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Evidence-based performance indicators of primary care for asthma: a modified RAND Appropriateness Method

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Abstract

Purpose. To develop evidence-based performance indicators that measure the quality of primary care for asthma.

Data sources. Cochrane Database of Systematic Reviews, MEDLINE, EMBASE and CINAHL for peer-reviewed articles published in 1998–2008 and five national/global asthma management guidelines.

Study selection. Articles with a focus on current asthma performance indicators recognized or used in community and primary care settings.

Data extraction. Modified RAND Appropriateness Method was used. The work described herein was conducted in Canada in 2008. Five clinician experts conducted the systematic literature review. Asthma-specific performance indicators were developed and the strength of supporting evidence summarized. A survey was created and mailed to 17 expert panellists of various disciplines, asking them to rate each indicator using a 9-point Likert scale. Percentage distribution of the Likert scores were generated and given to the panellists before a face-to-face meeting, which was held to assess consensus. At the meeting, they ranked all indicators based on their reliability, validity, availability and feasibility.

Results. Literature search yielded 1228 articles, of which 135 were used to generate 45 performance indicators in five domains: access to care, clinical effectiveness, patient centeredness, system integration and coordination and patient safety. The top five ranked indicators were: Asthma Education from Certified Asthma Educator, Pulmonary Function Monitoring, Asthma Control Monitoring, Controller Medication Use and Asthma Control.

Conclusion. The top 15 ranked indicators are recommended for implementation in primary care to measure asthma care delivery, respiratory health outcomes and establish benchmarks for optimal health service delivery over time and across populations.

Keywords: performance measure, quality of healthcare, primary healthcare, asthma, evidence-based medicine

Introduction

Asthma is the most common chronic respiratory disease in Canada, accounting for ~80% of chronic respiratory diseases and affecting 8.4% of the population [1]. There is general agreement that asthma is an 'ambulatory care sensitive condition', such that good outpatient management should result in decreased hospitalizations [2–5]. Inadequate control of asthma can be costly. In 1998, the major direct health care costs (hospital care and drug expenditures) for

asthma totalled over $402 million, although the use of other health services (i.e. visits to a general practitioner, specialist and emergency department) contributed 21% to the total cost [6, 7]. More recent data suggest that over $162 million was spent on treating uncontrolled asthma in Canada in 2004 [8].

Despite well-established management guidelines, variations in quality of asthma care are common in primary care settings [9–11]. There is a need to identify effective quality improvement strategies to ensure safe delivery of high-quality services. Community-based performance indicators (or quality of care indicators) can help identify barriers to, and enablers of, the development, dissemination and uptake of clinical guidelines for asthma management. However, to date, there has been no comprehensive national or provincial programme to monitor chronic respiratory disease patterns, assess respiratory disease burden on the healthcare system, or determine the impact of changes in health system/policy on respiratory health outcomes [12]. Performance indicators specific to chronic respiratory disease management currently do not exist at the national level, the values of which would suggest one or more dimensions of quality of care that are potentially amenable to change by the provider or the health system. Although some information is available on the burden of asthma, systematic data are missing for ascertaining trends in incidence and prevalence, use of healthcare resources, or specific healthcare costs in various age groups, across geographical areas and over time. Although there are asthma care performance indicators focused on therapy, the lack of patient-specific data (such as asthma control, adherence and response to therapy) has made evaluation of asthma care guideline implementation difficult [11, 13–17]. Measuring these factors at the patient level is necessary for constructing performance indicators that provide more meaningful information to clinicians, researchers, policy makers and health care planners for developing strategies to improve asthma care. The purpose of this study was to develop evidence-based asthma performance indicators that can be used to measure the quality of community and primary care for asthma, taking into consideration patient characteristics.

Methods

A modified RAND Appropriateness Method was used, which has characteristics of both the Delphi and Nominal Group Techniques and has been described as the only systematic method to combine expert opinion and evidence [18–21]. It consists of a literature review, an initial independent assessment of indicators by panellists using a mailed survey, followed by a face-to-face expert panel consensus meeting [22]. Ethics approval for this study was received from the Research Ethics Boards of The Hospital for Sick Children, Toronto, Ontario, Canada.

Modified systematic literature review

Peer-reviewed literature published between 1998 and 2008 in English was identified from Cochrane Database of Systematic Reviews, MEDLINE, EMBASE and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The search strategy was to retrieve a comprehensive list of articles that focus on the question, 'What are the current asthma performance indicators recognized or used in community and primary care settings?'.

Key text words were used to reflect the quality of asthma primary care in five domains: access to care, clinical effectiveness, patient centeredness, system integration and coordination and patient safety [23–25]. The following key words were used: asthma, primary health care, health status indicators, health services needs and demand, health services accessibility, outcome and process assessment (health care), quality indicators, clinical effectiveness, clinical indicator, performance measurement system, treatment outcome, practice guideline, clinical competence, guideline adherence, physician–patient relations, patient satisfaction, patient compliance, patient attitude, patient participation, patient dropouts, treatment refusal and patient education. A keyword search of grey literature (defined as, 'information produced on all levels of government, academia, business and industry in electronic and print formats not controlled by commercial publishing, i.e. where publishing is not the primary activity of the producing body') [26] databases was also performed by an experienced medical research librarian.

A standard data abstraction form was used to summarize the review. The strength of the supporting evidence for each indicator was assessed and categorized into five levels based on a common system used by most national guidelines [27–29]. Level I indicates evidence based on randomized controlled trials (RCT) (or meta-analysis of such trials) of adequate size to ensure a low risk of incorporating false-positive or false-negative results. Level II indicates evidence based on the RCT that are too small to provide level I evidence. Level III indicates evidence based on non-RCT research studies. Level IV indicates evidence based on the opinion of respected authorities or expert committees as indicated in published consensus conferences or guidelines. Level V indicates evidence based on the opinions of those who have written and reviewed the guidelines, based on their experience, knowledge of the relevant literature and discussion with their peers. Full-text articles that did not suggest specific performance indicators or did not provide supporting evidence for the suggested indicators were excluded.

Expert panel assembly

Nominations of expert panellists were requested from national and provincial professional organizations and stakeholder groups from which a panel comprised of 17 experts (three respirologists; two of each allergists, family physicians, paediatric respirologists, general paediatricians and pharmacists; one of each an emergency department physician, nurse, respiratory therapist and asthma educator) was assembled. Panellists represented diverse geographic regions (urban and rural), practice types (solo/group practice and health service organization), payment methods (fee-for-service and globally funded) and settings (community and academic).

Pulmonary function monitoring

Indicator definition: % of patients aged 6 years and over with asthma who received spirometry in last 12 months

Comments: _____

_____

Please rate this indicator in terms of the following statements where 1 indicates that you 'Definitely Disagree' with the statement and 9 indicates that you 'Definitely Agree'. Please circle ***one*** number or ***one*** response (Yes/No/Unsure) for each statement.

	Definitely Disagree				Uncertain or equivocal				Definitely agree
Validity • Evidence supports a link between this indicator and positive patient outcomes	1	2	3	4	5	6	7	8	9
Relevance • This indicator will drive quality improvement in primary care	1	2	3	4	5	6	7	8	9
• This indicator will increase healthcare accountability at the primary care level	1	2	3	4	5	6	7	8	9
Room for improvement • This indicator can detect current gaps in primary asthma care	1	2	3	4	5	6	7	8	9
Overall • Overall, this indicator has strong utility for asthma quality of care assessment	1	2	3	4	5	6	7	8	9
Feasibility • Data for this indicator can be accurately collected at the primary care level	YES				NO			UNSURE	
• Data on this indicator needs to be collected and interpreted for different groups (i.e. child vs. adult, and gender)	YES				NO			UNSURE	
• Risk adjustment is required when this indicator is used (e.g. severity, social determinants of health)	YES				NO			UNSURE	

Other Comments: _____

_____

_____

Evidence:

Source (bibliography number)	Summary	Evidence
16, 23, 60, 159, 193, 235, 292, 354	Pulmonary function monitoring is an important process of care for asthma. More pulmonary function recordings in the previous 3 months was associated with low risk of asthma mortality in patients with severe asthma	II–IIIB

Figure 1 Sample page from mailed survey to expert panellists.

Mailed survey

A survey was created and mailed to all panellists asking them to rate each indicator on five criteria items (Fig. 1). Panellists rated each item on a 9-point Likert scale, where '1' indicates strongest disagreement and '9' strongest agreement. The five items were: (i) evidence supports a link between the indicator and positive patient outcomes, (ii) the indicator will drive quality improvement in primary care, (iii) the indicator will increase healthcare accountability at the primary care level, (iv) the indicator can detect current gaps in primary asthma care and (v) overall, the indicator has strong utility for asthma quality of care assessment. The panellists were encouraged to consult the evidence table provided for each of the 45 indicators which contained a short summary of the evidence from the literature along with the level of evidence. A list of references used to develop the indicator was also

provided and panellists could contact the research group to obtain copies of the papers. In addition, panellists were also asked whether data are currently available and whether risk adjustment (including age and sex) is required.

Analysis

Means and medians of the Likert scores from the mailed survey were calculated for each criteria item, and percentage distributions of agreement were generated. For each item, the scores of 7–9 were categorized as 'agreement', 1–3 as 'disagreement' and 4–6 as 'neutral'. Agreement among panellists was assessed with a disagreement index, which was calculated as the 30–70% interpercentile range divided by the interpercentile range adjusted for symmetry, as defined by the RAND working group [22]. This disagreement index describes the dispersion of individual scores. According to the RAND method, index values >1 indicate disagreement.

Face-to-face expert panel consensus meeting

Twelve of the 17 panellists attended the 1-day face-to-face meeting held in Toronto, Canada in December 2008, 1 month after they returned their completed survey. Three panellists, whom did not attend in person, participated in the process through pre-meeting interviews and post-meeting voting. Two panellists (family physician and general paediatrician) were unable to attend the meeting nor participate in post-meeting voting due to scheduling conflicts. Before the meeting, panellists were given an anonymized summary of the scores from their initial rating of the indicators identified from the systematic literature review. At the meeting, panellists discussed openly their views of each indicator followed by a second round of indicator ranking. This final round was a YES/NO rating based on a composite of characteristics: reliability, validity, availability and feasibility of the indicator. Those indicators with seven or more votes (i.e. voted by at least 50% of the panellists) were recommended for future implementation.

Results

Modified systematic literature review

A total of 1228 abstracts were identified through the literature search and were assessed by a single reviewer (Fig. 2). Only 329 abstracts were considered relevant to the current study and retrieved for full-text review. A random sample of 30 abstracts was reviewed independently by a second reviewer to determine the reliability of the review process. The inter-ratter reliability was 86.7%. Five clinician experts then reviewed the 329 full-text articles, 4 national (Canada, Australia, Britain, USA) and 1 global asthma management guidelines (Global Initiative for Asthma, GINA). Of these, 135 full-text articles and 5 guidelines provided supporting evidence for specific asthma performance indicators and were used to generate the initial set of 45 indicators (Table 1). A list of citations for the full-text articles and guidelines can be made available.

Initial ranking of indicators

Figure 3 summarized results of the initial ranking of the 45 indicators on their overall utility for asthma quality of care assessment. Among indicators in the Access to Care domain, Overall use of Controller Medication had the highest percentage agreement 17 (88.2%), followed by Prescriptions of Controller Medication (82.4%). In the Clinical Effectiveness domain, the highest ranked indicators were: Appropriate use of Controller Medication; Urgent Care Visits for Asthma; Hospitalizations for Asthma; and Beta2-agonist-free Days, all with 100% agreement. The highest ranked indicators in the Patient Centeredness domain were: Referred to Asthma Education Program/Asthma Centre; Inhaler Technique Monitoring; and Adherence to Asthma Medications, all with 94.1% agreement. The highest ranked indicator in the Service Integration and Coordination and Patient Safety domains were Coordination with Acute Care (94.1% agreement) and Medication Side Effect Prevention for Osteoporosis (68.8% agreement), respectively. Of the 45 indicators, 44 had a disagreement index of <1.0 (range: 0.0–0.88) indicating high level of agreement. The only indicator that had a disagreement index >1.0 was Hospitalization Cost for Asthma, in the Clinical Effectiveness domain.

Final ranking of indicators

At the Delphi consensus conference, a second round of indicator ranking by the expert panel took place. Results of the ranking identified 15 indicators which were voted by at least 50% of the panellists (Table 2). Some of the original names

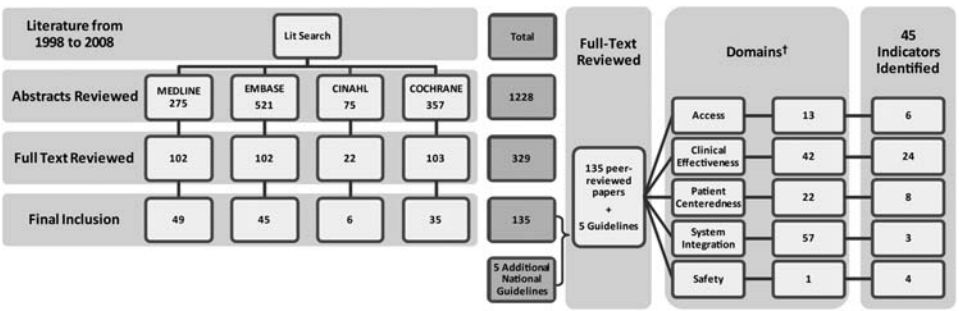

Figure 2 Flowchart of the modified systematic literature review process used to generate the initial set of asthma primary care performance indicators. †, evidence from the five National Guidelines are integrated in all five domains.

Table I Initial list of 45 asthma primary care performance indicators generated from the literature review, categorized by domain

Access to Care Domain
1. Routine Care Provider
2. Drug Plan that Covers Some Asthma Medications
3. Primary Care Visits for Asthma
4. Seen by a Specialist[a]
5. Controller Medication (Overall use)[a]
6. Controller Medication (Prescriptions)[a]

Clinical Effectiveness Domain
7. Asthma Diagnosis—Pulmonary Function Test
8. Asthma Diagnosis—Occupational Asthma Investigation
9. Pulmonary Function Monitoring
10. Asthma Control Monitoring
11. Controller Medication (Appropriate use)
12. Continuity of Care
13. Immunization (Influenza)
14. Immunization (Pneumococcus)
15. Asthma Mortality
16. Asthma Control (Overall)
17. Asthma Control—Asthma Exacerbations
18. Asthma Control—Symptom-free Days
19. Asthma Control—Beta2-agonist-free Days
20. Reliever Medication Use
21. Acute Health Services Use—Emergency Department Visits for Asthma
22. Acute Health Services Use—Hospitalizations for Asthma
23. Acute Health Services Use—Urgent Care Visits for Asthma
24. Burden of Illness—Overall Cost
25. Burden of Illness—Medication Cost for Asthma
26. Burden of Illness—Hospitalization Cost for Asthma
27. Burden of Illness—Absenteeism from Work/School for Asthma
28. Improvements in Pulmonary Function
29. Quality of Life (Patient)
30. Quality of Life (Parent)

Patient Centeredness Domain
31. Asthma Education—Referred to Asthma Education Program/Asthma Centre)[b]
32. Asthma Education—Received Asthma Education at Each Contact
33. Asthma Education—Received Asthma Education after ED Visits[b]
34. Inhaler Technique Monitoring
35. Received Action Plan
36. Other Management—Trigger Avoidance
37. Other Management—Weight Reduction
38. Other Management—Smoking Cessation
39. Adherence to Asthma Medications

Service Integration and Coordination Domain
40. Coordination with Acute Care
41. Coordination with Specialty Care

Patient Safety Domain
42. Medication Side Effect Monitoring (Adults)
43. Medication Side Effect Monitoring (Children)
44. Medication Side Effect Prevention (Osteoporosis)
45. Medication Side Effect Prevention (Glaucoma)

[a]This indicator is also assigned to the Clinical Effectiveness Domain.
[b]This indicator is also assigned to the Service Integration and Coordination Domain.

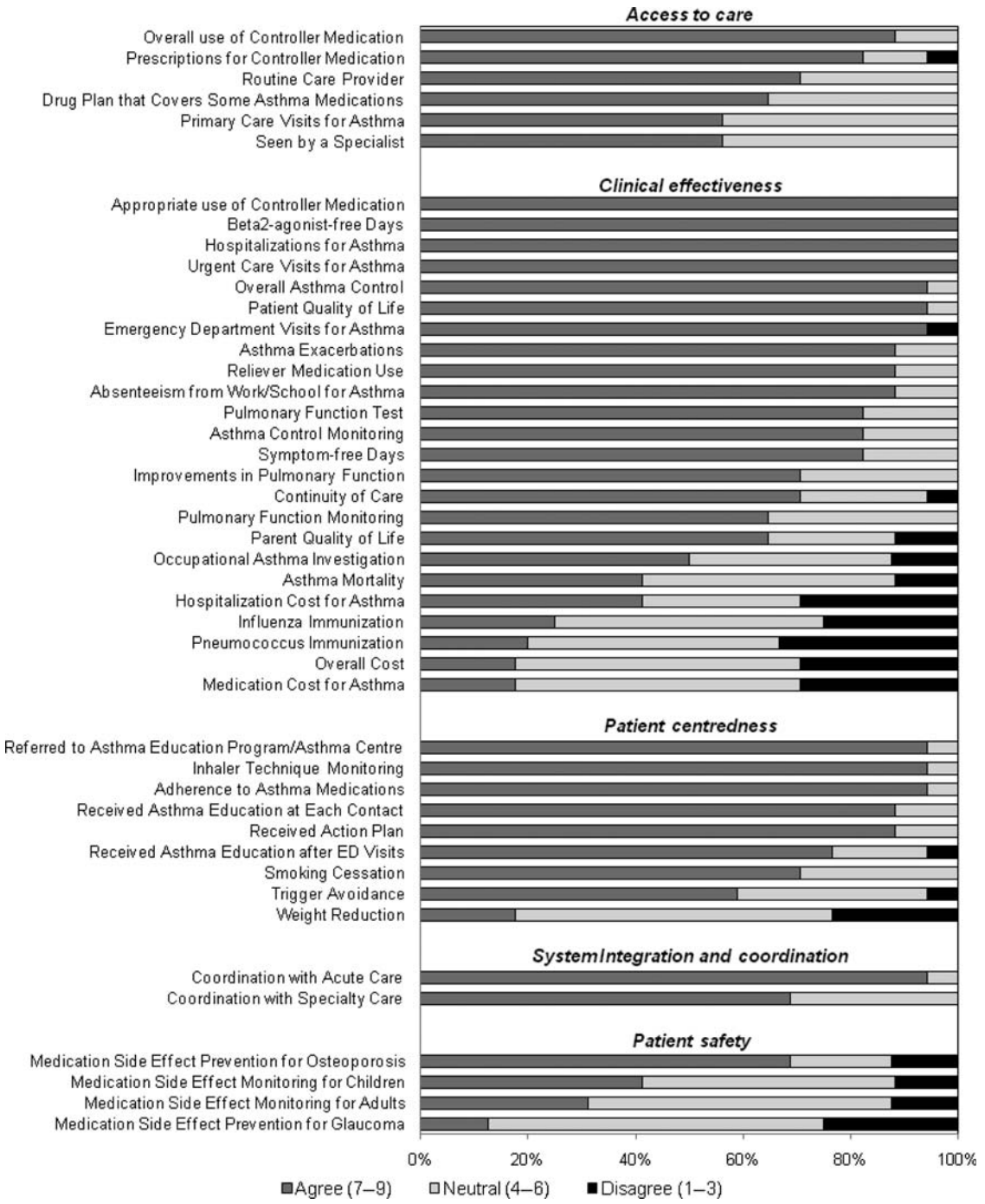

Figure 3 Initial ranking on overall utility, of the 45 asthma primary care performance indicators generated from the mailed surveys.

and definitions of the indicators were modified by the panellists to better reflect what the indicator was measuring. The highest ranked indicators: Asthma Education from Certified Asthma Educator; and Pulmonary Function Monitoring, each received 14 votes. The lowest ranked indicator of the top 15 was having a Routine Care Provider, which received 7 votes. Of these 15 indicators, 9 were assigned to the Clinical Effectiveness domain, 4 to the Patient Centeredness domain, and 2 to the Access to Care domain. The majority of the panellists agreed on the need for subgroup analysis and risk adjustment when interpreting data on the 15 indicators.

Discussion

This study uses a modified Delphi approach to generate asthma-specific performance indicators based on evidence and expert opinion. The set of indicators generated measures

Table 2 Top 15 most highly rated asthma primary care performance indicators based on the final ranking by the expert panellists at the consensus meeting

Top 15 performance indicators	Definition	No. of votes	Level(s) of evidence
1. Asthma Education from Certified Asthma Educator	% of patients with asthma who were referred to a certified asthma educator	14	I–III
2. Pulmonary Function Monitoring	% of patients aged 6 years and over with asthma who received spirometry in last 12 months	14	II–III
3. Asthma Control Monitoring	% of patients with asthma who had their asthma symptom control checked in last 6 months	13	III–IV
4. Controller Medication[a]		13	
a. Overall use	% of patients with uncontrolled asthma using inhaled corticosteroids		I–III, V
b. Prescriptions	Number of prescriptions of inhaled corticosteroids filled per person per year		II–III
5. Asthma Control[a]		13	
a. Overall	% of patients with well-controlled asthma in last 4 weeks		I, III
b. Symptom-free Days	Number (or %) of asthma symptom-free days in last 4 weeks		I–III
c. Absenteeism from Work/School for Asthma	Number of days missed from school or work due to asthma in last 4 weeks		I–III
6. Acute Health Services Use[a]		12	
a. Emergency Department Visits for Asthma	Number of emergency department visits for asthma in last 12 months		I–III, V
b. Urgent Care Visits for Asthma	Number of urgent care visits for asthma in last 12 months		I–III, V
7. Pulmonary Function Test	% of patients aged 6 years and over whose diagnosis of asthma was confirmed by spirometry, peak flow measurement or methacholine challenge test	12	II–IV
8. Use of Action Plan	% of patients with asthma who have received a written asthma action plan	12	I–V
9. Patient Quality of Life	Quality of life of asthma patients	10	I–III
10. Reliever Medication[a]		10	
a. Overall use	Number of short-acting beta2-agonist doses (2 puffs) per week in last 4 weeks		I–III
b. Beta2-agonist-free Days	Number (or %) of beta2-agonist-free days in last 4 weeks		I–II
11. Smoking Cessation	% of patients with asthma who are smokers having received advice/support to stop smoking	9	II, V
12. Asthma Exacerbations	% of patients with asthma who had $\geq$1 asthma exacerbation in last 12 months	8	I–III
13. Inhaler Technique Monitoring	% of patients with asthma who demonstrated their inhaler technique regularly	8	II, III, V
14. Primary Care Visits for Asthma	Number of primary care visits for asthma in last 12 months	8	III
15. Routine Care Provider	% of patients with asthma who have a routine care provider	7	III

[a]Sub-measures were included as per recommendation from the expert panel.

various aspects of primary care for asthma: prevention, promotion, chronic care, interaction with patients and collaboration with other health care sectors.

The need for practical and affordable quality assessment measures for asthma primary care is well recognized [15]. However, previous studies either focused on primary care in general, or developed asthma performance indicators based on published guidelines and expert opinion only [11, 13–15]. Two major strengths of the current study were: first, its asthma-specific focus and its rigorous analysis of the literature supporting each indicator; and secondly, our expert panel was composed of health care providers from various settings who serve patients from diverse socio-demographic backgrounds. Whereas asthma organizations were not represented on the panel, they contributed to the process by nominating experts. Asthma patients on the other hand were not included in any of the stages of indicator development. Careful selection of the panel is paramount to reaching consensus [30], and even though organizations and patients could contribute their views regarding asthma care, a panel of clinical experts was needed to assess the indicators and discuss using levels of evidence and their tacit knowledge from years in clinical practice.

Although some asthma quality indicators have been previously identified, few have been tested for their feasibility in real world settings [14, 15]. Some groups have only implemented one asthma-specific indicator within a larger set of other health indicators, such as 'diagnosed asthma patients filling a prescription for long-term control', for the Indicators of Quality in Family Practice developed by the Manitoba Centre for Health Policy and asthma mortality rate for the Health Care Quality Indicator (HCQI) Project of the Organization for Economic Cooperation and Development (OECD) [24, 31, 32]. Even though these indicators were compared across jurisdictions or countries, the quality of asthma care cannot be accurately assessed using such indicators. In the province of Saskatchewan, Canada, the Health Quality Council developed six asthma quality of care indicators to measure asthma control [33]. Since administrative datasets were to be used to populate those indicators, asthma control was measured by proxy, with five of the indicators focusing on medication use, as opposed to only two of the final set of 15 in our current study. The set of indicators most similar to the final set of 15 generated by this study is from the Australian Centre for Asthma Monitoring. In 2000, they developed an indicator-based monitoring system in which 24 indicators were used for data collection and monitoring [34, 35]. Through a Delphi survey conducted in 2008, the original 24 indicators were reduced to 10 [36]. These 10 indicators measure: prevalence of current asthma, deaths, hospitalization due to asthma, asthma control, general practice encounters, use of asthma action plans, quality of life, preventer use and costs of asthma [37]. Evaluations on the usefulness of these indicators in measuring performance of asthma care are currently unavailable. These indicators have not yet been recommended to be used by other countries as the definitions of indicators are still being tested for general applicability.

Our experts agreed on the many challenges in implementing performance indicators in primary care, particularly on data availability and data quality [11, 14, 15]. For example, a lack of documentation of details in patient care activities such as assessment of asthma severity and asthma education can lead to inaccurate measurement of quality of care [14, 15]. Inconsistent documentation can also undermine comparisons between physicians and practices [14]. Tackling such issues is not simple, owing to the reality that primary care settings are often busy, crowded with patients, and run by overworked staff struggling to meet the needs of regular medical care. In addition, there are potential confidentiality and cost challenges. As a result, it is unrealistic to expect that traditional primary data collection methods (i.e. surveys, medical chart audits or direct observations) will be used as a source of longitudinal data to monitor quality of primary care [11]. Therefore, integrating the recommended asthma care performance indicators with electronic medical record systems and using health administrative data will be crucial to the success of implementation and evaluation.

Another challenge in measuring the quality of asthma care is appropriate interpretation of results for benchmarking. Patient characteristics (such as age, gender and socioeconomic status) often differ among primary care practices, which may affect providers' practice patterns. One common approach to correct for such potential bias is sub-group analysis. For example, pulmonary function tests cannot be conducted on young children (i.e. aged <5 years). Therefore, comparisons of indicators involving pulmonary function testing (such as regular pulmonary function monitoring) should be limited to only primary care practice sub-populations that are aged 5 years or older. Another common analytical approach to correct for bias due to differences in patient characteristics is risk adjustment. For instance, patients with a drug plan may have better access to asthma medications and therefore may use medications more frequently than patients without a drug plan. Therefore, adjusting for drug plan enrolment status will be essential when measuring indicators such as, Appropriate use of Controller Medication. Collecting patient-level data such as those mentioned above will allow us to make appropriate comparisons among primary care practices and to generate more informative feedback to help identify barriers to, and enablers of, the development, dissemination and uptake of clinical guidelines for asthma management.

These asthma performance indicators will provide comparable and standardized information on respiratory health outcomes over time and across populations. They can be incorporated into population-based longitudinal surveillance systems in order to support regional health authorities monitor the effectiveness and impact of health policies and programmes that aim to improve respiratory health and provide effective, accessible and quality healthcare and may also serve as standard parameters in programme evaluation. These indicators can assist in the identification of potential prevention and management strategies and can be used to monitor progress towards targets. The challenge moving forward is to ensure common definitions are used and

uniform data collected using these indicators. Long-term monitoring of the burden of asthma can be guided by this common set of indicators, and trends can then be assessed and interpreted in conjunction with health programmes and policies implemented.

It is conceivable that different panels studying the same issues may produce systematically different judgments that may be attributable to their demographical differences (e.g. age, sex, education and years of practice). Although it is useful to stratify results by panellist's demographic factors, we were limited by a relatively small panel of 17 members. Any stratified analysis will therefore not likely be statistically meaningful. However, for future research, it would be advantageous to control for the panel's background in order to control for potential confounding.

Although the set of asthma performance indicators we identified represent a general consensus on quality asthma care and its measurement from the perspective of the health care provider, they need to be tested prior to being adopted for wide implementation at a population level. Future research should focus on implementation and evaluation of these indicators in order to address issues related to their relevance to primary care, robustness to gaming, reliability in measuring clinical care or management, responsiveness to change and feasibility for data collect (or implementation). These recommended key indicators can form the methodological basis or model for determining the current status of asthma health and healthcare, conducting comparative analyses to assess performance, and establishing benchmarks for optimal health service delivery for the population suffering from asthma.

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