.7 per 100,000 people³. Among children, asthma is the most common chronic disease, ranking among the top 20 conditions worldwide for disability-adjusted life years in children².

Asthma is characterized by the narrowing of lung passages, leading to possible inflammation or tightening of the muscles. It is manifested by symptoms, such as; wheezing, coughing, shortness of breath and possibly even chest tightness³. In addition, many patients experience triggers that will increase their frequency or severity of these symptoms. Some triggers may include: dust, smoke, weather fluctuation, pollen, animal fur, or perfumed items².

* Corresponding author: Ateequr Rahman

Pediatric asthma is often under-diagnosed and under-treated, even more so in low to middle income areas. This exacerbates the disturbances associated with asthma for these children's lives. Children can experience a lack of concentration, difficulty sleeping and exercising, tiredness during the day, and overall, a poor quality of life 3. However, inconveniences do not stop with the children, these then affect the parents and family closest to the child. Families may begin to miss work or school in order to take care of the child, which then can lead to an increased financial burden on the family 4. If symptoms become severe, an emergency visit may be required for treatment only exacerbating the aforementioned issues 5.

It is also important for pediatricians to follow National Asthma Education and Prevention Program (NAEPP) asthma guidelines to diagnose and prescribe in order to ensure patients receive the appropriate medications. According to the NAEPP asthma guidelines, it is also beneficial to follow up with the patients to check if their asthma condition is under control with current regimen and patients are following the prescription.⁶ Primary care providers did not adhere to the 2007 NAEPP asthma guidelines and fewer than one-third of asthma patients had adequate understanding of the inhaler technique or had daily maintenance therapy 6.

Physicians who followed the guidelines offered more preventive care, asthma action plan, and education about asthma more as compared to physicians who do not 7. If asthmatic pediatric patient's conditions are uncontrolled, the physicians should reassess the severity to level up the medications or it can lead to chronic obstructive pulmonary disease (COPD) 8.

The current 2020 GINA guidelines recommend that all patients who are diagnosed with asthma should be prescribed an inhaled corticosteroid as controller treatment in combination with a symptomatic driven inhaler 9. This recent update represented a 12-year campaign by GINA to obtain evidence that these strategies improved the treatment of asthma by reducing the risk of serious asthma related exacerbations and death, and avoid establishing a reliance on SABA early on in the course of the disease. The aim of this study was to determine if outpatient visits due to pediatric asthma are affected by patient demographics, type of insurance coverage, type of prescriber, geographic location, and severity, to identify potential inappropriate prescribing patterns of asthma inhalers.

2. Material and method

In this retrospective, secondary database analysis research, the prescribing patterns for outpatient pediatric asthma patients was evaluated. Various patient demographics were considered when studying this subclass of patients. These demographics include sex, age, race, type of payment, prescribers, and region. Sex was defined as male and female. Age was categorized as under 3, 4-7, 8-12, 13-16, and 17-18 years old. Race was defined as white, Black, Asian, Hispanic, and other. The prescriber type was defined by family practice, internist, pulmonologist, nurse practitioner, physician assistant and others. The type of payment was defined by Medicaid, private insurance, self-pay and others. Region was defined as Northeast, Midwest, West, and South. A total of 2,264 patients met the inclusion criteria and were extracted from the 2018 National Ambulatory Medical Care Survey (NAMCS), which captures ambulatory services offered in physicians' offices that are directly engaged in patient care. NAMCS is designed to meet the need for objective, reliable information about the provision and use of ambulatory medical care services in the United States. This data was collected by the National Center of Health Statistics (NCHS), which is a division of the CDC. Patients were extracted using ICD 10 codes J45.20 - J45.52 and aged less than 18 years old. The final data was exported into the Statistical Package for Social Sciences (SPSS®) version 27 for statistical analysis. The data were analyzed using descriptive analysis, two-tailed t-tests, and ANOVA with an alpha significance level at 0.05. The extracted data set was checked for integrity and equality in every aspect of the demographics.

3. Results

The finding of this study revealed that there was a significant amount of irregularities between pediatric patient prescribing patterns within the United States. The majority of the pediatric patient population was in the age range of 17-18 years old with the next highest majority being the 13-16 year old range. A total of 1,010 (44.6%) patients were male and 1,254 were female (55.4%). There was no significant difference among males and females in the appropriateness of asthma prescribing patterns. Of the patients in the 13-16 age range, 105 (14.6%) were prescribed appropriately compared to 335 (21.7%) who were prescribed inappropriately. The overall results from the different age ranges were statistically significant ($p < 0.001$). The majority of the pediatric patient population was of the white race (44.2%). Asian race, black race, hispanic race, and other races were statistically significant for being prescribed inappropriately. There was a significant difference among different types of patient payments in regards to appropriate prescribing. Inappropriate prescribing was seen more for patients with Medicaid (24.8%) and self payment (38.2%) as

compared to other types of payments ($p= 0.052$). There was a significant difference among the various prescribers that were evaluated in terms of appropriateness of prescribing. General practice/family physicians (35.1%) and nurse practitioners (20.9%) prescribed more inappropriately as compared to other prescribers ($p=0.001$). There was no statistical significance between different regions within the United States, however; patients from the Southern region of the U.S. were prescribed more inappropriately compared to the other regions in the U.S. ($p= 0.205$).

Table 1 Prescribing Patterns

| Prescribing Pattern Based on Demographic Variables | Appropriate Prescribing (n=718, 31.7%) | Inappropriate Prescribing (n=1546, 68.3%) | Significance (p) |
|---|---|--|-------------------------|
| Sex | | | |
| Male | 327 (45.55%) | 683 (44.2%) | 0.359 |
| Female | 391 (54.46%) | 863 (55.8%) | |
| Age Range | | | |
| Under 3 | 135 (18.8%) | 292 (18.9%) | <0.001 |
| 4-7 | 68 (9.5%) | 163 (10.5%) | |
| 8-12 | 52 (7.2%) | 99 (6.4%) | |
| 13-16 | 105 (14.6%) | 335 (21.7%) | |
| 17-18 | 358 (49.9%) | 657 (42.5%) | |
| Race | | | |
| White | 383 (53.3%) | 618 (40.0%) | <0.001 |
| Black | 145 (20.2%) | 343 (22.2%) | |
| Asian | 43 (6.0%) | 227 (14.7%) | |
| Hispanic | 106 (14.8%) | 237 (15.3%) | |
| Other | 41 (5.7%) | 121 (7.8%) | |
| Type of Payment | | | |
| Medicaid | 140 (19.5%) | 383 (24.8%) | 0.052 |
| Private Insurance | 174 (24.2%) | 383 (24.8%) | |
| Self Pay | 325 (45.3%) | 591 (38.2%) | |
| Others | 79 (11.0%) | 189 (12.2%) | |
| Prescribers | | | |
| Family Practice | 288 (40.01%) | 492 (31.8%) | <0.001 |
| Internist | 100 (13.9%) | 254 (16.4%) | |
| Pulmonologist | 92 (12.8%) | 151 (9.8%) | |
| Nurse Practitioner | 168 (23.4%) | 363 (23.5%) | |
| Physician Assistant | 33 (4.6%) | 71 (4.6%) | |
| Others | 37 (5.1%) | 215 (13.9%) | |
| Region | | | |
| Northeast | 139 (19.4%) | 271 (17.5%) | 0.205 |
| Midwest | 90 (12.53%) | 159 (10.3%) | |
| South | 336 (46.8%) | 752 (48.6%) | |

| | | | |
|------|-------------|-------------|--|
| West | 153 (21.3%) | 364 (23.5%) | |
|------|-------------|-------------|--|

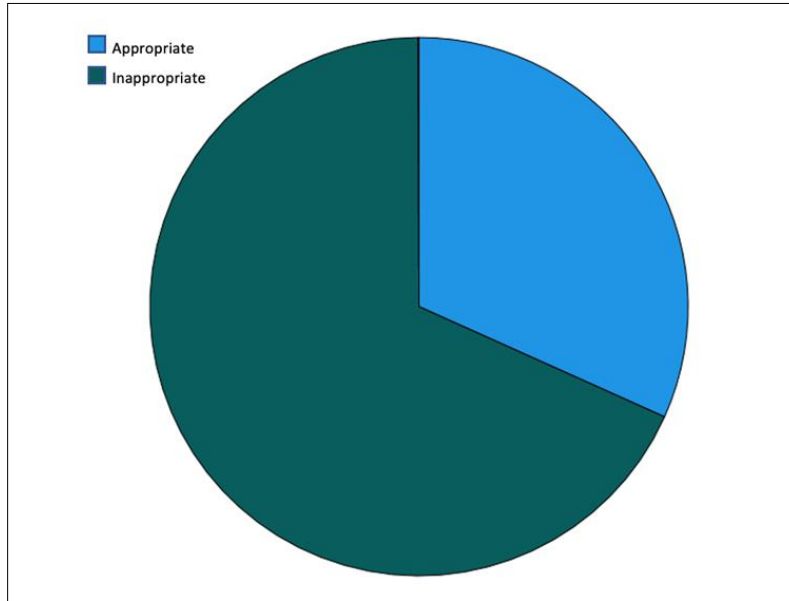


Figure 1 Appropriateness of Prescribing

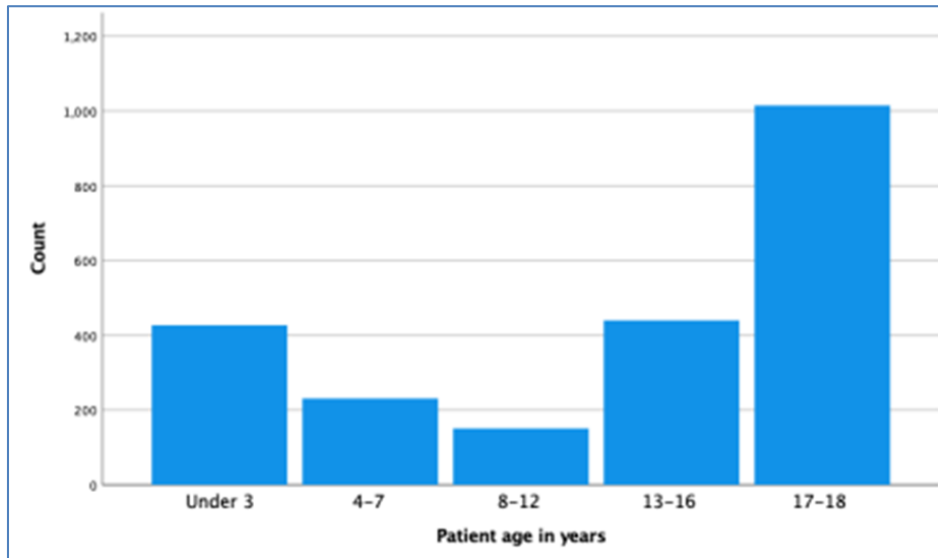


Figure 2 Age distribution of patients

4. Discussion

The findings from this study depict that a significant number of pediatric asthma patients across all demographics were not appropriately prescribed inhalers. The GINA guidelines state that they no longer recommend treatment with short acting beta2 agonists (SABA) without the addition of inhaled corticosteroids (ICS). Regular or frequent use of SABA's on its own has been shown to increase the risk of exacerbations. GINA now recommends that all adolescents with asthma should receive an ICS-containing controller treatment. This can be either symptom-driven or routinely to help reduce the risk of serious exacerbations and to control symptoms.

The primary care prescribers appear to prescribe more inappropriately as compared to other prescriber groups. These patterns could be due to inadequate time that is allotted for primary care visits. Shorter visits give less time to make

diagnoses, discuss treatment regimens, and prescribe effective and accurate treatment regimens. Additionally, primary care prescribers may not be keeping up to date with developments in drug therapy, may feel pressure from families of patients for a particular treatment, and may rely on previous clinical experience rather than scientific data. Efforts should be made to promote appropriate prescribing amongst this group. Such interventions could include enhancing knowledge and implementing guidelines to ensure the proper therapy is being prescribed.

Inappropriate prescribing in relation to pediatric patient age may be due to a multitude of factors. Pediatric patients may not adhere to utilizing multiple inhalers due to the additional burden, peer pressure, and not fully comprehending the implications of appropriate use. Patients from the southern region of the United States were prescribed more inappropriately. This could directly be linked to socioeconomic disparities and the general lack of access to healthcare compared to other parts of the United States.

5. Conclusion

The results support earlier findings that there is an increase in the number of pediatric patients diagnosed with asthma who are not being prescribed appropriate treatment. It is proposed to offer workshops, resources, and education for providers and patients to better treat and advocate for these patients. There is a need for proactive interventions to be made by both prescribers and policymakers. The study findings were limited to ambulatory patients visiting providers in 2018 and by the operational definitions of the study. Appropriate prescribing and adhering to asthma GINA guidelines prevent morbidity, mortality and improves pediatric patients' quality of life, thereby saving healthcare costs for both patients and providers.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest in the planning, designing and conducting of the study. This study was not funded by any entity.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Not applicable as the study utilized deidentified secondary database analysis.

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