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ASTHMA IN THE PRIMARY CARE SETTING

Development and implementation of an electronic asthma record for primary care: integrating guidelines into practice

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Abstract

Rationale: Evidence-based practice may be enhanced by integrating knowledge translation tools into electronic medical records (EMRs). We examined the feasibility of incorporating an evidence-based asthma care map (ACM) into Primary Care (PC) EMRs, and reporting on performance indicators. *Methods*: Clinicians and information technology experts selected 69 clinical and administrative variables from the ACM template. Four Ontario PC sites using EMRs were recruited to the study. Certified Asthma Educators used the electronic ACM for patient assessment and management. De-identified data from consecutive asthma patients were automatically transmitted to a secure central server for analysis. *Results*: Of the four sites recruited, two sites using "stand-alone" EMR systems were able to incorporate the selected ACM variables into an electronic format and participate in the pilot. Data were received on 161 visits by 130 patients aged 36.5 $\pm$ 26.9 (mean $\pm$ SD) (range 2–93) years. Ninety-four percent (65/69) of the selected ACM variables could be analyzed. Reporting capabilities included: individual patient, individual site and aggregate reports. Reports illustrated the ability to measure performance (e.g. number of patients in control, proportion of asthma diagnoses confirmed by an objective measure of lung function), benchmark and use EMR data for disease surveillance (e.g. number of smokers and the individuals with suspected work-related asthma). *Conclusions*: Integration of this evidence-based ACM into different EMRs was successful and permitted patient outcomes monitoring. Standardized data definitions and terminology are essential in order for EMR data to be used for performance measurement, benchmarking and disease surveillance.

Keywords

Asthma, electronic medical record, primary care provider

History

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Background

Asthma is a chronic disease that affects approximately 300 million people worldwide [1], including 2.7 million Canadians, representing 7.3% of the population [2]. Asthma is largely managed in the primary care setting, where the transition from paper records to electronic medical records (EMRs) is occurring at an increasingly rapid rate. More than 90% of general practitioners in Europe, Australia and the New Zealand have and use an EMR for clinical purposes [3]. Comparatively, the uptake of EMRs by primary care physicians in Canada has been much slower. The 2010 Canadian National Physician Survey recently reported that use of EMRs by primary care physicians and specialists has increased from 10% to16% [4].

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Recognizing that EMRs are a reality for health care delivery, there is a tremendous opportunity to integrate knowledge translation tools into the EMR functionality to support evidence-based chronic disease management and performance evaluation [5]. In a limited way, EMRs are being used as a means of enabling best practices, by incorporating prompts, alerts and/or decision support. Incorporating decision support into EMRs led to a change in how physicians monitored their patients with asthma and chronic obstructive pulmonary disease (COPD) in the Netherlands [6] and an increase in pediatricians' adherence to asthma guideline recommendations in Connecticut, USA [7]. Prompting physicians to document smoking status resulted in modest improvement in guideline adherence [8]. EMRs can also facilitate the transfer of information between settings and across the continuum of care, including the ability to view, document and prescribe [9]. In addition, they can provide the opportunity for patients to track their own test results online and communicate directly with their care providers [10]. Importantly, data may be analyzed enabling reporting and benchmarking.

An integrative review of the primary care literature from 1998 to 2008 was completed to ascertain the availability of an asthma EMR, and a standardized asthma data set could not be found [11]. This study was designed to explore the feasibility of standardizing asthma elements for EMRs while meeting the need for an electronic version of the Ontario Lung Association (OLA)'s Primary Care Asthma Program (PCAP) tools (an asthma care map (ACM) and action plan (AP)) (Figures A1 and A2) for primary care sites with EMRs [12]. The purpose of the study was to determine the feasibility of integrating the ACM into different EMRs within a cross-section of primary care health care models, and to forward de-identified data on a regular basis post-collection to a central secure server for analysis and multi-level report generation facilitating patient and program evaluation, surveillance and benchmarking.

Methods

Development of the asthma electronic record (e-record)

In June 2007, an interdisciplinary e-record working group (eWG) was established to guide the development of an asthma e-record and pilot project. The eWG included nine clinicians (two respirologists, one general practitioner, one nurse practitioner and five-certified asthma educators), four information management/technology (IT) experts, two senior health care administrators and one project manager. After establishing its terms of reference, the eWG met monthly with the primary care sites via teleconference and/or in person. The eWG responsibilities included: selection of asthma data elements, data definitions, selection of pilot sites and leads, design of the pilot implementation, interpretation of results and formulation of recommendations to the Ministry of Health and Long-Term Care for implementation of an electronic ACM in primary care.

In preparation for this study, extensive networking and information exchanges took place, including meetings with provincial government, e-Health representatives and those responsible for existing health care databases and/or registries. Discussions occurred with: the Ontario Perinatal Surveillance System, electronic Child Health Network© (eCHN©); SPIRIT, a web-based data system for monitoring stroke care; xwave©, a provincial EMR vendor; P-Prompt®, an electronic service providing patient reminders for EMRs; and the provincial organization responsible for setting minimum specifications for PC EMRs (OntarioMD).

A privacy officer was consulted to ensure compliance with privacy legislation (Personal Health Information Protection) [13]. A two-day workshop on privacy legislation was attended to better understand its impact on providers and patient care and the use of an EMR. A one-day workshop on SNOMED CT® (Systematized Nomenclature of Medicine-Clinical Terms) [14] was attended in an effort to begin to understand the need for standardized terminology and standardized definitions. During this process of planning for the pilot and networking, it became evident that input from a consultant familiar with the provincial e-health issues and health informatics was needed.

The consultant brought extensive experience in the development and implementation of eCHN© and a different perspective, which prompted the eWG to revise the work plan to include a more detailed environmental scan of the pilot sites. Visits to meet with the site champions and other health care providers were organized to assess site needs and available resources, and to review study expectations and time lines. The consultant's expertise was critical in the development of standardized terminology and standardized definitions, including data schema requirements. Data schema requirements included data format (e.g. date dd/mm/yyyy), data precision (e.g. weight in kilograms to the first decimal point), data definitions (e.g. asthma severity over what period of time) and the need for a default code for situations when no data are entered, so that ''no response'' was coded properly.

Asthma care map

The source document from which the asthma e-record was developed was the 2006 revision of an evidence-based ACM. The original ACM was developed by the OLA and piloted in eight primary care sites from 2002 to 2006 [15]. The ACM captures initial assessment and medical history; risk factors, triggers and environmental controls in place and follow-up assessment. Follow-up assessment includes a summary of asthma control, review of medications, device technique, discussion on prevention, review of an AP and referrals.

Asthma e-record pilot data elements

Sixty-nine of the more than 163 data elements in the ACM were chosen by the eWG for the pilot for analysis and reporting purposes. The 69 data elements encompassed 9 broad categories which are described in Table 1. Precise definitions were developed for each of the 69 data elements based upon the Canadian Asthma Consensus Guidelines (CACG) [16] or expert opinion of the eWG members and agreed upon by consensus. Use of this data dictionary was intended to ensure consistent capture of information between EMR systems, prevent misinterpretation of data elements by programmers, and permit data collation and analysis from different EMR systems [17,18].

Study design

A five-month observational study involving primary care sites experienced in delivering PCAP (including use of the ACM and AP) commenced the first week of January, 2008. Four

Table 1. Number of data elements by category.

Data category	Number of data elements
Administrative	5
Demographics	19
Visit characteristics	4
Diagnosis (confirmed/unconfirmed)	2
Asthma control	11
Medication	4
Asthma education	4
Work-related asthma	9
Health service use	11
TOTAL	69

primary care sites, selected by the eWG to represent different health care models and vendors, were invited to participate. Both sites that used provincially approved EMRs withdrew from the study. One site expressed concern in sending de-identified data beyond their circle of care. The second site withdrew after deciding to invest in another provincial EMR vendor. The two participating primary care sites delivered the asthma care program to 27 locations representing different primary health care models, including community health care centres, family health teams and solo practitioners. Both sites used ''stand-alone'' asthma EMR systems and either scanned the electronic asthma care program patient reports and AP into the site's EMR and/or inserted paper versions as attachments into the patients' paper medical record. The ability of two stand-alone systems to forward de-identified data securely was verified prior to subject enrollment.

Consecutive asthma patients were enrolled after obtaining informed consent. Ethics approval was received from Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board, Kingston, Ontario and Western University, London, Ontario, Canada.

Data collection

Pilot sites were asked to send real-time or weekly de-identified data to a secure central server for analysis and report generation, ensuring compliance with Canadian privacy legislation. Data from one site were extracted from within the hospital's secure network and housed locally on a secure research server in accordance with established hospital IT policies and procedures for analysis and report generation. A second site forwarded data using secure socket layer connections and Virtual Private Networking interfacing. Subject data elements included a unique identifier, sex and date of birth. No personal identifiers such as name, health insurance number or hospital identifiers were collected.

Analysis

Data were merged for analysis in Statistical Analysis System (SAS) (version 9.2 SAS Institute Incorporated, Cary, NY) and summarized using descriptive statistics by site and overall.

Results

Integration of the data elements into the EMR and e-record data transfer

Both participating sites incorporated greater than 90% of the agreed-upon 69 data elements into their electronic ACM. De-identified data were forwarded from the sites on 161 visits by 130 patients, aged 36.5 ± 26.9 years (mean $\pm$ SD; range: 2–93 years) to the central secure server and successfully merged for analysis and report generation. Secure data transfer occurred on a daily and/or weekly basis. Data not captured by 1 or both site(s) included race, peak expiratory flow (PEF) (personal best), diagnosis unknown and category of medication (controller or reliever). This was due to differences in programmer interpretation of data definitions. There was inconsistent capture of site type, site location, visit type (scheduled/unscheduled) and number and type of exacerbations.

Report capabilities

Sites created their own individual patient reports and APs electronically for their primary care locations. Detailed individual site and aggregate site reports were produced for monitoring, surveillance and benchmarking purposes.

Administrative reporting

Table 2 is one example of an administrative report describing the characteristics of all adult patients by site, overall and at initial and follow-up visits.

Patient-level reporting

It was feasible to report on the majority of the 69 elements by individual patients. Figure 1 is an example of a patient summary report, providing an overview of the most recent patient visit information (current medications, spirometry results and asthma control).

Site-level reporting

Individual site and/or site aggregate reports suitable for program evaluation and outcomes monitoring were generated. Table 3 is an excerpt from a site report noting the percentage of patients whose asthma is not in control for each of the seven asthma control parameters.

Benchmarking

The data were used to report baseline measures for each site, make comparisons between sites and to report on some aspects of quality management (e.g. number of spirometry completed, patient access to and use of medication, number of patients with a confirmed diagnosis by an objective measure). Table 4 is a synopsis of adherence to asthma guidelines by site and overall.

Surveillance

By observation, it was possible to identify individuals with suspected work-related asthma by gender, age, occupation, work exposure type and relationship of asthma symptoms and work. Eleven of 131 individuals were identified as suspected work-related asthma.

Discussion

Data elements from an evidence-based ACM were successfully integrated into asthma EMRs using standardized data definitions. These electronic ACMs were used in a variety of primary care models within two regional networks servicing over 27 locations, using different EMR systems, which securely transmitted de-identified data to a central server for analysis and report generation. Detailed individual-level, site-level and aggregate site reports were created using standardized data elements. This pilot project demonstrates that it is possible to incorporate evidence-based care pathways into EMRs. If standardized terminology and data definitions are used, data may be extracted for patient outcomes monitoring, program evaluation, benchmarking, performance improvement and surveillance.

Table 2. Administrative report: patient characteristics (adult).

Initial assessment by visits	Site 1 ($n=25$)	Site 2 ($n=39$)	All sites ($n=64$)
Age (yrs)	59.4 ± 16.6	52.4 ± 21.0	55.1 ± 19.6
Sex (%)			
Female	72.0	74.4	73.4
Race (%)			
	100.0	0.0	39.1
African	0.0	2.6	1.6
Arabic	0.0	2.6	1.6
Asian	0.0	5.1	3.1
Caucasian	0.0	84.6	51.6
Other	0.0	5.1	3.1
Height (m)	1.6 ± 0.2	1.6 ± 0.1	1.6 ± 0.2
Weight (kg)	74.3 ± 24.0	77.0 ± 25.9	76.0 ± 25.0
BMI (kg/m^2)	41.6 ± 75.6	29.6 ± 8.4	34.3 ± 47.5
Method of confirmed diagnosis (%)			
Missing	68.0	76.9	73.4
≥12–15% change FEV_1 post bronchodilator	32.0	12.8	20.3
≥20% change FEV_1 10–14 days after prednisone or ICS	0.0	0.0	0.0
Methacholine challenge PC_{20} <8 mg/mL	0.0	10.3	6.3
FEV_1 (L)	2.5 ± 1.2	2.4 ± 0.9	2.4 ± 1.0
PEFR (actual) (L/min)	–	358.7 ± 156.4	358.7 ± 156.4
PEFR (personal best) (L/min)	371.6 ± 112.1	–	371.6 ± 112.1
Current smoker (%)	20.0	12.8	15.6
Ex-smoker (%)	28.0	10.3	17.2
Never smoker (%)	28.0	76.9	57.8
Follow-up assessment by visits	Site 1 ($n=15$)	Site 2 ($n=17$)	All sites ($n=32$)
Age (yrs)	58.3 ± 16.6	54.2 ± 14.7	56.1 ± 15.5
Sex (%)			
Female	73.3	88.2	81.3
Race (%)			
	100.0	0.0	46.9
Caucasian	0.0	100.0	53.1
Height (m)	1.6 ± 0.1	1.6 ± 0.1	1.6 ± 0.1
Weight (kg)	78.0 ± 15.9	87.3 ± 29.1	83.0 ± 23.9
BMI (kg/m^2)	28.9 ± 6.0	35.7 ± 9.5	32.5 ± 8.6
Method of confirmed diagnosis (%)			
Missing	53.3	52.9	53.1
≥12–15% change FEV_1 post bronchodilator	46.7	23.5	34.4
≥20% change FEV_1 10–14 days after prednisone or ICS	0.0	5.9	3.1
Methacholine challenge PC_{20} <8 mg/mL	0.0	17.6	9.4
FEV_1 (L)	2.3 ± 0.7	2.1 ± 0.8	2.2 ± 0.7
PEFR (actual) (L/min)	476.0 ± 35.4	306.3 ± 95.1	328.9 ± 106.8
PEFR (personal best) (L)	397.8 ± 77.0	–	397.8 ± 77.0
Current smoker (%)	16.7	11.8	9.4
Ex-smoker (%)	26.7	5.9	15.6
Never smoker (%)	46.7	82.4	65.6

BMI, Body mass index, FEV_1, forced expiratory volume in 1 s, ICS, inhaled corticosteroid, PC_{20}, provocative concentration of methacholine required to decrease FEV_1 by 20% from baseline, PEFR, peak expiratory flow rate. Values are mean ± SD unless otherwise stipulated.

Feasibility was demonstrated in two sites using ''stand-alone'' asthma EMRs. A flexible programming platform and in-house IT expertise facilitated integration of the data elements and definitions for this pilot project. Two other primary care sites withdrew for concerns related to privacy, security and/or to upgrade to a new vendor. EMR implementation is a complex task with multiple barriers to overcome [9,18–21]. Cresswell et al. [22] described the implementation of a national procured electronic health system with a focus on interoperability. Similar to our experience, these investigators identified that successful implementation required an ability to customize software to meet the needs of individual sites. Providers need a robust EMR that not only performs technically, but is flexible enough to meet the needs of a variety of clinical settings [19,20].

The majority of the ACM elements were incorporated by both participating sites into their existing asthma e-records and data were captured on the majority of the predefined parameters. Reasons for the lack of capture or inconsistent capture were related to differences in clinical care practices (e.g. not routinely collecting personal best PEF), limited funding for sites to program software changes, differences in software programming and some miscommunication/misunderstanding regarding the data definitions.

As noted in other successful registries, standardized IT terms and definitions were paramount to enable data

Adult Asthma Clinic
Patient Summary Report

Name:	Jane Doe
CR#:	1234567
D.O.B:	Jan 18, 1989
HI#:	1234567890
Age:	23
Address:	ON

Jan 02, 2013
Reason for Visit/Referral: Scheduled 6 month visit

Dear Dr. John Smith

Thank you for your referral. The following information on Jane Doe was obtained during their asthma assessment.

Asthma Diagnosis Status: Confirmed Date: Sep 2012

Objective measures: ≥12-15% change in FEV_1 post bronchodilator (min. 180mL)

Asthma/Allergy History
- Personal History of: Food [peanut]
- Skin Prick Test: Yes Date: Feb 2000 Positive for dust mites, cat, tree/grass/weed pollen

Environment and Triggers

Risk factors	Sinusitis
Irritant triggers	Changes in weather
Allergic triggers	Cats, tree/grass/weed pollen, dust mites
Exposed to	Carpets (dust mites), cats

Medications
Controller: fluticasone 125 mcg 2 puffs bid
Reliever: salbutamol 100 mcg 1 or 2 puffs q4h prn

Current Control Status: Partially Controlled [Yellow Zone]

Physical activity limited	Yes
Needs reliever	No
Dyspnea, cough, wheeze, or chest tightness	No
School/work absence since last visit	No
Nighttime symptoms	2/wk
FEV_1 or PEFR ≤ 90% predicted or personal best	Yes
Exacerbations since last visit	No

Objective Measures

Predicted FEV_1	5.42 L	**Last FEV_1**	4.8 L	**FEV_1**	89 % predicted
		Last FVC	6.2 L	**FEV_1/FVC**	77 %
Predicted PEFR	682 L/min	**Last PEFR**	500 L/min	**PEFR**	86 % predicted
Personal Best PEFR	580 L/min				

FEV_1= forced expiratory volume in 1 second, PEFR= peak expiratory flow rate, FVC= forced vital capacity

Education
- Reviewed: Definition of asthma, Medications, Adherence to medication, Triggers
- Action Plan: Written (copy attached for your approval)

Assessment and Plan
Discussed the possibility of finding her cat a new home. Patient agreed to vacuum on a weekly basis as her rental unit contains carpets. Her device technique was optimal with the MDI and spacer. Return appointment is scheduled in 4 weeks. Please call if you have any questions or concerns.

Figure 1. Example patient level report.

Table 3. Site report.

Initial patient assessment	Site 1 ($n = 30$)	Site 2 ($n = 79$)	All sites ($n = 109$)
Asthma in control by each parameter (%)	6.7	25.3	20.2
No physical activity limitation	50.0	41.8	44.0
Needs reliever <4 doses/wk	26.7	32.9	31.2
Daytime symptoms <4 days/wk	36.7	63.3	56.0
Night-time symptoms <1 night/wk	56.7	53.2	54.1
No exacerbations since last visit	33.3	48.1	44.0
$FEV_1 \geq 90\%$ predicted or personal best	23.3	43.0	37.6

FEV_1, Forced expiratory volume in 1 s.

Table 4. Benchmarking report.

Initial assessment (by visits)	Site 1 ($n = 30$)	Site 2 ($n = 79$)	All sites ($n = 109$)
Have a reliever (%)	83.3	67.1	71.6
Use a controller (%)	70.0	79.7	77.1
Have an AP (%)	43.3	10.1	19.3
AP was revised (%)	33.3	1.3	10.1
AP was reviewed (%)	43.3	3.8	114.7
Demonstrate optimal device technique (%)	30.0	86.1	70.6
Referred to other asthma service (%)	16.7	1.3	5.5
Referred to (%)			
Asthma education	3.3	0.0	0.9
Specialist	6.7	0.0	1.8
Other	9.9	0.0	2.7

merging, analysis and reporting [23]. The success of this pilot was dependent upon precise data format definitions (e.g. dd/mmm/yyyy), precision (e.g. two decimal points) and clarification of time intervals for frequency parameters (e.g. ensured consistency across systems). In this project, the eWG achieved consensus on a set of data definitions. To our knowledge, there is no existing data definition standard for respiratory medicine. As the basis for our data definitions, we utilized clinical parameters and definitions reflected in the CACG [24] and work-related asthma definitions developed by experts in occupational asthma [25]. We support the view expressed by other authors that improvements in the quality of data would be facilitated by a federal health information interoperability standard, agreements for use of standardized nomenclatures across jurisdictions, standardized methods for documentation, including clinical pathways that support the uptake of practice guidelines and the financial support for implementation and sustainability [8,21,26].

Demonstrating the feasibility of integrating guideline-based tools, securely transmitting demographic and performance indicators, and creating outcome reports at the patient, site, and program level are foundational elements for the creation of an asthma registry. Elements of our program development were guided by the Niday Perinatal Database in Ontario, Canada. This database captures the spectrum of perinatal care with 90 defined patients elements and reports on 96% of Ontario births; providers are able to access real-time population based data, permitting inter-hospital/health unit comparisons for benchmarking and performance improvement [22].

There were several limitations in this feasibility pilot. The study occurred over a five-month period of time, resulting in a brief data collection time line and small sample size from only two EMR systems. Since both sites used ''stand-alone'' asthma EMR systems, we were not able to test feasibility in a certified provincial EMR. Additional funding and time would have been required to conduct a similar pilot using multiple provincial EMR vendors with standardized data elements. Lack of financial resources is commonly cited as a barrier to EMR implementation [20]. The asthma program and electronic charting were delivered/completed by Certified Asthma/Respiratory Educators in this pilot project. While this level of detailed asthma charting is currently occurring (using paper tools) in over 150 PCAP locations in Ontario, it may not be readily adopted by other professionals/providers in other primary care settings.

A number of challenges were encountered and lessons learned. Most eWG members were not expert in IT and management, meaning substantial time was required to understand the technical needs of the project. Gaps in standardized clinical definitions exist. For example, national [24] and international guidelines [27] for asthma control definitions vary slightly and a universally accepted definition is lacking. Multi-level reports were feasible and informative, but labor intensive and expensive to produce manually. Automation of report generation would facilitate performance measurement, benchmarking, surveillance and enable the establishment of an asthma registry.

A key success of this pilot project was achieving consensus surrounding data elements and clinical definitions that facilitated consistent data capture. In 2008, a number of these data elements and definitions agreed upon by the eWG were endorsed by the Government of Ontario's e-health agency responsible for setting minimum specifications for primary care vendors and for standards in the province of Ontario (OntarioMD Spec 3.02).

Incorporating an evidence-based ACM into an electronic format for use by health care providers was feasible. Two sites were able to send de-identified data from 27 locations to a central secure server for analysis. Reporting on asthma indicators in primary care using different EMRs is also feasible. If standardized data elements, definitions and terminology are used, EMR data captured at the point of care may be used not only for individual patient outcomes monitoring, but also for performance evaluation, surveillance and benchmarking. A national strategy endorsing a certification process for standardized definitions and terminology is required for EMRs.

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Declaration of interest

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Appendix

Asthma Care Map for Primary Care

Patient's Name: _____
Date: DD / MM / YYYY **DOB:** DD / MM / YYYY

Initial Assessment and Dx *(mark 'x' if yes)*

Asthma Diagnosis:

☐ ***Confirmed*** (Hx, physical, and objective measures) Date: DD / MM / YYYY (attach spirometry/PEF)
- ☐ ≥ 12-15% change in FEV_1 post bronchodilator (min. 180 mL) or
- ☐ ≥ 20 % change in FEV_1 after 10-14 day course of prednisone or ICS trial (min. 250 mL) or
- ☐ 20% diurnal variation of FEV_1/Peak Flow; 20% change post-bronchodilator or over time or
- ☐ Methacholine challenge: 20% reduction in FEV_1 [PC20] <8mg/mL.

☐ ***Suspected*** (need objective evidence, see above) DD/ MM/ YYYY

Note: if unable to perform spirometry, evidence of clinical benefits from acute bronchodilator therapy OR anti-inflammatory treatment should be documented_____

Severity:

☐ Hospitalized ever, total number of times_____
- ☐ Recent (< 2 years)
- ☐ Remote (>2 years)

☐ ED visits ever, total number of times_____
- ☐ Recent (< 2 years)
- ☐ Remote (>2 years)

☐ Near fatal episode (Coma, Intubated, ICU,↑CO_2), Total number of times: _____
- ☐ Recent (< 2 years)
- ☐ Remote (>2 years)

☐ Prednisone use ever, Total number of times: _____

☐ FEV_1, or PEF< 60% predicted

Allergy Hx: See page 2 for detail

☐ Conjunctivitis ☐ Rhinitis ☐ Eczema ☐ Food_____
☐ Anaphylaxis ☐ Medication _____

Skin prick test: DD / MM / YYYY

☐ Negative ☐ Positive for:
☐ Cats ☐ Dogs ☐ Dust/dust mites ☐ Feathers ☐ Mould ☐ Tree/grass/weed pollen
Other_____

Family Hx of allergy or asthma:

☐ Parent ☐ Sibling ☐ Grandparent

Smoking Hx:

☐ Non-Smoker ☐ Ex-smoker, quit when? DD/ MM/ YYYY Pack Years:_____(packs/day x # yrs smoked)
☐ Current-smoker, number of cigarettes you smoke/day on days you smoke_____
☐ Smoke within 5 minutes of wakening ☐ within 6-30 min. ☐ 31- 60 min. ☐ more than 60 min. ☐ don't know

Smoking cessation: consider Smokers Helpline @www.smokershelpline.ca or call 1-817-513-5333.

Occupation Hx:

Occupation(s)_____ ☐ Occupational Work Exposure(s)_____
Relation between asthma symptoms and work:
☐ started at work ☐ started within days of an accidental spill or fire ☐ worsened at work
☐ chest symptoms (cough/wheeze/chest tightness/shortness of breath) different (less) on days off
☐ chest symptoms different (less) on holidays
☐ Occupational Exposure Questionnaire completed

Issues and plans:

Signature: _____**Professional Designation:**_____

Figure A1. Asthma care map (reprinted with permission from the Ontario Lung Association).

Asthma Care Map for Primary Care

Patient's Name: _____
Date: DD / MM / YYYY **DOB:** DD / MM / YYYY

Risk Factors	***Irritant Triggers***	***Allergic Triggers***
☐ Beta-blocker	☐ Changes in weather	☐ Cockroach
☐ Exposure to second-hand smoke:	☐ Chemicals	☐ Dust
☐ Home	☐ Cold air	☐ Dust mites
☐ School/work	☐ Colds/chest infections	☐ Mould
☐ Social	☐ Emotions/stress	☐ Pets
☐ GERD	☐ Exercise	☐ Pollens/trees /grasses
☐ Menses	☐ Fireplace/wood stove	☐ Other
☐ Non-steroidal anti-inflammatory	☐ Gas stove	
☐ Pregnancy	☐ Outdoor pollution	
☐ Sinusitis	☐ Ozone	
☐ Other	☐ Windy day	

Trigger Exposure (Personal Exposure)	*Date no longer exposed*	***Environmental Controls in Place***	*Date put in place*
	DD / MM / YYYY		DD / MM / YYYY
☐ Birds		☐ Air conditioning in summer	
☐ Carpets and/or stuffed animals (dust mites)		☐ Central vacuum	
☐ Cats		☐ Dehumidifier	
☐ Dogs		☐ Hardwood /tile floors	
☐ Exposure to second-hand smoke		☐ Heat exchanger	
☐ Occupational exposure to fumes, dusts, animals		☐ Humidifier in winter (20-50% humidity desirable)	
☐ Other		☐ Mattress cover	
		☐ Pillow covers	
		☐ Regular furnace filter change	
		☐ Wash linens weekly in hot water	
		☐ Wash pets once a week	
		☐ Wear mask or respirator as needed	

Identified Barriers:

☐ Adherence	☐ Language
☐ Cultural issue	☐ Literacy
☐ Financial issues	☐ Lack of drug plan
☐ Lack of family/friend/school/work support	☐ Other

Client has communicated diagnosis/asthma management plan with:
☐ Family ☐ Friends ☐ Teachers/co-workers ☐ Health care professionals ☐ Other_____

Issues and Plan:

Signature: _____ **Professional Designation:** _____

Figure A1. Continued.

Asthma Care Map for Primary Care

Patient Name:_____

Follow-up Assessments: **Predicted FEV_1:**_____**L, Personal Best PEFR:** _____**L/min**

Circle: S/U, Yes/No, or enter value /comment; note additional dated comments below; initial sections completed

Date: **Scheduled or Urgent (S/U)**	DD / MM / YYYY S	U	DD / MM / YYYY S	U	DD / MM / YYYY S	U	DD / MM / YYYY S	U
Asthma Control	***(yes = uncontrolled asthma)***							
• Physical activity limited due to asthma	Y	N	Y	N	Y	N	Y	N
• Needs Reliever (≥ 4 doses/wk – yes; < 4/wk – no)	Y	N	Y	N	Y	N	Y	N
• Dyspnea, cough, wheeze, or chest tightness (≥ 4 days/wk – yes; < 4 days/wk – no)	Y	N	Y	N	Y	N	Y	N
• School/work absence since last visit	Y	N	Y	N	Y	N	Y	N
• Night time symptoms (>1/wk – yes; none – no)	Y	N	Y	N	Y	N	Y	N
• FEV_1 or PEFR ≤ 90% predicted or personal best	Y	N	Y	N	Y	N	Y	N
• Exacerbations since last visit (hospital admission, ED visit, Walk-in Clinic)	Y Date:_____	N	Y Date:_____	N	Y Date:_____	N	Y Date:_____	N
Spirometry/PEFR:								
• Spirometry (min. 2x/yr)	Y	N	Y	N	Y	N	Y	N
• Print out attached	Y	N	Y	N	Y	N	Y	N
• PEFR (every visit),	Y	N	Y	N	Y	N	Y	N
• Value (best of 3)	Litres/min		Litres/min		Litres/min		Litres/min	
Review: • Definition of asthma	Y	N	Y	N	Y	N	Y	N
• Medications	Y	N	Y	N	Y	N	Y	N
• Adherence to medications	Y	N	Y	N	Y	N	Y	N
• Device technique optimal	Y	N	Y	N	Y	N	Y	N
Prevention: • Smoking cessation	Y	N	Y	N	Y	N	Y	N
• Immunization (flu)	Y	N	Y	N	Y	N	Y	N
• Triggers	Y	N	Y	N	Y	N	Y	N
• Environmental control	Y	N	Y	N	Y	N	Y	N
Management: • Coping strategies	Y	N	Y	N	Y	N	Y	N
• Action plan: written	Y	N	Y	N	Y	N	Y	N
• Action plan: revised	Y	N	Y	N	Y	N	Y	N
• Action plan: reviewed	Y	N	Y	N	Y	N	Y	N
Asthma Medications:								
• **Reliever**_____	Y	N	Y	N	Y	N	Y	N
• **Controller**_____	Y	N	Y	N	Y	N	Y	N
• _____	Y	N	Y	N	Y	N	Y	N
_____	Y	N	Y	N	Y	N	Y	N
_____	Y	N	Y	N	Y	N	Y	N
Medication changes?	Y	N	Y	N	Y	N	Y	N
Referrals: • Asthma Education • Specialist • Other								
Signature and Professional Designation								

Figure A1. Continued.

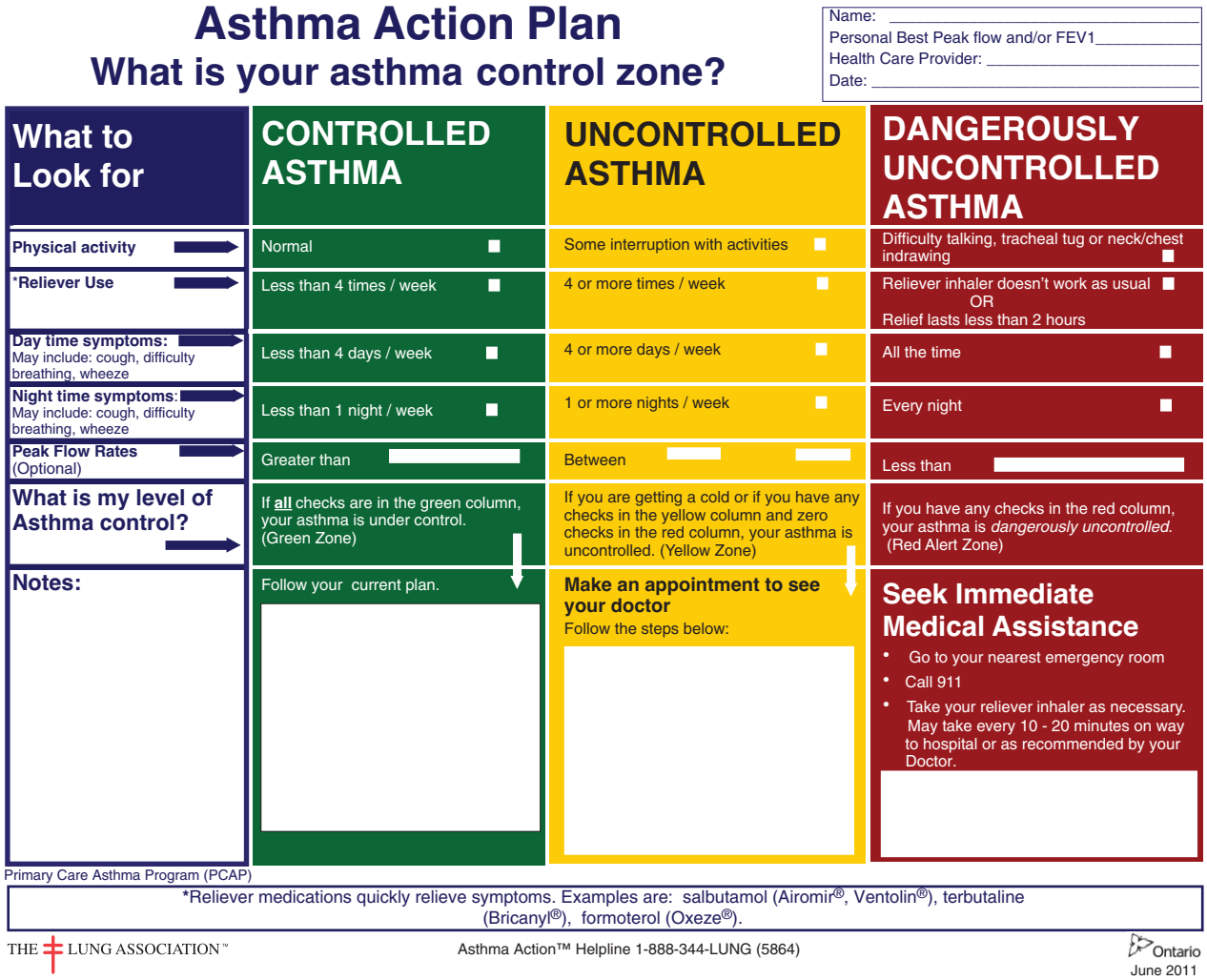

Figure A2. Asthma Action Plan (reprinted with permission form the Ontario Lung Association).