Original Article

The HEDIS Medication Management for People with Asthma Measure is Not Related to Improved Asthma Outcomes

Angelina Crans Yoon, MD[a], William Crawford, MD[b], Javed Sheikh, MD[a], Randy Nakahiro, PharmD[c], Aili Gong, MS[d], and Michael Schatz, MD, MS[c] *Los Angeles, Gardena, San Diego, Pasadena, Calif*

What is already known about this topic? Administrative data–based measures are being increasingly used to assess asthma quality of care. The Asthma Medication Ratio has been previously validated and shown to correlate with improved asthma outcomes.

What does this article add to our knowledge? Compliance with the Healthcare Effectiveness Data and Information Set Medication Management for people with Asthma measure does not correlate with improvements in asthma outcomes, including asthma-related hospitalizations, emergency department visits, or short-acting β_2-agonist dispensing.

How does this study impact current management guidelines? These results suggest that the Healthcare Effectiveness Data and Information Set Medication Management for people with Asthma measure may not be an appropriate asthma quality-of-care measure.

BACKGROUND: A new Healthcare Effectiveness Data and Information Set (HEDIS) asthma quality-of-care measure designed to quantify patient adherence to asthma controller medication has been implemented. The relationship between this measure and asthma outcomes is unknown.
OBJECTIVE: To examine the relationship between the HEDIS Medication Management for people with Asthma (MMA) measure and asthma outcomes.
METHODS: Administrative data identified 30,040 patients who met HEDIS criteria for persistent asthma during 2012. These patients were classified as compliant or noncompliant with the MMA measure at the 75% and 50% threshold, respectively. The association between MMA compliance in 2012 and asthma outcomes in 2013 was determined.
RESULTS: Patients who were 75% or 50% MMA compliant in 2012 showed no clinically meaningful difference in asthma-related hospitalizations, emergency department visits, or rescue inhaler dispensing in 2013 compared with those who were noncompliant. Stepwise comparison of patients who were 75% or more, 50% to 74%, and less than 50% MMA compliant showed no meaningful difference in asthma outcomes between groups.
CONCLUSIONS: Compliance with the HEDIS MMA measure is not related to improvement in the asthma outcomes assessed (rescue inhaler dispensing, asthma-coded hospitalizations, or asthma-coded emergency department visits). **© 2015 American Academy of Allergy, Asthma & Immunology** **(J Allergy Clin Immunol Pract 2015;3:547-52)**

Key words: *Asthma; HEDIS; Quality measures*

Asthma is a common chronic disease with a significant burden on patients and society.[1] Improvement in asthma control is associated with improved health outcomes,[2] and current asthma treatment guidelines emphasize reducing asthma impairment.[3] The increasing use of electronic medical records and administrative claims databases has enabled new methods of evaluating quality of care within managed health care organizations and other groups. Potential benefits of this data-driven analysis of care include improving health outcomes and decreasing the cost of care. With the push to track disease outcomes and define best practices, numerous measures have been created in an effort to assess quality of care for chronic medical conditions. The most widely used have been developed by the National Committee for Quality Assurance and are called the Healthcare Effectiveness Data and Information Set (HEDIS) measures. There are currently 71 HEDIS measures across 8 domains of care, with 3 of the measures addressing asthma.[4]

The 3 HEDIS asthma measures are applied to patients categorized as having "persistent asthma" by meeting specified administrative data criteria for both the measurement year and the premeasurement year (the HEDIS 2-year persistent asthma

[a]Department of Allergy/Clinical Immunology, Kaiser Permanente Medical Center, Los Angeles, Calif
[b]Department of Allergy, Kaiser Permanente Medical Center, Gardena, Calif
[c]Department of Allergy, Kaiser Permanente Medical Center, San Diego, Calif
[d]Department of Research and Evaluation, Kaiser Permanente, Pasadena, Calif
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Corresponding author: Angelina Crans Yoon, MD, Department of Allergy/Clinical Immunology, Kaiser Permanente Medical Center, 1515 N Vermont Ave, 5th Floor, Los Angeles, CA 90027. E-mail: angelina.crans-yoon@kp.org.
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Abbreviations used
AMR- Asthma Medication Ratio
ED- Emergency department
HEDIS- Healthcare Effectiveness Data and Information Set
ICS- Inhaled corticosteroid
MMA- Medication Management for people with Asthma
MPR- Medication possession ratio
PDC- Percentage of days covered
SABA- Short-acting β_2-agonist

criteria). This administrative data-based definition of persistent asthma, which encompasses a heterogeneous group of patients with asthma, has been validated by Schatz et al.[5] The original HEDIS asthma measure, called "Use of Appropriate Medications for People with Asthma," was first publicly reported in the year 2000 using measurement year 1999 data. The measure assesses asthma care by determining whether at least 1 canister of asthma controller medication was dispensed to patients with HEDIS-defined persistent asthma during the measurement year. This original "one-controller-per-year" HEDIS asthma measure has been examined by several studies, none of which has demonstrated a correlation between the measure and improved asthma outcomes.[6-8]

The second HEDIS asthma measure, the Medication Management for people with Asthma (MMA) measure, is the subject of this study. The HEDIS MMA measure, first publicly reported in 2013, is designed to measure patient adherence to asthma controller medications over time. It is applied to patients with HEDIS-defined persistent asthma and calculates asthma controller medication adherence rates at 2 thresholds: the percentage of patients who remained on an asthma controller medication for at least 50% of the treatment time and the percentage of patients who remained on an asthma controller medication for at least 75% of the treatment time. To our knowledge, no published studies have examined the relationship between compliance with the HEDIS MMA measure and asthma outcomes.

The third HEDIS asthma measure, the Asthma Medication Ratio (AMR), first publicly reported in 2014, has been shown in multiple studies of multiple asthma populations to correlate with improved asthma outcomes in both children and adults.[6,8-10]

The objective of our study was to evaluate the relationship between compliance with the HEDIS MMA measure and various asthma outcomes, including asthma-related hospitalizations and emergency department (ED) visits and quantity of short-acting β_2-agonist (SABA) medication dispensed.

METHODS

This study was approved by the Kaiser Permanente Southern California Institutional Review Board. Using the Kaiser Permanente Southern California patient database, which includes inpatient, outpatient, and pharmacy dispensing records, we identified 30,040 adult and pediatric patients aged 5 to 64 years with continuous enrollment from January 1, 2011, through December 31, 2013, who met criteria for HEDIS persistent asthma. *Continuous enrollment* was defined as less than 1 gap of 45 days of coverage. Patients were included in the study if they met at least 1 of the HEDIS persistent asthma criteria during the premeasurement year (2011) and again during the measurement year (2012). Inclusion criteria met were not required to be the same in each year. The HEDIS persistent asthma inclusion criteria are at least 1 ED visit with asthma as the principal diagnosis (as defined by the *International Classification of Diseases, Ninth Revision* code 493.xx), at least 1 hospitalization with asthma as the principal diagnosis, at least 4 outpatient asthma visits with asthma as 1 of the listed diagnoses, plus at least 2 asthma medication dispensing events or at least 4 asthma medication dispensing events in the year.[4] Patients were excluded if they had any *International Classification of Diseases, Ninth Revision*-coded diagnosis of emphysema, chronic obstructive pulmonary disease, cystic fibrosis, or acute respiratory failure, or if there were no asthma medications dispensed to them in 2012.

Asthma controller medication use was assessed using the HEDIS MMA formula[4] as follows. During the measurement year (2012), the earliest dispensing event of a controller medication was identified and defined as the *index dispensing event*. The time period between the date of the index dispensing event and the end of calendar year 2012 was defined as the *treatment period*. The number of days covered by the amount of dispensed asthma controller medication was calculated using the total amount of controller medication dispensed during the treatment period and the daily dose of medication prescribed. The percentage of days covered (PDC) was calculated by dividing the number of covered days by the total number of days in the treatment period. The 75% and 50% MMA measures quantified the number of patients who had a PDC of at least 75% or 50%, respectively. Asthma controller medications monitored included inhaled corticosteroids (ICS), ICS/long-acting β_2-agonist combination agents, leukotriene modifiers, theophylline, and cromolyn sodium.

The measurement year 2012 cohort was then followed for asthma outcomes from January 1, 2013, through December 31, 2013. Asthma outcomes assessed were asthma-coded hospitalizations and ED visits and the number of canisters of SABA medication dispensed. Asthma-related hospitalizations and ED visits were identified by encounters for which *International Classification of Diseases, Ninth Revision* code (493.xx) was the primary diagnosis. Rates of these 3 asthma outcomes were then compared between patients who met the 75% and 50% PDC thresholds and those who did not. In addition, patients were classified into 1 of 3 categories ($\geq$75%, 50% to 74%, and <50% PDC) and outcomes were compared between these 3 groups.

According to the HEDIS MMA measure, compliance is determined by the amount of asthma controller medication dispensed between the first controller dispensing event (index date) and December 31 of the measurement year. Patients with low asthma controller medication dispensing could be classified as either MMA-compliant (if the index dispensing occurred late in the calendar year) or MMA-noncompliant (if the index dispensing occurred early in the calendar year). To compare these 2 groups, patients with HEDIS-defined persistent asthma and fewer than 4 canisters of controller medication dispensed in 2012 were identified and categorized as either early dispensing (index dispensing date January 1, 2012, to March 31, 2012) or late dispensing (index dispensing date October 1, 2012, to December 31, 2012). The 75% MMA-compliant late dispensing patients were then compared with the 75% MMA-noncompliant early dispensing patients for year 2013 asthma outcomes including asthma-related hospitalizations and ED visits and dispensing of SABA and asthma controller medications.

TABLE I. Relationship between year 2012 HEDIS MMA status at the 75% and 50% adherence thresholds and year 2013 asthma outcomes

		Asthma outcomes in 2013 (% of population, 95% CI)		
2012 MMA status	Total N	Asthma hospitalization	Asthma ED visit	>6 SABA canisters dispensed
75% compliant	11,475	0.5 (0.4-0.6)	3.7 (3.4-4.1)	5.3 (4.9-5.8)
Not 75% compliant	18,565	0.4 (0.3-0.5)	4.0 (3.7-4.3)	3.9 (3.6-4.2)
P value		.4216	.2579	<.0001
50% compliant	19,354	0.4 (0.4-0.5)	3.7 (3.4-4.0)	4.9 (4.6-5.2)
Not 50% compliant	10,686	0.4 (0.3-0.6)	4.2 (3.8-4.6)	3.6 (3.2-3.9)
P value		.8405	.0328	<.0001

Data were analyzed using SAS version 9.1.3 (SAS Institute, Inc, Cary, NC). Chi-squared *P* values and Wilson CIs were then calculated. A 2-tailed *P* value of less than .05 was considered significant.

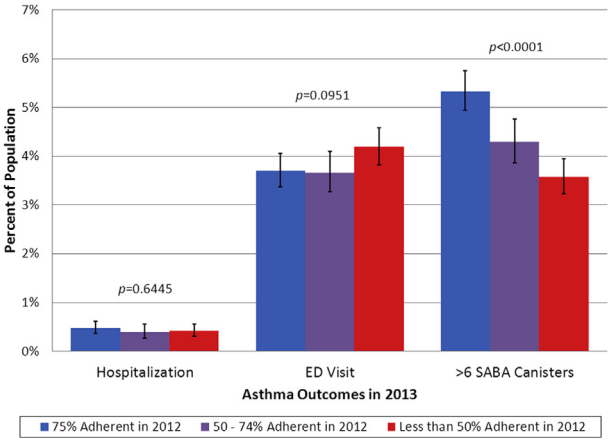

FIGURE 1. Relationship between year 2012 HEDIS MMA status of greater than or equal to 75%, 50% to 74%, and less than 50% adherence thresholds and year 2013 asthma outcomes. Bars represent 95% CIs.

RESULTS

A total of 30,040 patients who met HEDIS criteria for persistent asthma at the end of 2012 were identified from the Kaiser Permanente Southern California database and tracked for asthma outcomes in the year 2013.

There were no significant differences in the percentage of the cohort who had asthma-related hospitalizations or ED visits in 2013 when comparing patients who met the HEDIS 75% MMA criteria at the end of 2012 and those who did not (Table I). Patients who were 75% MMA-compliant were statistically significantly more likely to be dispensed more than 6 SABA canisters in 2013 ($P < .0001$). The direction of this effect was for worse outcomes in those compliant with the measure. Similarly, patients who were 50% MMA-compliant at the end of 2012 were statistically significantly more likely to be dispensed more than 6 SABA canisters in 2013 than did those who were not ($P < .0001$). There was no significant difference in asthma-related hospitalization rates between patients who were 50% MMA-compliant and those who were not. There was a slightly lower rate of asthma-related ED visits among patients compliant with the 50% MMA measure than among those who were not (Table I). Although this difference in ED visit rates reached statistical significance because of the large sample size, it is not likely to be clinically meaningful because 50% MMA-compliant patients were only 0.5% less likely than noncompliants to have an asthma-related ED visit (3.7% vs 4.2%). The structure of the HEDIS MMA measure facilitates stratification of the cohort into 3 groups that likely reflect levels of adherence to asthma controller medication: those with a PDC of 75% or more, those with a PDC of 50% to 74%, and those with a PDC of less than 50%. No significant difference in asthma-related ED visits or hospitalizations was evident in comparing these 3 groups. Patients who were 75% MMA-compliant were statistically significantly more likely to be dispensed more than 6 SABA canisters compared with the other 2 groups (Fig 1).

Because MMA compliance is measured between the first asthma controller dispensing date during the measurement year and the end of that calendar year, patients with low asthma controller dispensing can be either MMA-compliant or MMA-noncompliant depending on the date of the initial (index) controller dispensing. Similar year 2013 asthma controller dispensing patterns and asthma outcomes were seen for 2 groups of low controller patients: MMA-compliant patients with late 2012 index controller dispensing dates and MMA-noncompliant patients with early 2012 index controller dispensing dates (Table II).

DISCUSSION

Publicly reported administrative data-based measures such as the HEDIS asthma measures are widely used to compare and rate health care organizations in terms of quality of care, so it is important that these measures be related to improved health outcomes. Compliance with the original "one-controller-per-year" HEDIS asthma measure actually correlates with an increased risk for asthma-related adverse events, even when adjusted for baseline asthma medication use and demographic characteristics.[6,7,11] In contrast, compliance with the HEDIS AMR measure correlates with improved asthma outcomes in both children and adults.[6-11] The relationship between asthma outcomes and compliance with the HEDIS MMA measure has not been previously studied. Our results indicate that there is no correlation between compliance with the HEDIS MMA measure and improvement in the asthma outcomes examined.

The paradigm upon which the National Institutes of Health-sponsored Guidelines for the Diagnosis and Treatment of Asthma (Expert Panel Report 3) are based implies that patients with persistent asthma with greater adherence to controller medications should have improved asthma outcomes and decreased use of asthma rescue medication (SABA). The fact that patients compliant with the HEDIS MMA measure do not have improvements in asthma-related ED visits, hospitalizations, or rescue inhaler use compared with noncompliant patients suggests that either the relationship between asthma controller use and these asthma outcomes is complex or the HEDIS MMA measure is flawed.

There are several potential limitations with the HEDIS MMA measure that may affect its relationship to asthma outcomes. The PDC definition used by the MMA measure is similar to the

TABLE II. Relationship in patients with fewer than 4 controller medication canisters dispensed in 2012 between year 2012 HEDIS 75% MMA compliant patients with index dates late in the year and those not 75% MMA compliant but with index dates early in the year and year 2013 asthma outcomes

		Asthma outcomes in 2013 (% of population, 95% CIs)			
2012 MMA status <4 controller canisters dispensed in 2012	Total N	Asthma hospitalization	Asthma ED visit	>6 SABA canisters dispensed	<4 controller canisters dispensed
75% compliant with index date October-December	2586	0.3 (0.2-0.6)	4.0 (3.3-4.8)	3.5 (2.9-4.3)	68.3 (70.1-66.5)
Not 75% compliant with index date January-March	1076	0.4 (0.1-1.0)	3.3 (2.4-4.6)	4.0 (3.0-5.3)	72.5 (69.7-75.1)
P value		.7643	.4289	.5629	.3017

medication possession ratio (MPR) used in other studies. Although the MPR has been previously validated as an adequate measure of consistent use of medication as prescribed for non-asthma conditions,[12,13] the PDC may not be a good measure of appropriate use of asthma controller medication for the HEDIS MMA measure. Compliance with the HEDIS MMA measure is determined by dispensing of controller medications to adequately cover the time period between the initial (index) prescribing event during the measurement year and the end of that calendar year. This specification is problematic for a number of reasons. It potentially penalizes the appropriate step-down of well-controlled asthma patients to lower doses of controller medication as recommended by Expert Panel Report 3 guidelines.[3] It also potentially penalizes guidelines-based management of patients with seasonal asthma or viral-induced asthma exacerbations who have accrued enough asthma utilization to meet the HEDIS persistent asthma criteria.

In addition, the HEDIS MMA measure introduces an arbitrary factor, timing during the calendar year of the index asthma controller dispensing, as a potential determiner of MMA compliance. Patients with low asthma controller dispensing and similar asthma utilization patterns are classified as either MMA-compliant or MMA-noncompliant depending on the timing of their index controller dispensing. We found similar asthma outcomes and year-over-year controller dispensing patterns for late index date MMA-compliant patients and early index date MMA-noncompliant patients.

Finally, measuring medication adherence using pharmacy dispensing data does not directly measure the medication actually taken by the patient as prescribed. These flaws of the HEDIS MMA measure, alone or in combination, may account at least in part for the failure of the measure to correlate with improved asthma outcomes.

The assumption inherent to the HEDIS MMA measure is that daily asthma controller therapy is fundamental to the well-being of patients with HEDIS-defined persistent asthma. This assumption may or may not be true. In 1 study, ICS adherence, as measured by a 6-month moving average adjusted for provider-initiated medication discontinuation, correlated with improved outcomes only when adherence greater than 75% was compared with adherence less than 25%.[14] Several studies have suggested that for patients with mild persistent asthma, intermittent symptom-based use of ICSs may be equivalent to daily use.[15-18] This is possibly why published studies have failed to demonstrate a strong link between adherence to asthma controller medication and improved asthma outcomes.

Efforts to improve adherence by directed interventions, even when successful, may not improve asthma outcomes. In a recent 6-month randomized controlled trial by Foster et al,[19] an intervention was successful in improving adherence to asthma controller medication, but despite the improved adherence, no significant improvement was seen in asthma control or in rates of asthma exacerbation. Similarly, in a randomized trial that used automated telephone calls to patients who had been prescribed ICSs in an effort to improve adherence, results showed that while adherence modestly improved, health care utilization and SABA dispensing did not.[20]

In children, the relationship between controller adherence and asthma outcomes appears to be even more complex. One study found that patients with an MPR of 80% to 120% over the course of the study period were actually prescribed more SABA canisters than those with a lower MPR, suggesting increased asthma impairment.[21] Another pediatric study found that adherence rates of greater than 50% were associated with decreased asthma-related ED visits but no decrease in asthma hospitalizations, and that overall health care costs were higher in patients with increased adherence.[22] An ancillary study of the Childhood Asthma Management Program clinical trial found no relationship between adherence to inhaled budesonide and several important clinical outcomes, including urgent asthma visits, need for oral corticosteroids, asthma symptom scores, and need for asthma rescue medication.[23]

In a study of adolescents that relied on self-reported adherence, adherence of greater than 75% was associated with less wheezing and symptom variability, but no difference in ED visits or hospitalizations compared with less than 75% adherence. Patients in the lower adherence group reported that their asthma was under good control despite increased symptoms, suggesting that patients tolerate a certain level of asthma symptoms despite education provided during the study on the benefits of ICS use.[24]

Greater complexity associated with asthma medication administration, such as twice-daily dosing regimens and inhalant delivery systems, may decrease patient adherence. A study of insurance claims data examined adherence to asthma controllers and found that increased adherence to leukotriene receptor antagonists, but not to ICSs, reduced asthma-related ED visits and hospitalizations. This finding suggests that simplification of asthma treatment regimens to once-daily oral tablets may be associated with improved adherence. However, increased adherence to both leukotriene receptor antagonists and ICSs was associated with increased cost of overall asthma care.[25]

In contrast to the lack of association between compliance with the HEDIS MMA measure and improved administrative data-determined asthma outcomes, other administrative data-based measures do correlate with improved asthma outcomes. An analysis of candidate asthma quality-of-care measures done by Schatz et al[11] found 2 measures that correlate well with asthma

outcomes: the number of SABA canisters dispensed and the AMR.[11] The number of SABA canisters dispensed per year inversely correlates with asthma outcomes and is thought to be a marker of asthma impairment.[26] Thus, the relationship of the AMR with improved asthma outcomes appears to be at least in part mediated by the SABA component of the ratio. Given the lack of association between the HEDIS MMA and one-controller-per-year measures and asthma outcomes, it appears that a SABA component is necessary to establish the link between an asthma quality-of-care measure and improved asthma outcomes. It is also quite possible that patient self-titration of asthma controller medication on the basis of the level of impairment (SABA use) is an effective method of balancing the potential benefit of controller therapy with its potential risks.

Strengths of this study include its large sample size and use of real-world data. Limitations of this study include the fact that the criteria for HEDIS-defined persistent asthma for measurement year 2012 relied on the number of canisters of asthma medication dispensed rather than the number of asthma medication dispensing events. This change in persistent asthma criteria increased the size of our HEDIS cohort and may have resulted in the inclusion of patients with intermittent asthma. Measurement year 2012 represented a 1-year aberration involving the HEDIS persistent asthma criteria. The previously used dispensing event-based criteria for HEDIS persistent asthma were restored for measurement year 2013 and beyond. We plan to repeat this analysis using our measurement year 2013 HEDIS persistent asthma cohort to assess for potential confounding effects of the 1-year change to the HEDIS persistent asthma criteria. Additional limitations of our study include those inherent to all studies relying on administrative data, including the inability to know exactly how medications dispensed relate to actual medication use. As use of the integrated electronic health record becomes more widespread, and as tools to extract useful data from the electronic health record become more robust, this and other limitations of currently available administrative data will hopefully be overcome.

Although conventional wisdom holds that increased adherence to asthma controller medications will inevitably lead to improved asthma outcomes, our current study and the existing literature on asthma medication adherence suggest that this may not be the case. Our study raises the possibility that use of the HEDIS MMA measure to publicly report asthma quality of care may have unintended consequences. Driving use of asthma controller medication to high levels in order to achieve compliance with the HEDIS MMA measure may place patients at increased risk of medication-related adverse effects[27-30] without the benefit of improved asthma outcomes. Furthermore, there is a cost to society and the health care system when the use of expensive asthma controller medications is driven higher without the corresponding reduction in ED/hospital utilization or other adverse asthma outcomes. Taking these factors into account, the AMR appears to be the single best HEDIS asthma measure, and multiple asthma quality-of-care measures may be neither necessary nor desirable.

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