

OUTCOMES

Is patient assessment of asthma care delivery associated with publicly reported performance measures?

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Abstract

Objective: To determine the association between patient assessment of healthcare delivery and publicly reported asthma performance measures. **Methods:** We identified individuals 5–50 years old who had asthma quality measures reported to the Minnesota Community Measurement© (MCM©) by their clinic and sent them a postal survey which included within it the Patient Assessment of Chronic Illness care (PACIC), a validated measure of patient perception of the quality of healthcare delivery. We performed a multivariable analysis to examine the association between PACIC scores and achievement of asthma care quality measures. **Results:** The response rate for the ACS was 102/367 (28%); a non-response bias analysis revealed no differences between responders and non-responders for age, gender and asthma control. Most responders (73%) reported taking asthma medications daily and most (71%) had poorly controlled asthma. The PACIC score was not associated with any of the asthma quality measures based on the data reported to MCM© by the clinic. A higher PACIC score was, however, associated with having an asthma action plan based on patient-reported data in the ACS ($p < 0.0001$) but not with patient-reported asthma control or emergency department/hospitalizations for asthma. **Conclusions:** Patient assessment of high quality asthma care delivery was associated with patient self-report of having an asthma action plan but was not associated with any of the publicly reported asthma performance measures.

Keywords

Asthma, asthma action plan, delivery of healthcare, health services research, outcome and process assessment (healthcare), outcome assessment (healthcare), quality of healthcare, quality assurance (healthcare)

History

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Introduction

For most individuals with asthma, guideline-directed treatment can improve asthma-related outcomes [1,2]. However, translation of asthma guidelines remains challenging. One path to improvement may be to provide feedback on the quality of care to the stake-holders via public reporting of performance measures [3]. It is critical that the choice of asthma quality markers are carefully scrutinized so that patients and providers find them relevant, thereby improving the delivery of care and improving patient outcomes.

It is unknown if patient experience based on the Chronic Care Model [4,5] is associated with current asthma performance measures. The Chronic Care Model describes how health systems can be improved to meet the needs of individuals with chronic diseases such as asthma [6]. The Patient Assessment of Chronic Illness Care (PACIC) is a measurement tool that provides the framework for understanding the key aspects of chronic care delivery from a patient's perspective, including healthcare organization, delivery

system design, decision support, self-management support, clinical information systems, and connecting with community resources [7,8]. Comparing results from the PACIC and asthma performance measures may identify opportunities to retain, refine or develop measures that reflect the importance of healthcare delivery processes most relevant to patients.

The state of Minnesota is a leader in collecting chronic disease quality data [9]. Data reported publicly by Minnesota Community Measurement© (MCM©) are sent by healthcare providers who abstract data from the medical record. The MCM© for asthma changed from “use of appropriate medications for people with asthma” (at least one asthma controller medication given to patients with persistent asthma in 1 year) from 2004 to 2010 [10] to emergency room (ER) visits/hospitalizations for asthma, asthma control and having an asthma action plan (AAP) in 2011, a change based in part on recommendations made in 2009 by the NCQA/PCPI group [11]. In 2009 and 2010, Minnesota healthcare providers met the previous asthma quality reporting requirement for “use of appropriate medications for people with asthma” 92% of the time, compared with 74% of the time when this measure was first reported in 2004. This measure was based on the Healthcare Effectiveness Data and Information Set (HEDIS) measure for asthma which states that patients who have a

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diagnosis of persistent asthma in the prior year should have at least one asthma controller medication dispensed in the following year [10]. Many asthma experts have recognized that this requirement sets a very low bar for measuring asthma quality. In 2009, the NCQA/PCPI group proposed the following asthma quality measures and directly quote the NAEPP-3 guideline statements to support these choices: (1) assess asthma control, (2) screen tobacco, (3) if tobacco exposure, cessation advice, (4) controller medications for persistent asthma, (5) a controller to total asthma medication ratio of >0.5 , (6) risk assessment based on systemic steroid use for exacerbation and (7) an asthma discharge plan when leaving the ER or hospital [11]. We are unaware of any previous reports that have considered any of the proposed asthma quality measures and how they associate with measures of the Chronic Care Model, such as the PACIC.

In this study, we compare publicly reported performance measures with patient-reported asthma care delivery quality. Only by analyzing both measures as we have in this study we can learn about the strengths and limitations of these different measures.

Methods

Sample

Participants were 5–50 years old with at least 2 asthma visits in the past 2 years and at least 1 asthma visit during the reporting period for MCM©. An asthma visit was defined by a diagnosis of asthma in the billing codes (493.xx) in any position on the diagnosis list. Individuals were excluded if they were permanent nursing home residents, on hospice care, died prior to the end of the measurement period or had a diagnosis of COPD, emphysema, cystic fibrosis or acute respiratory failure. The participants were identified from within the Mayo Clinic Health System Southwest Minnesota Region (MCHS-SMR). The MCHS-SMR has 187 physicians, 55 non-physician providers, and 3302 employees serving patients at 19 sites in southwestern Minnesota. The MCHS-SMR is one of 2 large healthcare systems that serve individuals in the region, which includes both rural and suburban settings, with the largest city, Mankato, having a population of 39 528 individuals.

Study design and measures

This is a cross-sectional study comparing data as reported to the MCM© (asthma control, asthma exacerbations and having an action plan) with patient-reported assessment of healthcare delivery quality (the PACIC) obtained from the Asthma Care Survey (ACS) from the same individuals. The study design also includes a comparison of patient-reported data from the ACS instead of clinic-reported for the currently selected quality measures (control, exacerbation and action plan) and the PACIC. The list of potential participants from the MCHS-SMR with performance measures reported to MCM© was first screened for participants who signed agreements to allow medical record research. Only those participants who had previously agreed to participate in medical record review research were sent an ACS. An additional written consent form was sent along

with the ACS and we only used ACS data from participants who returned a signed copy. The study was approved by the MCHS-SMR IRB.

The MCM© for asthma include emergency room (ER) visits or hospitalizations for asthma, asthma control measure, and having an AAP that includes three specific components (trigger avoidance, medication information and what to do in the case of worsening symptoms). The MCM© for asthma did not include other quality measures suggested by the NCQA/PCPI group. The clinic is responsible for abstracting these data from the patient's written and electronic medical record and then reporting the data to MCM©.

The ACS is comprised of a 15 page booklet and 47 total questions. The survey questions refer to events in the past 12 months, except where previously validated questions require a shorter recall period. The ACS included questions that measured asthma control, ED and hospitalizations for asthma, systemic corticosteroid use for asthma, whether patients had or used AAPs, and the PACIC [11,12]. The PACIC scores are averaged from the 20 questions contained within the survey based on 6 month patient recall, with scores ranging from 1–5 based on responses to questions with the following answer categories: “None of the time,” “A little of the time,” “Some of the time,” “Most of the time,” and “Always.” Thus higher scores in the PACIC are associated with more favorable responses. The PACIC also has sub-scores based on grouping of the questions as follows: patient activation, delivery system/practice design, goal setting/tailoring, problem solving/contextual, and follow-up/coordination. In all cases, if missing items were present for a particular score or sub-score, the average was taken among the non-missing items. The ACS also included an adaptation of the Diabetes Distress Scale [13], CAHPS® Clinician and Group Survey Adult Primary Care Visit Questionnaire [14], a question about healthcare literacy [15], and the Asthma Control Questionnaire (ACQ-6) [16–19]. Higher scores on the ACQ-6 suggest poorer asthma control, with a cut-off of >0.75 (averaged across the 6 questions) suggesting poor asthma control. The Asthma Control Test (ACT) [20], another tool for assessing asthma control, is scored by summing 5 questions (5 points each) with a total possible score of 25. For the ACT, lower scores suggest poor asthma control, with a cut-off of <20 suggesting poor asthma control. The ACQ-6 and ACT are similar and were both used in this study for asthma control assessment [21]. Finally, we included a question within the ACS that asked the participant to rate their asthma care team from 0 (worst possible care) to 10 (best possible care). This measure was analyzed dichotomously around a cut-off of <8 (low) versus $8+$ (high) based on the observed data distribution. Table 1 summarizes the data points available from the clinic-reported MCM© and the patient-reported ACS.

Survey questions were created through an iterative review process in consultation with survey methodologists, clinical experts and patient advocates. Feedback obtained from patients occurred by having the patient (who were not part of the final sample) complete the survey and the authors obtaining informal feedback about time length to complete survey, clarity of questions, missing questions and questions that drew the most interest. The survey was administered by

Table 1. Data sources.

Asthma Care Survey (ACS): Patient-reported	Minnesota Community Measurement (MCM) [9]: Clinic- reported
Number of hospitalizations for asthma	Number of hospitalizations for asthma
Number of emergency department visits for asthma	Number of emergency department visits for asthma
Having a written asthma action plan that includes triggers, which medications to take, and what actions to take for worsening asthma	Having a written asthma action plan that includes triggers, which medications to take, and what actions to take for worsening asthma
Asthma Control Questionnaire (ACQ-6) [16]	Asthma Control Test (ACT) [20]
Patient Assessment of Chronic Illness Care (PACIC), measuring quality of healthcare delivery [5]	–
Additional demographic data: educational attainment, health insurance status	Age, gender
Type of asthma medication used	–
Number of years with asthma	–

US mail on 16 December 2011; non-responders were sent a second mailing 1 month later and a 3rd mailing approximately 3 months later. There were no direct monetary incentives included to complete the survey; however, participants were informed that 1 of the survey responders would be randomly selected to win an iPad. Survey responders and non-responders were compared based on data abstracted for MCM© to assess for response bias.

Statistical analysis

The sample size was based on the accessible population meeting the inclusion and exclusion criteria in the MCHS-SMR. The MCHS-SMR was selected because it reported all of its asthma patients to the MCM© rather than a sample of all its patients.

Data were summarized with frequencies and percentages or means and standard deviations, where appropriate. Characteristics were compared between responders and non-responders with chi-square tests for gender and asthma control and with a *t*-test for age. The association between the PACIC total and subscale scores with each quality component of MCM© for asthma (as determined for both what was reported to MCM© and what was reported in the ACS) was tested with two-sample *t*-tests. PACIC total and subscale scores were also compared with self-reported quality of healthcare (continuous with scale 1–10) with linear regression models (outcome: PACIC score). We next performed a multivariable analysis to examine the associations described above while controlling for age, gender, insurance status, and educational level using linear regression models (outcome: PACIC total score). ANOVA was used to examine whether the average PACIC score differed between patients who reported an action plan (derived via three components of the ACS) together with whether or not their asthma was well-controlled (ACQ-6 ≤0.75 versus >0.75). The concordance between self-reported presence of an asthma action plan (ACS) versus what was reported in the MCM© data was assessed with the Kappa statistic. All analyses were conducted using SAS version 9 (Cary, NC).

Results

Of the 367 individuals sent the ACS, 102 returned it with consent to use as research (response rate = 28%). Using data reported to the MCM© from the MCHS-SMR region, we were able to compare characteristics of survey responders

Table 2. Demographics of asthma care survey^a.

	Total (N = 102)
Age, Mean (SD)	28.9 (14.2)
Sex, Female	55 (58.5%)
Race, White	95 (94.1%)
Education level	
High school or less	34 (34.7%)
Some college	31 (31.6%)
College degree or higher	21 (21.4%)
Insurance	
Employer with or without supplemental	62 (61.4%)
Government	19 (18.8%)
Individual	17 (16.8%)
Number of years with asthma	
Less than 1 year	1 (1.0%)
1 to 5 years	26 (25.5%)
6 to 10 years	23 (22.5%)
More than 10 years	52 (51.0%)
Number of systemic steroid bursts	
0	57 (57.0%)
1	12 (12.0%)
2	15 (15.0%)
3 or more	16 (16.0%)
ACQ-6 score, Mean (SD)	1.4 (1.1)
ACQ-6 score ≤ 0.75	30 (29.4%)
ED Visits for Asthma ≥ 1	19 (20.0%)
Hospitalization for Asthma ≥ 1	6 (6.0%)
Taking daily asthma controller medications	74 (72.5%)

^aAll data from this demographic table are information provided by patients in the Asthma Care Survey.

and non-responders. Gender (58.5% versus 58.1% female, *p* = 0.95), Age (28.9 versus 25.7, *p* = 0.07) and ACT score (18.9 versus 17.7, *p* = 0.54) were not different between survey responders and non-responders, respectively. Table 2 summarizes the demographic data.

The overall PACIC score reported in the ACS was compared to performance measures reported to the MCM© and in the ACS itself. The overall PACIC scores were not associated with any of the performance measures, including having all of the quality criteria met. Only 2 of the 97 individuals met all of the performance measures reported to MCM©, limiting the ability to make comparisons for this composite quality measure. Only 17 individuals had an AAP reported to MCM©; PACIC score was not associated with having an AAP reported to MCM© (PACIC 2.89 for having an AAP versus 2.88 for not, *p* = 0.99). On the other hand, when the overall PACIC scores were compared with asthma patient self-reported measures in the ACS, a higher PACIC

Table 3. Comparison of Overall Patient Assessment of Chronic Illness Care (PACIC) score with asthma outcomes reported by patients in the Asthma Care Survey (ACS).

	N	Mean (SD) score for PACIC	p Value ^a	p Value (adj) ^b
ACQ-6				
≤0.75 (well controlled)	29	3.11 (1.08)	0.12	0.10
>0.75 (not well controlled)	68	2.79 (0.90)		
ED visits in last year			0.46	
0	76	2.92 (0.95)		
>0	19	2.73 (1.08)		
Hospital visits in last year			0.67	
0	89	2.89 (0.99)		
>0	6	2.71 (0.67)		
Action plan including 3 components			<0.0001	0.0001
Yes	26	3.55 (0.80)		
No	71	2.64 (0.90)		
Quality criteria met: All 3 measures including asthma under control, no ED or hospitalization for asthma, and having an action plan that includes the 3 required components			0.013	0.01
Yes	9	3.64 (0.98)		
No	88	2.81 (0.93)		
Self-reported rating of asthma care team			0.0003	<0.0001
<8	56	2.59 (0.86)		
≥8	41	3.29 (0.96)		
Use of systemic corticosteroids			0.89	0.88
None	53	2.89 (1.00)		
Any	42	2.86 (0.95)		

^aTwo-sample *t*-test;^b*p* Values from regression model (outcome: PACIC) that adjusts for age, gender, insurance status, and educational level.

score was strongly associated with having an AAP (3.55 for those with an AAP versus 2.64 for those without, $p < 0.0001$) as was having all asthma quality criteria met (3.64 for those with criteria met versus 2.81 for those with criteria unmet, $p = 0.013$). In addition, a higher PACIC score was also strongly associated with an individual's higher self rating of their asthma care team (3.29 for high rating versus 2.59 for low rating, $p = 0.0003$). These differences remained statistically significant after adjusting for age, gender, insurance status, and education (summarized in Table 3).

When considering the presence of a patient-reported AAP together with whether the asthma is in control (as measured by the ACQ-6) in an ANOVA model, we found significant differences with respect to AAP only (least squares mean PACIC with versus without action plan: 3.57 versus 2.69, $p < 0.0001$). This difference remained significant regardless of whether or not the patient's asthma was in control. The least squares mean for the ACQ-6 factor were a PACIC score of 3.22 for being in control versus 3.03 for not being in control ($p = 0.34$). We did not find a significant interaction between these two factors ($p = 0.61$).

The PACIC sub-scores, similar to the overall scores, did not show any associations with MCM© asthma performance measures (data not shown). The PACIC sub-scores were significantly associated with having a patient-reported AAP, having all performance measure criteria met (based on patient-report), and with patients' rating of the healthcare team (see Table 4 for summary).

Having an AAP as self-reported in the ACS was poorly associated with what is reported to MCM©. Based on the single question "Have you been given an action plan in the past 12 months by your provider?", 41 (42.7%) of 96 ACS

respondents reported "yes". Of those who said yes, only 8 were reported to have an AAP based on the clinic-reported MCM©. Overall, the MCM© and the data for this survey question were concordant 57% of the time, with a kappa statistic of 0.054.

Discussion

We found that patient-report of having an AAP and having all 3 quality criteria (having an AAP, having controlled asthma as determined by a validated tool, and having no ED or hospital visits for asthma) are associated with a validated measure of chronic care delivery (the patient-reported PACIC). However, this association was only seen when using patient-reported survey data (from ACS) and not when using data as reported for performance measurement to the MCM©. We found no association between the PACIC and having a favorable asthma control score or <1 ED or hospital visits for asthma in either performance measures reported to MCM© or for the patient-reported data from the ACS. We, therefore, found that none of the asthma quality measures, as currently reported to the MCM© via clinic-report based on medical record data abstraction, are associated with a patient-reported measure of healthcare delivery quality.

The strengths of this study are the community-based sample, the unique data set linking self-report in survey and clinic-reported performance measures, and the use of a validated tool to assess the quality of chronic care delivery. There are several limitations to our study. First, the timing of the ACS administration was not simultaneous with the data collecting period for MCM©. To account for this time difference, we anchored the ACS by including the ACQ-6 and

Table 4. Subscores of the Patient Assessment of Chronic Illness Care (PACIC) and asthma outcomes as reported by patients in the Asthma Care Survey (ACS).

Data from ACS	Patient activation		Delivery system/practice design		Goal setting/tailoring		Problem solving/contextual		Follow-up/coordination	
	Mean (SD) from PACIC	p Value	Mean (SD) from PACIC	P Value	Mean (SD) from PACIC	p Value	Mean (SD) From PACIC	p Value	Mean (SD) from PACIC	p Value
ACQ-6 ≤ 0.75		0.19		0.31		0.17		0.06		0.11
Yes	3.53 (1.30)		3.54 (1.23)		2.94 (1.14)		4.01 (1.18)		2.24 (1.29)	
No/missing	3.16 (1.20)		3.28 (1.10)		2.60 (1.05)		3.52 (1.11)		1.86 (0.89)	
ED visits for asthma in last year		0.46		0.33		0.77		0.37		0.56
0	3.29 (1.20)		3.40 (1.08)		2.71 (1.08)		3.71 (1.12)		2.02 (1.05)	
>0	3.05 (1.38)		3.10 (1.37)		2.63 (1.16)		3.44 (1.32)		1.05 (1.00)	
Hospital visits for asthma in last year		0.20		0.62		0.94		0.90		0.90
0	3.28 (1.24)		3.35 (1.15)		2.70 (1.10)		3.66 (1.17)		1.99 (1.06)	
>0	2.61 (1.10)		3.11 (1.22)		2.67 (0.95)		3.60 (1.06)		1.93 (0.59)	
Action plan with 3 components		0.0004		0.0001		<0.0001		0.0007		0.010
Yes	3.97 (0.95)		4.06 (0.80)		3.52 (0.80)		4.31 (0.94)		2.42 (1.23)	
No	3.00 (1.23)		3.08 (1.14)		2.39 (1.01)		3.43 (1.14)		1.81 (0.90)	
Quality criteria met		0.09		0.06		0.008		0.07		0.02
Yes	3.93 (0.98)		4.04 (1.11)		3.60 (0.71)		4.33 (1.30)		2.71 (1.47)	
No	3.20 (1.24)		3.28 (1.12)		2.60 (1.07)		3.60 (1.12)		1.90 (0.95)	
Self-reported rating of asthma care team		0.003		0.0008		0.002		0.0004		0.014
<8	2.95 (1.20)		3.03 (1.09)		2.41 (0.94)		3.31 (1.20)		1.75 (0.76)	
≥ 8	3.71 (1.16)		3.81 (1.05)		3.10 (1.15)		4.14 (0.89)		2.27 (1.26)	
Use of systemic corticosteroids		0.50		0.65		0.74		0.62		0.95
None	3.32 (1.27)		3.39 (1.15)		2.66 (1.16)		3.71 (1.10)		1.98 (1.08)	
Any	3.14 (1.21)		3.28 (1.15)		2.74 (1.00)		3.59 (1.24)		2.00 (1.00)	

p Values: Two-sample *t*-test.

ED/hospital asthma visits which helped to balance the potential bias introduced by the seasonal pattern of asthma and the timing of the ACS. Second, the survey response rate was slightly lower than expected based on a 42.5% response rate in diabetes survey in a similar population [22] and 33.5% in an asthma survey with a slightly different population [23]. To address concerns of nonresponse bias, we compared baseline age, sex, and asthma impairment data between responders and non-responders and found no significant differences. Third, the data may not extrapolate to individuals <5 years old or >50 years old; such individuals may have unique asthma management needs not addressed by these quality measures we analyzed. Fourth, variables such as specialist care, allergy sensitization, and BMI were not considered in our multivariable analysis. Future studies considering asthma quality measures should incorporate these potentially important factors and their impact on perceived quality of care and asthma outcomes. Finally, the study sample was limited in its analytic power due to the limited number of individuals who met all three criteria to achieve the overall high quality rating. Limited power may be most relevant to the ED or Hospital visit outcomes given the low number of these events in our sample, but may also apply to the trend ($p = 0.10$) of an association between better asthma control scores and higher PACIC scores.

Our data may provide preliminary guidance for those selecting asthma performance measures. First, the differences noted between patient self-report and administrative-report of having an AAP raise concerns about the accuracy of using administrative data for this measure, at least in its first year of reporting these specific measures. A recent report highlights challenges of using administrative data for public quality reporting [24]. In addition, the finding that only 2% of patients met all the three asthma quality measures suggest high expectations (perhaps too difficult to achieve) or simply the beginning point of a steep learning curve for the healthcare providers in performing and documenting these measures. While our data suggest AAPs could act as a surrogate measurement for the quality of healthcare delivery (if clinic-reported data can be collected to accurately reflect patient-reported data), others (all pediatric studies) have noted that they may have limited value in mild asthmatics, are a burden on providers to create and document, and are not proven to independently impact asthma outcomes [25–27]. A recent report describes an association between AAPs, patient adherence, and patient satisfaction [28], which, along with our data, strengthens the case to include AAPs as a performance measure. Including the AAP as a performance measure also allows providers who manage severe asthma populations to demonstrate high quality of care delivery even when they are unable to report favorable asthma control or exacerbation data. This study, however, did not find that asthma control modified the association between PACIC and having an AAP, suggesting that perhaps this relationship holds regardless of asthma control level.

Conclusions

The current publicly reported asthma performance measures are not associated with a patient-reported assessment of

chronic healthcare delivery (the PACIC). Patient-report of having an AAP and having all the three quality criteria (having an AAP, having controlled asthma as determined by a validated tool, and having no ED or hospital visits for asthma) were associated with higher quality of healthcare delivery. Further studies are needed to clarify which outcome measurements (and from whom they are collected) would best serve the interest of asthma patients and the providers that aim to improve the quality of asthma care.

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Declaration of interest

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