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An Evaluation Of The Treatment Of Asthma In The State Of Mississippi Using HEDIS Quality Control Measures

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AN EVALUATION OF THE TREATMENT OF ASTHMA IN THE STATE OF MISSISSIPPI USING HEDIS QUALITY CONTROL MEASURES

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A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

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ABSTRACT

Introduction: Asthma is an inflammatory condition of the lungs that can have significant impacts on a patient's quality of life. Asthma attacks can be very uncomfortable and even deadly in some cases. The objective of this study is to evaluate the treatment of asthma in the state of Mississippi and to describe the disparities between demographics to help healthcare providers identify patients who might be at risk for poor treatment and help those patients receive quality healthcare. **Methods:** The data was retrospectively collected from January to December 2014 Mississippi Centers for Medicare and Medicaid Services claims data. This study is a retrospective, longitudinal, analytical, non-experimental design to describe the quality of asthma treatment in the state of Mississippi. The study uses two measures from the Healthcare Effectiveness Data and Information Set (HEDIS), the Asthma Medication Ratio (AMR) and Medication Management for People With Asthma (MMA). **Results:** The results are split into two main categories, AMR and MMA. The AMR section is then divided into categories for age, race, and sex. The MMA measure is further divided into Proportion of Days Covered>50% (PDC50) and Proportion of Days Covered>75% (PDC75) for the categories of age, race, and sex. The results showed significant differences among demographics for each measure except for MMA PDC75 by Sex. **Discussion:** These differences could be due to medication adherence issues, the misclassification of intermittent asthma as persistent asthma, or limitations within the measures.

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LIST OF ABBREVIATIONS

NCQA	The National Committee on Quality Assurance
HEDIS	Healthcare Effectiveness and Data Information Set
CMS	Centers for Medicare and Medicaid Services
HI	Hospital Insurance
SMI	Supplementary Medical Insurance
FPL	Federal Poverty Line
MMA	Medication Management for people with Asthma
AMR	Asthma Medication Ratio
PDC	Proportion of Days Covered

BACKGROUND

Description of the Problem

According to the Center for Disease Control and Prevention, as of 2017, there were over 25 million Americans living with asthma, or, roughly, 8% of the population. There were also over 3,500 deaths, in 2017, with asthma as the main cause. The CDC also states that there are 187,772 people in Mississippi living with asthma, or 8.3% of the state population. Mississippi had 47 deaths attributable to asthma in 2017 (Asthma State Data, 2019). Though the state average is close to the national average for citizens living with asthma, the mean of Mississippians, especially children, living with uncontrolled asthma is significantly higher than the national average, with 53.1% of children in Mississippi vs 38.4% of children nationally (AsthmaStats 2014). According to the Asthma and Allergy Foundation of America, between 2008 and 2013, asthma accounted for over $50 billion in medical costs alone, not including the other economic costs associated with it. This averages over $6 billion per year. (AAFA)

Causes of Asthma

Asthma is a chronic lung disease that causes the airways to be inflamed and narrow, making it difficult to breathe. During an exacerbation, symptoms worsen, making it even harder to breathe. Symptoms of an asthma exacerbation include; wheezing, shortness of breath, tachypnea (rapid breathing), and coughing. If severe enough, the asthma exacerbation can be life threatening with symptoms such as cyanosis (a condition where the lips and fingertips turn blue from lack of oxygen), flaring of the nostrils, very

fast movement of the stomach or ribs with breathing, incomplete exhalation, or, in infants, unresponsiveness to parents. (AAFA)

Asthma exacerbations can be triggered by a several different factors, including physical activity, allergens, or occupational factors such as fumes or dust. When an irritant encounters a patient with asthma's airways, the airways become inflamed and constricted, causing the symptoms seen in asthma exacerbations. (AAAI)

Treatment of Asthma

The two main types of medication used to treat asthma are controller and reliever medications. Controller medications are taken prophylactically every day to prevent asthma exacerbations and control the daily symptoms of asthma. Types of controller medications include: inhaled corticosteroids, inhaled corticosteroid combinations, long acting beta-2 agonists, leukotriene modifiers, mast cell stabilizers, methylxanthines, and immune modulators. Reliever medications are typically short-acting, inhaled beta-2 agonists. The treatment of asthma is dependent on whether it is classified as intermittent or persistent. The differences in these two classes can be seen in Appendix B. Intermittent asthma does not require a controller medication while persistent does and could require multiple (Asthma Quick Care Reference, 2012).

Quality Control Measures

Quality of care, as defined by the Institute of Medicine, is "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Lohr, 1990). As

different options for health insurance began to arise in the 20th century, so too did the need for a way to measure the quality of care received by patients. The need partly arose from economic reasons and partly from a wellbeing of the patient side. The patients needed to know that they were going to receive the best healthcare possible and the insurance company wanted to ensure that their money was being spent efficiently on capable doctors and hospitals (McIntyre et al, 2001). The National Committee on Quality Assurance (NCQA) created the Healthcare Effectiveness and Data Information Set (HEDIS) as a quality control measure to be used by consumers and insurers alike. HEDIS is composed of six domains of care composed of ninety quality control measures. According to the NCQA website, "191 million people are enrolled in plans that report HEDIS results," which is over half the United States population according to recent census data (HEDIS) (US Census Bureau, 2011).

This study will be using the HEDIS Asthma Medication Ratio (AMR) and Medication Management for People with Asthma (MMA) quality control measures. AMR is the ratio of controller medications to total asthma medications. MMA measures the mean of people who remain on a controller medication for at least 50% of their treatment period and the mean of people who remain on a controller medication for at least 75% of their treatment period.

Medicare and Medicaid

In 1965, Congress added amendments XVIII and XIX to the Social Security Act, establishing Medicare and Medicaid, respectively. Medicare gives coverage to all citizens over the age of 65, regardless of past medical history. Medicaid is meant to give coverage

to lower income citizens; however, it is made to be state run but was not made mandatory for each state to have a program. Both programs are administered by the Centers for Medicare and Medicaid Services (CMS).

There have been several changes to Medicare since 1965. Currently it is divided into 4 parts: Part A, Part B, Part C, and Part D. Medicare provides coverage to anybody over the age of 65, people with end stage renal-disease or amyotrophic lateral sclerosis, and some disabled people under the age of 65. As well as the previously mentioned health status', in order to be eligible for Medicare a person must also be a citizen and he/she or their spouse must have worked in a Medicare eligible job for at least ten years. Part A, also known as Hospital Insurance (HI), is paid for through the HI Trust Fund which is funded through payroll tax and also partly through a deductible paid by the patient. It covers in-patient hospital visits, care at a skilled nursing facility, home health, and hospice care. There is also automatic enrollment for Part A. Part B, also known as Supplementary Medical Insurance (SMI), is paid for through the SMI Trust Fund, which is funded through patient premiums and through revenues from the federal government. Part B covers most outpatient visits and some drugs, such as those that cannot be administered by the patient, but it does not cover hearing, vision, dental, or most prescription drugs. To be eligible for Part B, the patient must also be enrolled in Part A however, enrollment in Part B is voluntary and not automatic. Part C, also known as Managed Care, is a plan available to those enrolled in Part A and Part B. Part C is a program where the patient is enrolled in a private insurance company but Medicare is paying a predetermined amount to the company to offset the cost. These plans are required to cover the same elements as Part A and Part B but can cover more. Many Part

C plans also offer coverage for prescription drugs, vision, dental, and hearing. Beneficiaries of these plans pay the Part B premium as well as an additional premium for any additional coverage. Medicare Part D is available to those enrolled in Part A and Part B. Part D is funded through the SMI Trust Fund and covers prescription drugs. Beneficiaries are allowed to choose their own prescription drug plan. These plans must include a Medication Therapy Management program to help increase patient understanding, adherence, and decrease adverse events.

Whereas Medicare is almost exclusively for people over the age of 65, with some exceptions, Medicaid is for people of any age who do not have the means to afford healthcare on their own. It is funded by both the state and federal governments, with the federal government contributing an amount proportional to the state's average income level. Medicaid is also administered by the individual state, with some national guidelines. There are three groups covered under Medicaid: the Mandated Categorically Needy, Optionally Categorically Needy, and Medically Needy. The Mandated Categorically Needy includes children under the age of 19 whose family's income is less than 138% of the Federal Poverty Line (FPL), pregnant women whose income is less than 133% of the FPL, parents who receive welfare, and people with disabilities who receive a Supplemental Security Income below 79% of the FPL. The Optionally Categorically Needy category is determined by the states but must include the same benefits and coverage as the Mandated category. The Medically Needy category includes individuals who make above the FPL thresholds to fit into another category but spend so much on medical expenses that their income falls below a state established line (Ramachandran, 2018).

Study Significance

This study will help to identify specific at-risk populations for poor treatment of asthma in the state of Mississippi. This will help healthcare providers, such as primary care providers, pharmacists, and nurses, to be more vigilant in identifying and assisting in suboptimal treatment. In preparation for this study, a literature review was conducted, and it was found that a similar study was conducted in one aspect by the Mississippi Drug Utilization Review Board (Asthma Overview, 2019)**;** however, that study was much smaller in comparison to the one conducted for this paper.

Study Objectives

The objectives of this study are:

1. To evaluate the performance on HEDIS Medication Management for people with Asthma (MMA) and Asthma Medication Ratio (AMR) among patients with persistent asthma using claims data from CMS Medicaid.
2. To describe the demographic variations of MMA and AMR for patients enrolled in Mississippi Medicaid with persistent asthma.
3. To explore ways to improve MMA and AMR disparities throughout the state of Mississippi.

Methods

Design

The study was conducted using a retrospective, longitudinal, analytical, non-experimental design to describe the quality of asthma treatment in the state of Mississippi using Mississippi Centers for Medicare and Medicaid Services claims data. This study is approved by the University of Mississippi Institutional Review Board, the protocol number is 19-051.

Sample

The sampled data is consistent with the parameters set forth by HEDIS AMR and MMA measures. See Appendix A for AMR and MMA measures, respectively. The study was conducted using Mississippi Centers for Medicare and Medicaid Services claims data for calendar year 2014. Beneficiaries with persistent asthma were identified and classified as receiving appropriate treatment or not using the specifications in the HEDIS quality measures for asthma treatment. Demographic characteristics of beneficiaries were determined from the CMS beneficiary summary files and comorbidities were identified using medical claims for the beneficiaries included in the study. The AMR set consists of 17,997 patients and the MMA set consists of 14,014 patients. The difference is that the AMR measure excludes patients who received no asthma medications, whether controller or reliever, while the MMA measure only excludes patients who did not receive any controller medications.

Data Collection and Analysis

All data collected was retrospective claims data from the Mississippi Centers for Medicare and Medicaid Services. Descriptive statistics and logistic regressions will be used to compare performance on the HEDIS measures across beneficiary characteristics and to identify disparities in the treatment of asthma in Mississippi.

The AMR is the ratio of controller asthma medications to total asthma medications. The ideal ratio is greater than 0.5, where no other medications are needed, and the asthma is controlled.

The MMA measure is quantified by using the Proportion of Days Covered (PDC). This is the proportion of days on an asthma controller medication related to the total number of days in the treatment period. The first category is PDC50, which is the number of persons who were on a controller medication for over 50% of the treatment period. The second category is PDC75, which is the number of persons who were on a controller medication for over 75% of the treatment period. For this study, the study population was assigned numerical values to measure the PDC50 and PDC75. Those with a score of PDC<50% or PDC<75% are deemed unfavorable outcomes. Those with a score of PDC>50% or PDC>75% are deemed favorable outcomes.

Results

The AMR measure was composed of 17,997 individuals ranging from 5 years old to 64 years old representing six racial categories. Table 1 shows the frequency and mean of the overall population with an AMR of less than or greater than or equal to 0.5. Approximately 69.01% of the population received an AMR greater than or equal to 0.5. As shown in Table 2, the average age was 16 years old with 12 years old being the median. Tables 3 shows the frequency and mean for each age group.

Table 4 shows the analysis of AMR by a function of the age group demographic, with the associated Chi-Square Test. Approximately 79.23% of 5-11 year olds, 68.06% of 12-18 year olds, 43.51% of 19-50 year olds, and 58.48% of 51-64 year olds, had an AMR score of 0.5 or greater. The Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

Table 5 shows the frequency and mean for each racial demographic. Table 6 shows the analysis of AMR by a function of the race demographic with the associated Chi-Square Test. Approximately 66.19% of African Americans, 74.07% of American Indians, 88.52% of Asians, 74.49% of Caucasians, 69.52% of Hispanics, and 66.95% of the Unknown/Other category, had an AMR score of 0.5 or greater. The Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

Table 7 shows the frequency and mean for males and females. Table 8 shows the analysis of AMR by a function of sex, with the corresponding Chi-Square Test. Approximately 64.89% of females had an AMR score of 0.5 or greater while 72.98% of males did. The Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

The MMA measure was composed of 14,014 individuals broken down into the same demographic categories as the AMR measure. The data is divided into two sections, PDC50 and PDC75, and further divided into race, sex, and age group. The overall PDC50 and PDC75 data is shown in Tables 9 and 10, respectively. For PDC50, approximately 41.07% of individuals received a score of 1. For PDC75, approximately 18.10% of individuals received a score of 1.

Table 11 shows the frequency and mean of the age group categories for the MMA measure. Table 12 shows the analysis of PDC50 by age group, with the associated Chi-Square Test. Approximately 41.27% of 5-11 year olds, 37.97% of 12-18 year olds, 43.91% of 19-50 year olds, and 53.89% of 51-64 year olds, received a score of 1. The Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

In Table 13 the analysis of PDC75 is shown by age group, with the associated Chi-Square Test. Approximately 17.64% of 5-11 year olds, 15.91% of 12-18 year olds, 21.79% of 19-50 year olds, and 31.11% of 51-64 year olds, received a score of 1. The

Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

Table 14 shows the frequency and mean of the racial group categories for the MMA measure. In Table 15, the analysis of PDC50 is shown by race, with the corresponding Chi-Square Test. Approximately 36.39% of African Americans, 37.50% of American Indians, 43.40% of Asians, 50.96% of Caucasians, 42.08% of Hispanics, and 50.32% of Unknown/Others, received a score of 1. The Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

Table 16 shows the analysis of PDC75 by race, with the corresponding Chi-Square Test. Approximately 14.17% of African Americans, 12.50% of American Indians, 28.30% of Asians, 25.89% of Caucasians, 18.33% of Hispanics, and 28.46% of Unknown/Others, received a score of 1. The Chi-Square Test gives a p-value of less than 0.0001. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

Table 17 shows the frequency and mean of the males and females for the MMA measure In Table 18, the analysis of PDC50 is shown by sex, with the corresponding Chi-Square Test. Approximately 40.11% of females and 41.90% of males received a score of 1. The Chi-Square Test gives a p-value of 0.0312. This means that for the 95% confidence interval, there is a statistically significant difference between the groups.

Table 19 shows the analysis of PDC75 by sex, with the corresponding Chi-Square Test. Approximately 17.82% of females and 18.33% of males received a score of 1. The

Chi-Square Test gives a p-value of 0.4377. This means that for the 95% confidence interval, there is no significant difference with regard to individual's sex.

AMR Tables:

Table 1: Overall AMR

AMR	Frequency (n)	Mean (%)
< 0.5	5578	30.99
> 0.5	12419	69.01

Table 2: AMR and Age Statistics

Variable	Mean	Median	Minimum	Maximum	Standard Deviation
AMR	0.69	1.00	0	1.00	0.46
Age (years)	16.43	12.00	5.00	64.00	13.67

Table 3: Age Frequency for AMR Ratio

Age Group (years)	Frequency (n)	Mean (%)
05-11	8,976	49.87
12-18	5,429	30.17
19-50	2,606	14.48
51-64	986	5.48

Table 4: AMR by Age Groups

Age Group (years)	AMR			
Frequency Row Mean	< 0.5	> 0.5	Total	p-value
05-11	1864 (20.77)	7112 (79.23)	8,976	< 0.0001
12-18	1734 (31.94)	3695 (68.06)	5,429	
19-50	1472 (56.49)	1134 (43.51)	2,606	
51-64	508 (51.52)	478 (48.48)	986	
Totals	5,578 (30.99)	12,419 (69.01)	17,997	

Table 5: Race Frequency for AMR Ratio

Race	Frequency (n)	Percent (%)
African American	11,080	61.57
American Indian	27	0.15
Asian	61	0.34
Caucasian	5728	31.83
Hispanic	269	1.49
Unknown/Other	832	4.62

Table 6: AMR Ratio by Race

Race	AMR Ratio			
Frequency Row Mean	< 0.5	> 0.5	Total	p-value
African American	3,746 (33.81)	7,334 (66.19)	11,080	< 0.0001
American Indian	7 (25.93)	20 (74.07)	27	
Asian	7 (11.48)	54 (88.52)	61	
Caucasian	1461 (25.51)	4267 (74.49)	5,728	
Hispanic	82 (30.48)	187 (69.52)	269	
Unknown/Other	275 (33.05)	557 (66.95)	832	
Totals	5,578 (30.99)	12,419 (69.01)	17,997	

Table 7: Sex Frequency for AMR Ratio

Sex	Frequency (n)	Mean (%)
F	8,837	49.10
M	9,160	50.90

Table 8: AMR by Sex

Sex	AMR			
Frequency Row Mean	< 0.5	> 0.5	Totals	p-value
Female	3103 (35.11)	5734 (64.89)	8,837	< 0.0001
Male	2475 (27.02)	6685 (72.98)	9,160	
Totals	5,578 (30.99)	12,419 (69.01)	17,997	

MMA Tables:

Table 9: Overall PDC50

PDC50	Frequency	Percent
0	8258	58.93
1	5756	41.07

Table 10: Overall PDC75

PDC75	Frequency (n)	Mean (%)
0	11478	81.90
1	2536	18.10

Table 11: MMA Measure Age Group Characteristics

Age Group (years)	Frequency (n)	Mean (%)
5-11	7902	56.39
12-18	4085	29.15
19-50	1487	10.61
51-64	540	3.85

Table 12: Age Group by PDC50

Age Group (years)	PDC50			
Frequency Row Mean	PDC<50% n (%)	PDC>50% n (%)	Total	p-value
05-11	4641 (58.73)	3261 (41.27)	7902	
12-18	2534 (62.03)	1551 (37.97)	4085	
19-50	834 (56.09)	653 (43.91)	1487	< 0.0001
51-64	249 (46.11)	291 (53.89)	540	
Total	8258 (58.93)	5756 (41.07)	14014	

Table 13: Age Group by PDC75

Age Group (years)	PDC75			
Frequency Row Mean	PDC<75% n (%)	PDC>75% n (%)	Total	p-value
05-11	6508 (82.36)	1394 (17.64)	7902	
12-18	3435 (84.09)	650 (15.91)	4085	
19-50	1163 (78.21)	324 (21.79)	1487	< 0.0001
51-64	372 (68.89)	168 (31.11)	540	
Total	11478 (81.90)	2536 (18.10)	14014	

Table 14: MMA Measure Demographic Characteristics

Race	Frequency (n)	Mean (%)
African American	9286	66.26
American Indian	24	0.17
Asian	53	0.38
Caucasian	3789	27.04
Hispanic	240	1.71
Unknown/Other	622	4.44

Table 15: Race by PDC50

Race	PDC50			
Frequency Row Mean	PDC<50% n (%)	PDC>50% n (%)	Total	p-value
African American	5907 (63.61)	3379 (36.39)	9286	< 0.0001
American Indian	15 (62.50)	9 (37.50)	24	
Asian	30 (56.60)	23 (43.40)	53	
Caucasian	1858 (49.04)	1931 (50.96)	3789	
Hispanic	139 (57.92)	101 (42.08)	240	
Unknown/Other	309 (49.68)	313 (50.32)	622	
Total	8258 (58.93)	5756 (41.07)	14014	

Table 16: Race by PDC75

Race	PDC75			
Frequency Row Mean	PDC<75% n (%)	PDC>75% n (%)	Total	p-value
African American	7970 (85.83)	1316 (14.17)	9286	< 0.0001
American Indian	21 (87.50)	3 (12.50)	24	
Asian	38 (71.70)	15 (28.30)	53	
Caucasian	2808 (74.11)	981 (25.89)	3789	
Hispanic	196 (81.67)	44 (18.33)	240	
Unknown/Other	445 (71.54)	177 (28.46)	622	
Total	11478 (81.90)	2536 (18.10)	14014	

Table 17: MMA Measure Sex Characteristics

Sex	Frequency (n)	Mean (%)
F	6480	46.24
M	7534	53.76

Table 18: Sex by PDC50

Sex	PDC50			
Frequency Row Mean	PDC<50% n (%)	PDC>50% n (%)	Total	p-value
Female	3881 59.89	2599 40.11	6480	0.0312
Male	4377 58.10	3157 41.90	7534	
Total	8258 58.93	5756 41.07	14014	

Table 19: Sex by PDC75

Sex	PDC75			
Frequency Row Mean	PDC<75% n (%)	PDC>75% n (%)	Total	p-value
Female	5325 (82.18)	1155 (17.82)	6480	0.4377
Male	6153 (81.67)	1381 (18.33)	7534	
Total	11478 (81.90)	2536 (18.10)	14014	

Discussion

Asthma Medication Ratio Key Findings

Comparing AMR by age groups, the 05-11 year age group considerably outperformed all the other groups. This could be due to adherence issues. If a patient has trouble adhering to prescription instructions for a controller medication, which are sometimes administered multiple times per day, the patient will need more non-controller medications, such as rescue inhalers. This will shift the patient from what could be an optimal treatment to a treatment with an unfavorable AMR. That age group is still dependent on parents or guardians for their adherence and the parents may follow instructions more closely to keep their children healthy. As the patient ages, he/she become more independent and though he/she may be able to take his/her medications independently, he/she may not to remember to take his/her controller medication. This explanation also provides a reason why the 51-64 year age group, outperformed the 19-50 age group, as an older patient may be more responsible and more likely to take care of their health and have better medication adherence (Hadji et al, 2016)

In AMR by Race, the African American group performed the worst, despite having the same insurance and, theoretically, access to the same healthcare providers. Similar to how adherence is the reason the 05-11 year age group performed the best, adherence could be the reason African Americans performed the worst. These issues could be due to cultural barriers, poor health literacy, or poor patient education.

For males and females, males performed significantly better than females. This could also be due to females being more likely to visit their physician and have their medications changed, which would alter the AMR.

Medication Management for People With Asthma Key Findings

MMA measures medication adherence by using claims data from pharmacies. Looking at the 12-18 year age group by PDC50 and Age Group by PDC75, they performed the worst according to the MMA measures with the 05-11 year ago group performing the second worst. This could be due to the misclassification of mild asthma as persistent asthma skewing the results. After the 12-18 year age group, the PDC50 and PDC75 increases as age increases, showing increased adherence. This could be due to fewer misclassifications or patients are starting to take their healthcare more seriously and getting better about taking their medication. The average value for PDC50 was 41.07%, when this is changed to PDC75, the value drops to 18.10%, a relative change of -55.97%. This change is similar to what the majority of the demographics experienced. This data is also could also be skewed by patients not correctly diagnosed with persistent asthma. It also is very telling as to how poorly these controller medications are actually taken. Throughout both AMR and MMA measures, every group was statistically significantly different with the exception of one, Sex by PDC75. It had a p-value of 0.4377 meaning that there is not a statistically significant difference in sex. This is most likely due to males and females sharing more of the same influences on adherence than people of different age groups or racial groups.

Study Limitations

The main limitation of this study is that it may not be generalizable to other populations because the data was derived from Medicaid claims data. People who are enrolled in Medicaid are generally associated with a lower socioeconomic status. People of a higher socioeconomic status might have access to more doctors and medications not available to Medicaid patients due to factors associated with a lower socioeconomic status, such as limitations in number of specialized providers in an area or barriers in transportation to providers. A lower socioeconomic status is also generally associated with poor health literacy which could affect medication adherence (Wamala et al, 2007). People with Medicaid insurance are also limited to 6 prescriptions per month and might be less likely to fill a controller prescription as they would a reliever prescription. Another limitation is the study uses claims data from the year 2014, which is just one year of data. Both measures also include patients who have had four medication dispensing events. This allows for the opportunity of misclassification of patients with intermittent asthma as patients with persistent asthma. The measures are for patients with persistent asthma, but medication dispensing events is not in the criteria for the classification of asthma so there is not a guarantee the patients have persistent asthma. For AMR, one way the data can become skewed is if a patient goes through many different controller medications throughout the year. This would skew the data because the ratio would be falsely high due to the amount of controller medications, offsetting the non-controller medications. There are multiple ways the MMA data can be skewed. If a

person is not correctly diagnosed with persistent asthma, fits the inclusion criteria, is started on controller medication, but later reclassified as intermittent asthma, or even no asthma at all, and treatment of controller medications is discontinued, those patients will still be included in the measure. The MMA data could also be skewed by patients using asthma controller medications for seasonal asthma, where they are only adherent to their medications for a certain portion of the year. Many people also visit urgent care clinics instead of their primary care physician for medical care, this could be a source of error as many urgent care offices might not have access to spirometry, a tool needed to accurately diagnose and assess asthma. There is also no guarantee the patient took the medication, only that the prescription was filled. These two sources of error could account for the reason why the PDC50 and PDC75 mean value for 1 was low.

Practical Relevance

With certain groups being identified as falling behind other groups in terms of performance, healthcare professionals can use this data to try to mediate the disparity. Pharmacists, in particular, can be sure to be more vigilant about educating patients about the difference in controller and reliever medications and the importance of proper technique and adherence. This would improve health outcomes and performance on quality control measures. Pharmacists can also be more vigilant about ensuring that patients with persistent asthma have a controller medication as a part of their medication regimen.

Ideas for Future Research

For future research, it would be advantageous to change the exclusion criteria to exclude people whose asthma diagnoses have been downgraded from persistent to intermittent. It would also be beneficial to do a similar study showing the variation by geographic region. This could help to identify areas of the state that are consistently underperforming so that these problems can be addressed.

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Appendix A

Asthma Medication Ratio (AMR)

SUMMARY OF CHANGES TO HEDIS 2017

- No changes to this measure.

Description

The mean of members 5–85 years of age who were identified as having persistent asthma and had a ratio of controller medications to total asthma medications of 0.50 or greater during the measurement year.

Note: *For Medicaid, report only members 5–64 years of age. For Medicare, report only members 18–85 years of age.*

Definitions

Oral medication dispensing event

One prescription of an amount lasting 30 days or less. To calculate dispensing events for prescriptions longer than 30 days, divide the days supply by 30 and round down to convert. For example, a 100-day prescription is equal to three dispensing events (100/30 = 3.33, rounded down to 3). Allocate the dispensing events to the appropriate year based on the date on which the prescription is filled.

Multiple prescriptions for different medications dispensed on the same day are counted as separate dispensing events. If multiple prescriptions for the same medication are dispensed on the same day, sum the days supply and divide by 30. Use the Drug ID to determine if the prescriptions are the same or different.

Refer to the definition of *Oral medication dispensing event* in MMA for examples.

Inhaler dispensing event

When *identifying the eligible population*, use the definition below to count inhaler dispensing events.

All inhalers (i.e., canisters) of the same medication dispensed on the same day count as one dispensing event. Medications with different Drug IDs dispensed on the same day are counted as different dispensing events. For example, if a member received three canisters of Medication A and two canisters of Medication B on the same date, it would count as two dispensing events.

Allocate the dispensing events to the appropriate year based on the date when the prescription was filled.

	Use the Drug ID field in the NDC list to determine if the medications are the same or different.
Injection dispensing event	Each injection counts as one dispensing event. Multiple dispensed injections of the same or different medications count as separate dispensing events. For example, if a member received two injections of Medication A and one injection of Medication B on the same date, it would count as three dispensing events. Allocate the dispensing events to the appropriate year based on the date when the prescription was filled.

Units of medications

When identifying medication units for the numerator, count each individual medication, defined as an amount lasting 30 days or less, as one medication unit. One medication unit equals one inhaler canister, one injection, or a 30-day or less supply of an oral medication. For example, two inhaler canisters of the same medication dispensed on the same day count as two medication units and only one dispensing event.

Use the package size and units columns in the NDC list to determine the number of canisters or injections. Divide the dispensed amount by the package size to determine the number of canisters or injections dispensed. For example, if the package size for an inhaled medication is 10 g and pharmacy data indicates the dispensed amount is
30 g, this indicates 3 inhaler canisters were dispensed.

Eligible Population

Note: *Members in hospice are excluded from the eligible population. Refer to General Guideline 20: Members in Hospice.*

Product lines

Commercial, Medicaid, Medicare (report each product line separately).

Ages

For commercial, ages 5-85 as of December 31 of the measurement year. Report the following age stratifications and total rate:

- 5–11 years.
- 12–18 years.
- 19–50 years.
- 51–64 years.
- 65–85 years.
- Total.

For Medicaid, ages 5–64 as of December 31 of the measurement year. Report the following age stratifications and total rate:

- 5–11 years.
- 12–18 years.
- 19–50 years.
- 51–64 years.
- Total.

For Medicare, ages 18–85 as of December 31 of the measurement year. Report the following age stratifications and total rate:

- 18-50 years.
- 51–64 years.
- 65–85 years.
- Total.

The total is the sum of the age stratifications for each product line.

Continuous enrollment

The measurement year and the year prior to the measurement year.

Allowable gap

No more than one gap in enrollment of up to 45 days during each year of continuous enrollment. To determine continuous enrollment for a Medicaid beneficiary for whom enrollment is verified monthly, the member may not have more than a 1-month gap in coverage during each year of continuous enrollment year.

Anchor date

December 31 of the measurement year.

Benefits

Medical. Pharmacy during the measurement year.

Event/ diagnosis

Follow the steps below to identify the eligible population.

Step 1

Identify members as having persistent asthma who met at least one of the following criteria during both the measurement year and the year prior to the measurement year. Criteria need not be the same across both years.

- At least one ED visit (ED Value Set), with a principal diagnosis of asthma (Asthma Value Set).
- At least one acute inpatient encounter (Acute Inpatient Value Set), with a principal diagnosis of asthma (Asthma Value Set).
- At least four outpatient visits (Outpatient Value Set) or observation visits (Observation Value Set), on different dates of service, with any diagnosis of asthma (Asthma Value Set) ***and*** at least two asthma medication dispensing events (Table MMA-A). Visit type need not be the same for the four visits.
- At least four asthma medication dispensing events (Table MMA-A).

Step 2

A member identified as having persistent asthma because of at least four asthma medication dispensing events, where leukotriene modifiers or antibody inhibitors were the sole asthma medication dispensed in that year, must also have at least one diagnosis of asthma (Asthma Value Set), in any setting, in the same year as the leukotriene modifier or antibody inhibitor (i.e., the measurement year or the year prior to the measurement year).

Step 3: Required exclusions

Exclude members who met any of the following criteria:

- Members who had any diagnosis from any of the following value sets, any time during the member's history through December 31 of the measurement year:
  - Emphysema Value Set.
  - Other Emphysema Value Set.
  - COPD Value Set.
  - Obstructive Chronic Bronchitis Value Set.
  - Chronic Respiratory Conditions Due to Fumes/Vapors Value Set.
  - Cystic Fibrosis Value Set.
  - Acute Respiratory Failure Value Set.
- Members who had no asthma medications (controller or reliever) dispensed (Table AMR-A) during the measurement year.

Administrative Specification

Denominator The eligible population.

Numerator The number of members who have a medication ratio of 0.50 or greater during the measurement year. Follow the steps below to calculate the ratio.

Step 1 For each member, count the units of controller medications (Table AMR-A) dispensed during the measurement year. Refer to the definition of *Units of medications*.

Step 2 For each member, count the units of reliever medications (Table AMR-A) dispensed during the measurement year. Refer to the definition of *Units of medications*.

Step 3 For each member, sum the units calculated in step 1 and step 2 to determine units of total asthma medications.

Step 4 For each member, calculate the ratio of controller medications to total asthma medications using the following formula.

$$\frac{\text{Units of Controller Medications (step 1)}}{\text{Units of Total Asthma Medications (step 3)}}$$

Step 5 Sum the total number of members who have a ratio of 0.50 or greater in step 4.

Table AMR-A: Asthma Controller and Reliever Medications

ASTHMA CONTROLLER MEDICATIONS			
Description	**Prescriptions**		
Antiasthmatic combinations	• Dyphylline-guaifenesin	• Guaifenesin-theophylline	
Antibody inhibitors	• Omalizumab		
Inhaled steroid combinations	• Budesonide-formoterol	• Fluticasone-salmeterol	• Mometasone-formoterol
Inhaled corticosteroids	• Beclomethasone • Budesonide • Ciclesonide	• Flunisolide • Fluticasone CFC free • Mometasone	
Leukotriene modifiers	• Montelukast	• Zafirlukast	• Zileuton
Mast cell stabilizers	• Cromolyn		
Methylxanthines	• Aminophylline	• Dyphylline	• Theophylline
ASTHMA RELIEVER MEDICATIONS			
Description	**Prescriptions**		
Short-acting, inhaled beta-2 agonists	• Albuterol	• Levalbuterol	• Pirbuterol

Note: *NCQA will post a comprehensive list of medications and NDC codes to www.ncqa.org by November 1, 2016.*

Data Elements for Reporting

Organizations that submit HEDIS data to NCQA must provide the following data elements.

Table AMR-1/2/3: Data Elements for Asthma Medication Ratio

Data Elements	Administrative
Measurement year	✓
Data collection methodology (Administrative)	✓
Eligible population	*For each age stratification and total*
Number of required exclusions	*For each age stratification and total*
Numerator events by administrative data	*For each age stratification and total*
Numerator events by supplemental data	*For each age stratification and total*
Reported rate	*For each age stratification and total*
Lower 95% confidence interval	*For each age stratification and total*
Upper 95% confidence interval	*For each age stratification and total*

Medication Management for People With Asthma (MMA)

SUMMARY OF CHANGES TO HEDIS 2017

- No changes to this measure.

Description

The mean of members 5–85 years of age during the measurement year who were identified as having persistent asthma and were dispensed appropriate medications that they remained on during the treatment period. Two rates are reported:

1. The mean of members who remained on an asthma controller medication for at least 50% of their treatment period.
2. The mean of members who remained on an asthma controller medication for at least 75% of their treatment period.

Note: *For Medicaid, report only members 5–64 years of age. For Medicare, report only members 18–85 years of age.*

Definitions

IPSD	Index prescription start date. The earliest prescription dispensing date for any asthma controller medication during the measurement year.
Treatment period	The period of time beginning on the IPSD through the last day of the measurement year.
PDC	Proportion of days covered. The number of days that a member is covered by at least one asthma controller medication, divided by the number of days in the treatment period.

Oral medication dispensing event

One prescription of an amount lasting 30 days or less. To calculate dispensing events for prescriptions longer than 30 days, divide the days supply by 30 and round down to convert. For example, a 100-day prescription is equal to three dispensing events (100/30 = 3.33, rounded down to 3). Allocate the dispensing events to the appropriate year based on the date when the prescription is filled.

Multiple prescriptions for different medications dispensed on the same day count as separate dispensing events. If multiple prescriptions for the same medication are dispensed on the same day, sum the days supply and divide by 30. Use the Drug ID to determine if the prescriptions are the same or different.

- *Two prescriptions* for different medications dispensed on the same day, each with a 60-day supply, equals four dispensing events (two prescriptions with two dispensing events each).
- *Two prescriptions* for different medications dispensed on the same day, each with a 15-day supply, equals two dispensing events (two prescriptions with one dispensing event each).
- *Two prescriptions* for the same medication dispensed on the same day, each with a 15-day supply, equals one dispensing event (sum the days supply for a total of 30 days).
- *Two prescriptions* for the same medication dispensed on the same day, each with a 60-day supply, equals four dispensing events (sum the days supply for a total of 120 days).

Inhaler dispensing event	When *identifying the eligible population*, use the definition below to count inhaler dispensing events. All inhalers (i.e., canisters) of the same medication dispensed on the same day count as one dispensing event. Medications with different Drug IDs dispensed on the same day are counted as different dispensing events. For example, if a member received three canisters of Medication A and two canisters of Medication B on the same date, it would count as two dispensing events. Allocate the dispensing events to the appropriate year based on the date when the prescription was filled. Use the Drug ID field in the NDC list to determine if the medications are the same or different.
Injection dispensing event	Each injection counts as one dispensing event. Multiple dispensed injections of the same or different medications count as separate dispensing events. For example, if a member received two injections of Medication A and one injection of Medication B on the same date, it would count as three dispensing events. Allocate the dispensing events to the appropriate year based on the date when the prescription was filled.
Calculating number of days covered for the numerator	If multiple prescriptions for different medications are dispensed on the same day, calculate number of days covered by a controller medication using the prescriptions with the longest days supply. For multiple different prescriptions dispensed on different days with overlapping days supply, count each day within the treatment period only once toward the numerator. If multiple prescriptions for the same medication are dispensed on the same or different day, sum the days supply and use the total to calculate the number of days covered by a controller medication. For example, three controller prescriptions for the same medication are dispensed on the same day, each with a 30-day supply, sum the days supply for a total of 90 days covered by a controller. Subtract any days supply that extends beyond December 31 of the measurement year. Use the drug ID provided by the NDC to determine if the prescriptions are the same or different.

Eligible Population

Note: *Members in hospice are excluded from the eligible population. Refer to General Guideline 20: Members in Hospice.*

Product lines	Commercial, Medicaid, Medicare (report each product line separately).
Ages	For commercial, ages 5-85 as of December 31 of the measurement year. Report the following age stratifications and total rate: • 5–11 years. • 12–18 years. • 19–50 years. • 51–64 years. • 65–85 years. • Total.

For Medicaid, ages 5–64 as of December 31 of the measurement year. Report the following age stratifications and total rate:

- 5–11 years.
- 12–18 years.
- 19–50 years.
- 51–64 years.
- Total.

For Medicare, ages 18–85 as of December 31 of the measurement year. Report the following age stratifications and total rate:

- 18-50 years.
- 51–64 years.
- 65–85 years.
- Total.

The total is the sum of the age stratifications for each product line.

Continuous enrollment

The measurement year and the year prior to the measurement year.

Allowable gap

No more than one gap in enrollment of up to 45 days during each year of continuous enrollment. To determine continuous enrollment for a Medicaid beneficiary for whom enrollment is verified monthly, the member may not have more than a 1-month gap in coverage during each year of continuous enrollment year.

Anchor date

December 31 of the measurement year.

Benefits

Medical. Pharmacy during the measurement year.

Event/diagnosis

Follow the steps below to identify the eligible population for the measure.

Step 1

Identify members as having persistent asthma who met at least one of the following criteria during both the measurement year and the year prior to the measurement year. Criteria need not be the same across both years.

- At least one ED visit (ED Value Set), with a principal diagnosis of asthma (Asthma Value Set).
- At least one acute inpatient encounter (Acute Inpatient Value Set), with a principal diagnosis of asthma (Asthma Value Set).
- At least four outpatient visits (Outpatient Value Set) or observation visits (Observation Value Set) on different dates of service, with any diagnosis of asthma (Asthma Value Set) ***and*** at least two asthma medication dispensing events (Table MMA-A). Visit type need not be the same for the four visits.
- At least four asthma medication dispensing events (Table MMA-A).

Table MMA-A: Asthma Medications

Description	Prescriptions		
Antiasthmatic combinations	• Dyphylline-guaifenesin	• Guaifenesin-theophylline	
Antibody inhibitor	• Omalizumab		
Inhaled steroid combinations	• Budesonide-formoterol	• Fluticasone-salmeterol	• Mometasone-formoterol
Inhaled corticosteroids	• Beclomethasone • Budesonide	• Ciclesonide • Flunisolide	• Fluticasone CFC free • Mometasone
Leukotriene modifiers	• Montelukast	• Zafirlukast	• Zileuton
Mast cell stabilizers	• Cromolyn		
Methylxanthines	• Aminophylline	• Dyphylline	• Theophylline
Short-acting, inhaled beta-2 agonists	• Albuterol	• Levalbuterol	• Pirbuterol

Note: *NCQA will post a comprehensive list of medications and NDC codes to www.ncqa.org by November 1, 2016.*

Step 2 A member identified as having persistent asthma because of at least four asthma medication dispensing events, where leukotriene modifiers or antibody inhibitors were the sole asthma medication dispensed in that year, must also have at least one diagnosis of asthma (Asthma Value Set), in any setting, in the same year as the leukotriene modifier or antibody inhibitor (i.e., the measurement year or the year prior to the measurement year).

Step 3: Required exclusions Exclude members who met any of the following criteria:

- Members who had any diagnosis from any of the following value sets, any time during the member's history through December 31 of the measurement year:
  - Emphysema Value Set.
  - Other Emphysema Value Set.
  - COPD Value Set.
  - Obstructive Chronic Bronchitis Value Set.
  - Chronic Respiratory Conditions Due to Fumes/Vapors Value Set.
  - Cystic Fibrosis Value Set.
  - Acute Respiratory Failure Value Set.
- Members who had no asthma controller medications (Table MMA-B) dispensed during the measurement year.

Table MMA-B: Asthma Controller Medications

Description	Prescriptions		
Antiasthmatic combinations	• Dyphylline-guaifenesin	• Guaifenesin-theophylline	
Antibody inhibitor	• Omalizumab		
Inhaled steroid combinations	• Budesonide-formoterol	• Fluticasone-salmeterol	• Mometasone-formoterol
Inhaled corticosteroids	• Beclomethasone • Budesonide	• Ciclesonide • Flunisolide	• Fluticasone CFC free • Mometasone
Leukotriene modifiers	• Montelukast	• Zafirlukast	• Zileuton
Mast cell stabilizers	• Cromolyn		
Methylxanthines	• Aminophylline	• Dyphylline	• Theophylline

Note: *NCQA will post a comprehensive list of medications and NDC codes to www.ncqa.org by November 1, 2016.*

Administrative Specification

Denominator The eligible population.

Numerators

Medication Compliance 50% The number of members who achieved a PDC of at least 50% for their asthma controller medications (Table MMA-B) during the measurement year.

Medication Compliance 75% The number of members who achieved a PDC of at least 75% for their asthma controller medications (Table MMA-B) during the measurement year. Follow the steps below to identify numerator compliance.

Step 1 Identify the IPSD. The IPSD is the earliest dispensing event for any asthma controller medication (Table MMA-B) during the measurement year.

Step 2 To determine the treatment period, calculate the number of days beginning on the IPSD through the end of the measurement year.

Step 3 Count the days covered by at least one prescription for an asthma controller medication (Table MMA-B) during the treatment period. To ensure that a days supply that extends beyond the measurement year is not counted, subtract any days supply that extends beyond December 31 of the measurement year.

Step 4 Calculate the member's PDC using the following equation. Round (using the .5 rule) to two decimal places.

$$\frac{\text{Total Days Covered by a Controller Medication in the Treatment Period (step 3)}}{\text{Total Days in Treatment Period (step 2)}}$$

Medication Compliance 50% Sum the number of members whose PDC is ≥50% for their treatment period.

Medication Compliance 75% Sum the number of members whose PDC is ≥75% for their treatment period.

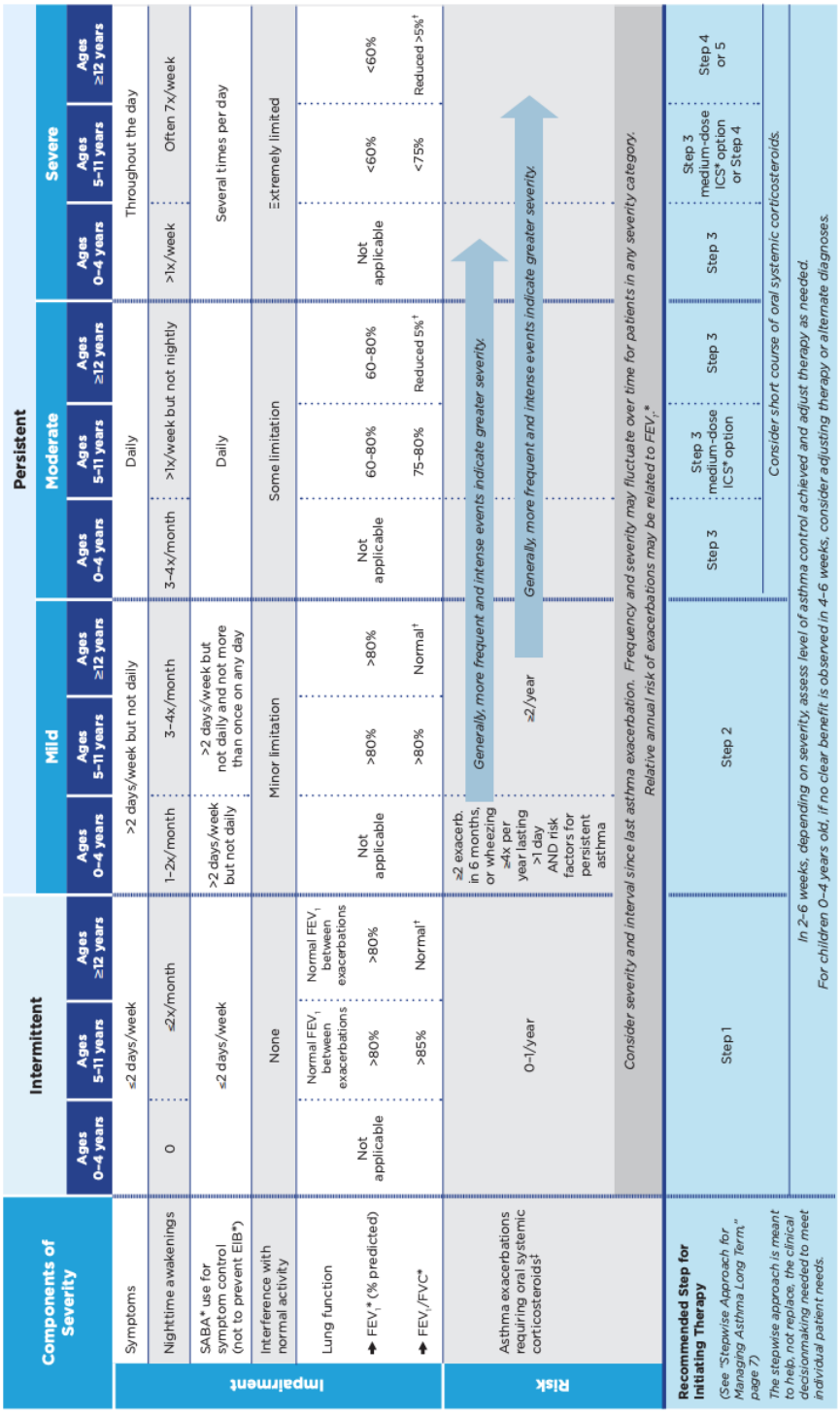
Data Elements for Reporting

Organizations that submit HEDIS data to NCQA must provide the following data elements.

Table MMA-1/2/3: Data Elements for Medication Management for People With Asthma

Data Elements	Administrative
Measurement year	✓
Data collection methodology (Administrative)	✓
Eligible population	*Each rate, for each age stratification and total*
Number of required exclusions	*Each rate, for each age stratification and total*
Numerator events by administrative data	*Each rate, for each age stratification and total*
Numerator events by supplemental data	*Each rate, for each age stratification and total*
Reported rate	*Each rate, for each age stratification and total*
Lower 95% confidence interval	*Each rate, for each age stratification and total*
Upper 95% confidence interval	*Each rate, for each age stratification and total*

Appendix B



Components of Severity		Intermittent		Persistent							
				Mild			Moderate			Severe	
		Ages 0–4 years	Ages 5–11 years	Ages ≥12 years	Ages 0–4 years	Ages 5–11 years	Ages ≥12 years	Ages 0–4 years	Ages 5–11 years	Ages ≥12 years
Impairment	Symptoms	≤2 days/week			>2 days/week but not daily			Daily		Throughout the day	
	Nighttime awakenings	0	≤2x/month		1–2x/month	3–4x/month		3–4x/month	>1x/week but not nightly	>1x/week	Often 7x/week
	SABA* use for symptom control (not to prevent EIB*)	≤2 days/week			>2 days/week but not daily	>2 days/week but not daily and not more than once on any day		Daily		Several times per day	
	Interference with normal activity	None			Minor limitation			Some limitation		Extremely limited	
	Lung function ➧ FEV_1* (% predicted)	Not applicable	Normal FEV_1 between exacerbations >80%	Normal FEV_1 between exacerbations >80%	Not applicable	>80%	>80%	Not applicable	60–80%	60–80%	Not applicable	<60%	<60%
	➧ FEV_1/FVC*		>85%	Normal†		>80%	Normal†		75–80%	Reduced 5%†		<75%	Reduced >5%†
Risk	Asthma exacerbations requiring oral systemic corticosteroids‡	0–1/year			≥2 exacerb. in 6 months, or wheezing ≥4x per year lasting >1 day AND risk factors for persistent asthma	≥2/year		*Generally, more frequent and intense events indicate greater severity.*			
		*Consider severity and interval since last asthma exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV_1.**						*Generally, more frequent and intense events indicate greater severity.*			
Recommended Step for Initiating Therapy *(See "Stepwise Approach for Managing Asthma Long Term," page 7)*		Step 1		Step 2			Step 3	Step 3 medium-dose ICS* option	Step 3	Step 3	Step 3 medium-dose ICS* option or Step 4	Step 4 or 5
The stepwise approach is meant to help, not replace, the clinical decisionmaking needed to meet individual patient needs.		*Consider short course of oral systemic corticosteroids.* *In 2–6 weeks, depending on severity, assess level of asthma control achieved and adjust therapy as needed.* *For children 0–4 years old, if no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternate diagnoses.*									

(Asthma Quick Care Reference, 2012)