Measuring asthma quality in primary care: Can we develop better measures?

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Summary

Objective: Asthma is common and commonly under-treated. Currently quality indicators often do not provide specific directions for areas of improvement. This work lays the foundation for a quality improvement initiative that provides practice-specific feedback related directly to clinical activities completed for individual patients with asthma.

Methods: Medical record review using a group of quality assessment elements developed from previous medical record review studies of asthma care and the NAEPP asthma care guidelines.

Results: For 500 school children ages 5–18 yr who made one or more asthma visits in the year of interest, the frequency of daytime asthma symptoms were recorded in 54\% of patients' medical records at any time during a one-year period, while nighttime symptom frequency was recorded in 33\%. Only 12\% of medical records recorded any information on missed work, school or activity days. Nine percent recorded information or acknowledged any asthma “triggers”. Asthma severity level was documented in only an additional 4\% of the children’s records. Most medical records documented prescribed asthma medications and dosages (85\%) but few recorded the medications or dosages the patients were actually taking.

Conclusions: Many medical records do not include the basic clinical information required to assess asthma severity, adherence to asthma therapy or the response to therapy. This lack of information makes implementation of asthma care guidelines impossible. Therefore, these measures may be useful baseline quality indicators to begin the process of improving asthma care.

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Introduction

Asthma is among the most common reasons for a visit to a family physician, pediatrician or general internist.\textsuperscript{1,2} Almost 25\% of children are told they have asthma at some time before age 18\textsuperscript{3–5} and 3–5\% of adults report needing asthma care each year with another 5\% reporting exercise-induced asthma.\textsuperscript{1,6–13} The majority of the 11.9 million annual asthma-related office visits are made to primary care physicians.\textsuperscript{3,4,7,13–15}

Asthma is associated with significant preventable morbidity and perhaps preventable mortality.\textsuperscript{16–25} Many studies have assessed the potential for decreasing preventable morbidity, the quality of asthma care provided, and its congruence with national asthma guidelines.\textsuperscript{20,21,26–34} Most of the studies show that prescribed asthma therapy varies significantly from that recommended in guidelines but few studies can link the therapy or outcomes data to the specific aspects of care delivered by the primary care physician. Therefore, few studies can link the currently used quality indicators with specific recommendations for changes in physician management for individual patients or for system enhancements to solve quality deficiencies.\textsuperscript{30,35–39} For example, telling physicians that the ratio of prescribed inhaled corticosteroids to short acting beta agonists is ‘‘too low’’ does little to suggest an intervention for individual patient care or to develop a system-based solution.\textsuperscript{40–43}

Most funded and published asthma guideline implementation programs are intensive, require extensive investment of time and personnel, have shown only limited sustainable improvement and are often too expensive to use in routine practice.\textsuperscript{34,44,45} Therefore asthma remains an appropriate area for continued development of more practical and affordable quality assessment measures that can be linked to quality improvement programs.

This study reports on the development of a new simple set of asthma quality of care measures that are directly linked to the most basic clinical activities performed during an asthma visit.\textsuperscript{46,47} Some of these activities such as patient’s adherence to recommended medications\textsuperscript{48,49} have been assessed previously. Others have not. The instrumental activities selected\textsuperscript{50–52} quantify the documentation of timing and frequency of asthma related symptoms, activity limitations, and response to medication use and are designed to assess asthma care in any primary care office practice. The results are discussed in the context of asthma quality improvement activities, and ways in which this set of asthma quality measures can be linked directly to changes in physician and office practice to enhance the ability of the physician, patient and family to care for asthma.

Methods

This is a retrospective medical record review study of a random sample of school-aged children whose parents reported they had asthma on a school-based asthma screening survey completed in Rochester, MN and whose diagnosis was confirmed by medical record review\textsuperscript{4,7} and a second random sample of school-aged children who made an asthma visit (code 493.xx) to a large HMO in New Mexico during 2001.

Rochester, MN is a city of 90,000 within rural Minnesota. The school children in this community are 75\% White non-Hispanic and 35\% qualify for free or reduced lunch programs. Albuquerque, NM is a larger city with a more diverse population including about 25\% Hispanic children and another 15\% of other racial groups. About 41\% of the school children in Albuquerque qualify for free breakfast or lunch programs (2000 Census data).

After approval from the Olmsted Medical Center, the Mayo Clinic and Lovelace Foundation Institutional Review Boards, the sample of children for medical record review was selected. The Minnesota population was a random sample of 250 of the 1018 eligible children aged 5–18 yr whose parents said they had been told their child had asthma. The method of identifying these eligible children and the school-based study have been described elsewhere.\textsuperscript{4} The New Mexico sample of 250 subjects was a random sample of all children aged 5–18 yr who made an asthma visit (code 493.xx) to one of the Lovelace Clinic sites in Albuquerque, New Mexico during 2001. The sample of 250 was drawn from 2342 eligible children.

The medical records for all of the children were identified. In Minnesota, 3 of 250 children selected had no medical records found in any clinic in Rochester, MN. All of the New Mexico children had medical records that could be reviewed. In addition to collecting demographic data to confirm age, gender and the prevalence of asthma, additional medical record data were collected from each clinic visit in which asthma care or control was discussed in the medical visit note. Using all visits from the period of January 1–December 31, 2000 in Minnesota and January 1, and December 31, 2001 in New Mexico, medical records were searched for the documentation of asthma-related symptoms, severity scores and lung function data in medical and
nursing notes from primary care visits (Table 1). Asthma symptoms were considered to be wheezing, prolonged coughing, chest tightness, difficulty breathing and use of or need to use a short-acting beta agonist inhaler. Severity levels were considered documented if any comments were present that stated mild, moderate or severe asthma or intermittent or persistent asthma even if the persistent asthma did not have any other modifiers documented. Lung function data included either peak flow values or spirometry entered into the medical record for children over 8 years of age but was considered necessary only in the year of incident diagnosis.51,53,54 Additional information related to other asthma-like diagnoses in the medical record such as reactive airway disease (RAD) or wheezy bronchitis, presence of a follow-up visit after any emergency department visit or hospitalization for asthma were collected since the medical records of the two large clinics in Olmsted County, MN include emergency department and hospitalization data.

Asthma medications were defined as any short or long acting beta agonist, inhaled corticosteroid, leukotriene modifiers, theophyllines, and cromoglycates. Oral steroids required specific notation that they were for asthma therapy.

Inter-rater reliability testing was done using mock study records since it was not possible to use the actual records of either site to do this testing. Ten mock study records were developed by one of the authors (BPY). The inter-rater reliability was assessed for each category of data in Table 2. All four data abstractors (2 RNs from each site) reviewed the 10 mock records. The inter-rater reliability was high with only 8 items of the 104 items reviewed being different. In each case 1 of the 4 study nurses recorded a different response. The most common difference was in the of documentation of symptom frequency. In 5 instances 1 of the nurses marked present when the note stated a range of symptom days such as 1–4 per month or none to occasional. Each nurse also abstracted 5 patients medical records on two occasions. Only five entries of the 97 assessed were different between the two assessments. The inter and intra-rater reliability were considered excellent for this tool.

Data were analyzed at the person rather than visit level. For each item the information was considered to present or absent based on the entire year of visits. For example, if one of three asthma-related visits during the year documented medications actually used then that element or item was considered to be present. Calculations were simple proportions of presence for each item in all subjects whose charts were reviewed. The data from the two communities were not different on any value using \( \chi^2 \) comparisons. To protect the identity of the individual care sites, the data were combined across care sites in Minnesota and New Mexico. No more sophisticated analyses were performed since this is a baseline observational study.

### Results

Of the 500 children in the sample, 59% \( (n = 295) \) were boys. There were slightly more children in the group \( \leq 12 \) than those 13 years and older. This was due to the greater number of younger children identified from the visit records in New Mexico (Table 2).

Of the 497 children with an available medical record to review, 490 had an asthma-related visit in the year of interest. In New Mexico all of the 250 children identified by clinic visits with a code of

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Suggested quality indicators.</th>
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<tbody>
<tr>
<td>Frequency of daytime symptoms</td>
<td></td>
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<tr>
<td>Frequency of nighttime symptoms</td>
<td></td>
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<tr>
<td>Number of missed activity days</td>
<td></td>
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<tr>
<td>Severity score if none of the above are present</td>
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<tr>
<td>Triggers documented or allergy referral</td>
<td></td>
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<tr>
<td>Prescribed medications documented</td>
<td></td>
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<tr>
<td>Actual medications used documented</td>
<td></td>
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<tr>
<td>NON-urgent asthma visit</td>
<td></td>
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<tr>
<td>RAD or other non-asthma diagnosis used</td>
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<tr>
<td>PEF or spirometry in year of new asthma diagnoses if patient over 8 years of age.</td>
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<th>Table 2</th>
<th>Demographics of sample.</th>
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<td></td>
<td>Minnesota ( N = 247 ) ( n(%) )</td>
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<tr>
<td>Boys</td>
<td>143 (58)</td>
</tr>
<tr>
<td>Girls</td>
<td>104 (42)</td>
</tr>
<tr>
<td>5–12 years of age</td>
<td>125 (51)</td>
</tr>
<tr>
<td>13–18 years of age</td>
<td>122 (99)</td>
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493.xx had a visit and in Rochester, 240 of the children whose parents said they had made an asthma-related visit had one or more asthma visits identified and available for abstraction. Overall, 24% of the children (n = 118) with visits had one or more visits during the year with an ICD-9 code of 493.xx but a written diagnosis of reactive airway disease or RAD. Only one diagnosis of wheezy bronchitis was found in this cohort. Of those 118 children with at least one written diagnosis of RAD, 67% (n = 79) also had a diagnosis of “asthma” in a visit previous to the “RAD” visit.

Overall, 54% of the 490 children (n = 265) had the frequency of daytime symptoms that recorded with sufficient specificity to be able to use them for severity assessment (Table 3). Another 10% had notes stating “occasional”, “sometimes” or “frequent” daytime symptoms. These were not sufficiently specific to determine severity and were included with the 36% of children with no documentation of daytime symptoms frequency. Nighttime symptoms were less commonly noted with 33% of medical records (n = 162) documenting frequency, another 5% stating nighttime symptoms occurred “once in a while” or “sometimes”. Comments of “patient doing well” or “poorly” were not considered documentation of any type of symptom frequency.

Only 12% of the charts (n = 59) had specific documentation of the number of missed activity days including missed school days. Nine percent of the records (n = 44) commented on triggers, usually discussing the ability to avoid triggers, or concerns about triggers or evidence of a referral to another physician for allergy evaluation.

The severity level was present in 4% (n = 8) of medical records that included one or more visits for asthma in the year of observation. Only 3 of these medical records did not also have all of the data necessary to complete a severity assessment. Altogether 11% (n = 56) of medical records that had either a severity score or sufficient data to develop a severity scores. There were only 5 incident cases of asthma in children 8 years and older among the group studied. Of these 3 had a peak flow level assessed or had spirometry testing recorded (n = 2). Peak flow testing was present in 48% (n = 246) of the urgent care and emergency room visits for asthma exacerbations.

A total of 11% of the children (n = 54) had at least one non-urgent visit (not to urgent care or the emergency department or to the office for an exacerbation or “attack”) during which asthma control or therapy or education was discussed. These visits were often primarily for a school, sports or camp physical examination to complete a required form and asthma evaluation was included during the visit. Visits related just to asthma management (visits primarily for asthma but without an exacerbation) were uncommon (2% of children, n = 4). Of the 68 children (14%) who had an emergency department (ED) visit for their asthma, about two-thirds (68%, n = 46) had a follow-up visit within two weeks after the ED visit.

Medications that were prescribed were recorded with name, dose and frequency in 85% of the medical records. However, only 15% (n = 74) had any comment on how frequently the medications were actually being taken.

It was not possible to distinguish whether symptom, activity limitation and medication questions were answered by the child or the parent when both were present during the visit. Seven of the visits appeared to be with a child only. The level of documentation of all variable was the same for children of all ages.

### Discussion

Physicians and nurses often do not record sufficient data to allow assessment of asthma severity using the NAEPP/NHLBI national guidelines.\(^5\)\(^1\),\(^5\)\(^2\),\(^5\)\(^4\) In addition, they do not consistently use the same “word” for a diagnosis of asthma and not all children with visits to a non-office site, specifically the ED, have a follow-up visit. The tested asthma quality indicators appear to identify areas ripe for quality improvement.

Currently all national and international asthma guidelines (such as those of the ACAAI or AAAI and GINA) are based on those developed by the science committee of the National Asthma Education and Prevention Program (NAEPP) and published by NHLBI.\(^5\)\(^1\),\(^5\)\(^2\),\(^5\)\(^4\) These guidelines are derived from

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**Table 3** Documentation frequencies.

<table>
<thead>
<tr>
<th>Activity</th>
<th>N (%)</th>
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<tbody>
<tr>
<td>Asthma visit</td>
<td>490 (99)</td>
</tr>
<tr>
<td>RAD diagnosis</td>
<td>118 (24)</td>
</tr>
<tr>
<td>Daytime symptoms</td>
<td>265 (54)</td>
</tr>
<tr>
<td>Nighttime symptoms</td>
<td>162 (33)</td>
</tr>
<tr>
<td>Missed activity days</td>
<td>59 (12)</td>
</tr>
<tr>
<td>Triggers documented</td>
<td>44 (9)</td>
</tr>
<tr>
<td>Medications prescribed documented</td>
<td>422 (85)</td>
</tr>
<tr>
<td>Actual medication use documented</td>
<td>74 (15)</td>
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\(^*\)Number and percent of medical records in which each item was documented.
the available evidence and the NAEPP science committee’s interpretation of that evidence. The 1991 guidelines were the first to report the empirically based asthma severity index reported to be the first step in attempting to translate asthma research into guidelines and patient care. The empirically based severity index continues to be the basis for all US asthma management guidelines.\textsuperscript{51,55,56} The asthma severity system is based on the frequency of daytime symptoms, nighttime symptoms, activity limitations and medications. Failure to record these data in the medical record makes implementation of the national and international asthma guidelines difficult if not impossible. While not perfect, the empirical severity index has provided some suggested structure to asthma care.

The asthma guidelines assume that the necessary symptom and activity limitation information is being obtained and that severity scores are being calculated.\textsuperscript{51} However, the wide spread and consistent lack of either severity levels or symptom frequency and activity limitation data found in this study demonstrates an important gap in current asthma care. While it is true that physicians and other clinicians may collect these data and simply fail to document them, the lack of this information in the clinical record makes longitudinal guideline-based asthma care difficult or impossible to imagine since it is unlikely that a physician can remember what they fail to document over days, weeks or months.

Physicians list several barriers to incorporating the asthma guidelines into practice including time, relevance and knowledge.\textsuperscript{29,58-61} Doerschug and colleagues reported that obtaining the information to calculate the asthma severity score was the least understood and most difficult to operationalize portion of the 1997 NAEPP asthma guidelines. Less than 63\% of asthma specialists and 46\% of primary care physicians could appropriately score the severity of asthma in patient vignettes. They concluded that all physicians could benefit from further training in the use of severity scoring and applying treatment paradigms based on asthma severity.\textsuperscript{58} That conclusion supports the basic premise of this project, that physicians and practices do not have functional systems to obtain the information needed to assess asthma severity or control. Physicians must find it difficult or impossible to initiate, modify and monitor asthma treatment based on the person’s symptoms, current adherence to previously recommended therapy or functional limitations.

Large managed care organizations and National Council for Quality Assessment (NCQA) use audit and feedback to clinics and on some occasions to individual providers or physicians to improve asthma care.\textsuperscript{30,31,62-68} The feedback from the audits seldom includes information on basic clinical activities or specific recommended changes in systems or practice activities.\textsuperscript{69-71} For example, stating that a certain practice has lower rates of inhaled corticosteroid use than other similar clinics suggests no specific strategy to resolve the problem.\textsuperscript{68,72} Outcome or quality measures suggested by the National Institute for Child HealthCare Quality (NICHQ) are based on assumptions that symptoms and activity scores are being routinely collected.\textsuperscript{42} The NICHQ programs provide tools for collecting symptom data but do make such data collection a measured outcome. The marked lack of documented symptom, activity and actual medication use in current primary care physicians records suggests that quality measures that include assessment of these basic clinical activities are important intermediate steps before attempting to include rates of severity assessment or appropriate medication ratios as quality measures.

For physicians who choose not to use the asthma severity assessment as outlined in the NHLBI guidelines\textsuperscript{54} it is difficult to imagine how a patient’s current status can be assessed or how to determine appropriate changes in medication can be developed without some metric related to symptoms. Terms such as “often”, “sometimes” or “occasionally” to describe the frequency of symptoms may have very disparate meanings and are unlikely to provide a reliable measure of control or response to therapy.\textsuperscript{57} Few physicians would want to titrate medications for angina or cholesterol management based on such vague assessments.

Other quality indicators such as the consistent use of terminology for asthma may also be important. Parents report they have little confidence in a health care system that interchangeably uses a variety of terms for their child’s illness.\textsuperscript{57} Parents and adults with asthma report that using alternative terminology such as RAD or wheezy bronchitis suggests that the physician does not really know whether or not they or their child have asthma and makes giving or using chronic or daily medication less attractive.\textsuperscript{57}

This is a pilot study to assess the type of data that can be obtained using simple quality measures based on the basic elements of a patient history. The available data is limited by the use of medical records that often do not record all the information obtained during a medical visit. However, the recorded data is the information available for longitudinal care and to other clinicians who may care for the person in addition to the usual
physician or clinician. The data were collected from only three large medical clinics and may not reflect practice at other sites with limited racial and ethnic variability. Therefore, this work should be repeated in other settings across the country.

Conclusions

Without having basic pieces of clinic data such as symptom frequency, frequency of missed activities, actual medications used and response to those medications, current asthma care guidelines cannot be used. Translating these necessary and important data elements into quality measures allows audits in which each measure has a direct solution that can be incorporated into the care system of a practice. Use of these simple clinical activity items as quality assessment tools may further facilitate translation of asthma guidelines into practice. Additional research will be required to assess the ability of changes in the quality measures to affect patient outcomes.

Acknowledgement

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