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Clinical Best
Practice Guidelines

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Adult Asthma Care: Promoting Control of Asthma

Second Edition

RNAO
Registered Nurses' Association of Ontario
L'Association des infirmières et infirmiers
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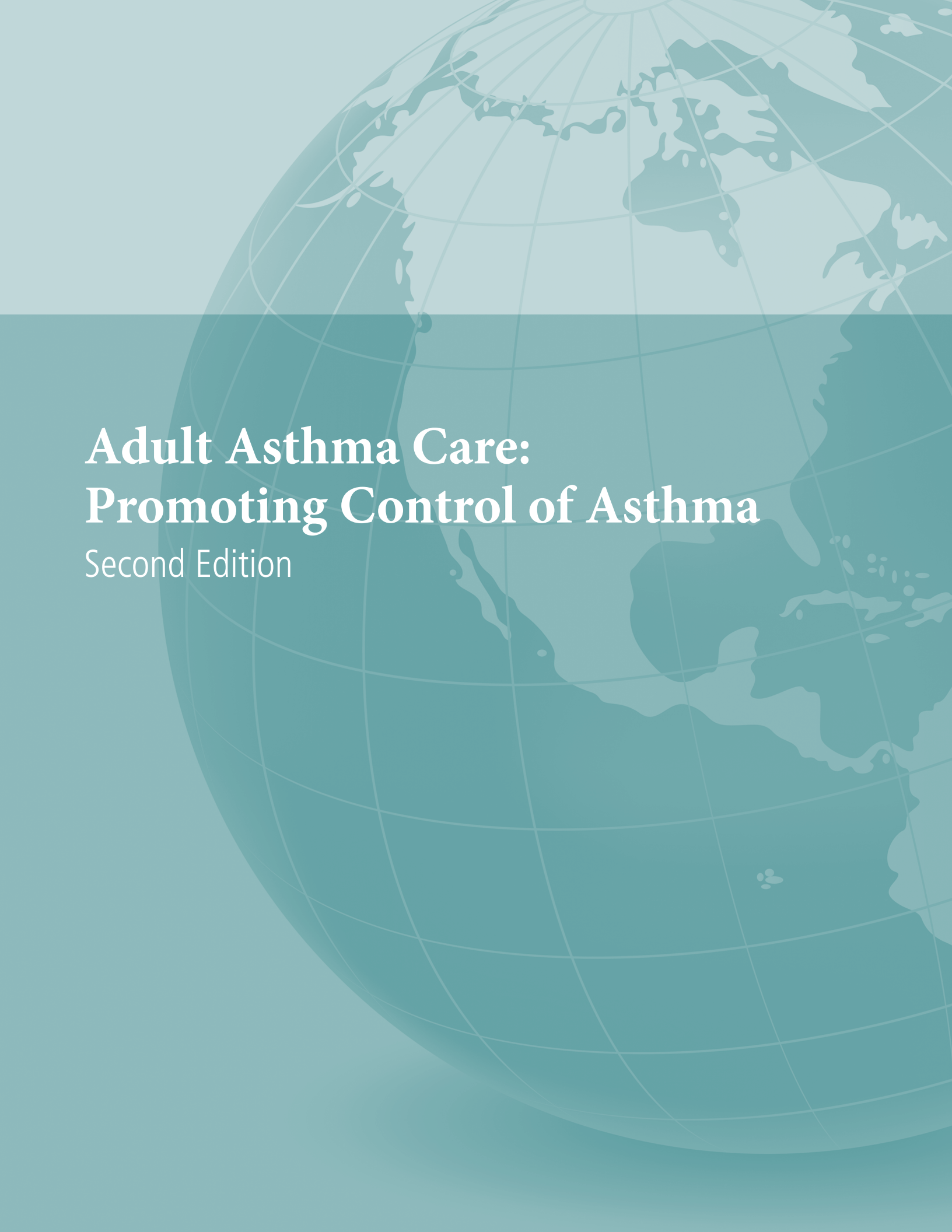

Adult Asthma Care: Promoting Control of Asthma

Second Edition

Greetings from Doris Grinspun,

Chief Executive Officer, Registered Nurses' Association of Ontario

The Registered Nurses' Association of Ontario (RNAO) is delighted to present the second edition of the clinical Best Practice Guideline *Adult Asthma Care: Promoting Control of Asthma*. Evidence-based practice supports the excellence in service that health professionals are committed to delivering every day. RNAO is delighted to provide this key resource.

We offer our heartfelt thanks to the many stakeholders who are making our vision for best practice guidelines a reality, starting with the Government of Ontario, for recognizing RNAO's ability to lead the program and for providing multi-year funding. For their invaluable expertise and leadership, I wish to thank Dr. Irmajean Bajnok, former Director of the RNAO International Affairs and Best Practice Guidelines Centre; Dr. Valerie Grdisa, Director of the RNAO International Affairs and Best Practice Guidelines Centre; and Dr. Michelle Rey, RNAO's Associate Director of Guideline Development. I also want to thank the co-chairs of the expert panel, Dr. Lisa Cicutto (Director of Community Research, National Jewish Health/Director, Clinical Science Graduate Program/Professor, University of Colorado Denver) and Delanya Podgers (Asthma Program Nurse Practitioner, Kingston General Hospital), for their exquisite expertise and stewardship of this Guideline. Thanks also to RNAO staff Megan Bamford (Guideline Development Lead), Andrea Stubbs (Guideline Development Project Coordinator), Tanvi Sharma (Lead Nursing Research Associate), Nafsin Nizum, Julie Blain and Lisa Ye (Nursing Research Associates); and the rest of the RNAO Best Practice Guidelines program team, for their intense work in the production of this new Guideline. Special thanks to the members of the RNAO expert panel for generously providing their time and expertise to deliver a rigorous and robust clinical resource. We couldn't have done it without you!

Successful uptake of best practice guidelines requires a concerted effort from educators, clinicians, employers, policy-makers, and researchers. The nursing and health-care communities, with their unwavering commitment and passion for excellence in patient care, have provided the expertise and countless hours of volunteer work essential to the development and revision of each Best Practice Guideline. Employers have responded enthusiastically by nominating best practice champions, implementing guidelines, and evaluating their impact on patients and organizations. Governments at home and abroad have joined in this journey. Together, we are building a culture of evidence-based practice.

We invite you to share this Guideline with your colleagues from other professions, because we have so much to learn from one another. Together, we must ensure that the public receives the best possible care every time they come into contact with us—making them the real winners in this important effort!

Doris Grinspun, RN, MSN, PhD, LLD (Hon), O. ONT.
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How to Use This Document

This nursing Best Practice Guideline (BPG)[G*] is a comprehensive document that provides resources for evidence[G]-based nursing practice. It is not intended to be a manual or "how to" guide, but rather a tool to guide best practices and enhance decision-making for nurses[G] and other health-care providers[G] working with adults living with asthma[G]. The Guideline should be reviewed and applied in accordance with both the needs of individual organizations or practice settings, and the needs and preferences of persons and their families accessing the health system for care and services. In addition, the Guideline provides an overview of appropriate structures and supports for providing the best possible evidence-based care.

Nurses, other health-care providers, and administrators who lead and facilitate practice changes will find this document invaluable for developing policies, procedures, protocols, educational programs and assessments, interventions, and documentation tools. Nurses and other health-care providers in direct care will benefit from reviewing the recommendations and the evidence that supports them. We particularly recommend that practice settings adapt these guidelines in formats that are user-friendly for daily use.

If your organization is adopting this Guideline, we recommend that you follow these steps:

1. Assess your nursing and health-care practices using the recommendations in this Guideline,
2. Identify which recommendations will address needs or gaps in services, and
3. Develop a plan for implementing the recommendations.

Implementation resources, including the RNAO T*oolkit: Implementation of Best Practice Guidelines* (2012b) are available at www.RNAO.ca.

All of the RNAO BPGs are available for download on the RNAO website at http://RNAO.ca/bpg. To locate particular BPGs, search by keyword or browse by topic.

We are interested in hearing how you have implemented this Guideline. Please contact us via our website at http://RNAO.ca/contact to share your story.

* Throughout this document, terms marked with a superscript G ([G]) can be found in the Glossary of Terms (**Appendix A**).

Purpose and Scope

Best practice guidelines are systematically developed statements designed to assist nurses working in partnership with persons and their families to make decisions about health care and services (Field & Lohr, 1990). This nursing Best Practice Guideline (BPG) is intended to replace the RNAO BPG *Adult Asthma Care Guidelines for Nurses: Promoting Control of Asthma* (2004a) and its supplement (2007a). It is to be used by nurses and other members of the interprofessional health-care team[G] to enhance the quality[G] of their practice pertaining to the assessment and management of adult asthma, ultimately improving clinical and health outcomes through the use of evidence-based practices.

In October 2015, RNAO convened an expert panel consisting of a group of individuals with expertise in the clinical topic of adult asthma care. The RNAO expert panel was interprofessional in composition, comprising individuals holding clinical, administrative, academic, and research positions in a range of health-care organizations, practice areas, and sectors.

The expert panel established the purpose and scope of this Guideline. The purpose of this Guideline is to provide nurses and other health-care providers with **evidence-based recommendations of foundational asthma care for adults with a diagnosis of asthma**. The expert panel adopted the diagnostic and control criteria for asthma in adults outlined in the *Canadian Thoracic Society 2012 Guideline Update: Diagnosis and Management of Asthma in Preschoolers, Children and Adults* (CTS 2012 Guideline Update; Lougheed et al., 2012) (http://www.respiratoryguidelines.ca/sites/all/files/2012_CTS_Guideline_Asthma.pdf). The recommendations in this Guideline apply to adults who have received an established or confirmed diagnosis of asthma from an appropriate health-care provider, as defined by the Canadian Thoracic Society (CTS) (Lougheed et al., 2012). See **"Diagnosing Asthma"** under Background Context on page 22, and **Table 1** on page 25.

This Guideline aims to assist nurses and other health-care providers help persons with asthma achieve asthma control, thereby minimizing and, ideally, preventing morbidity and mortality and improving quality of life. This Guideline provides best practice recommendations in three main areas:

- **Practice recommendations**[G] are directed primarily at nurses who provide direct care to persons with asthma across the spectrum of care, including (but not limited to): primary care, acute care, home-care settings, alternative levels of care/complex continuing care, and long-term care. The secondary audience of the practice recommendations includes other members of the interprofessional health-care team who collaborate with nurses to provide comprehensive care (e.g., respiratory therapists, physiotherapists, etc.).
- **Education recommendations**[G] are directed at those who are responsible for the education of health-care providers—for example, educators, quality improvement teams, managers, administrators, and academic and professional institutions. These recommendations outline the core content and training strategies required for entry-level health-care programs, ongoing education, and professional development. The primary audience includes those who provide education to nurses, and the secondary audience includes those who provide education to other members of interprofessional health-care teams.
- **Organization and policy recommendations**[G] apply to managers, administrators, and policy-makers who are responsible for developing policy or securing supports required within health-care organizations that enable the implementation of best practices.

For optimal effectiveness, recommendations in these three areas should be implemented together.

The scope of this Guideline includes effective assessment and management interventions for adults (defined as persons aged 18 and older) who have a diagnosis of asthma. Several populations and conditions are beyond the scope of this Guideline. These include:

- Assessment and management recommendations specific to children. These are covered in the RNAO BPG *Promoting Asthma Control in Children* (2004b) and its supplement (2008).
- Asthma–COPD overlap syndrome. The expert panel was cognizant of the relationship between asthma and chronic obstructive pulmonary disease[G] (COPD). Asthma and COPD can co-exist, in a condition known as asthma–COPD overlap syndrome[G] (Global Initiative for Asthma [GINA], 2015). However, due to the complexities involved in working with this population, the expert panel decided that this clinical issue was beyond the scope of this Guideline. Assessment and management interventions specific to COPD are covered in the RNAO BPG *Nursing Care of Dyspnea: The 6th Vital Sign in Individuals with Chronic Obstructive Pulmonary Disease* (2005) and its supplement (2010a).
- Assessment and management recommendations specific to asthma in pregnancy.
- Pharmacological management of asthma. While pharmacological interventions are essential to achieving asthma control, they are outside the scope of this Guideline. Pharmacological management is comprehensively addressed in the *CTS 2012 Guideline Update* (Lougheed et al., 2012).
- Work-related asthma. While it is acknowledged that work-related asthma[G] (WRA) affects many adults with asthma, recommendation statements specific to WRA have not been developed. However, many of the recommendations are relevant for health-care providers, including occupational health nurses, who practise with individuals in this population.

This Guideline is designed to apply to all domains of nursing practice—including clinical, education, and administration, and across health-care settings (including acute care, rehabilitation, long-term care, out-patient clinics, community care, and home care). It is acknowledged that achieving control of asthma requires coordination and communication among health-care providers as well as a partnership between the person with asthma and the interprofessional health-care team. In addition, the needs and preferences of the person should be considered, and the personal resources available should be assessed and incorporated into the plan of care.

Various factors will affect the successful implementation of the recommendations in this Guideline across settings. Individual nurses' skills and knowledge, and their professional judgment are shaped over time by education and experience, and thus individual competencies vary. In all cases where the care needs of a person lie outside of the scope of a nurse's professional knowledge, the nurse should consult with other members of the interprofessional health-care team (College of Nurses of Ontario [CNO], 2011). Government legislation, organizational policies and procedures, and the client population will also affect the implementation of this Guideline.

For more information about this Guideline, including the Guideline development process and the systematic review[G] and search strategy, refer to **Appendices B** and **C**.

Use of the Term "Person[G]" in This Guideline

In this Guideline, the terms "person," "persons," and "people" are used to refer to adults with an asthma diagnosis with whom a health-care provider is engaged in a therapeutic relationship. The expert panel has determined these terms to be equivalent to the terms "patient," "client," and "resident" that are used across health-care settings. Exceptions to the use of this terminology occur in discussions of literature (e.g., studies, reports, etc.) that use alternative terms.

Use of the Term "At Every Encounter" in This Guideline

In this Guideline, the term "at every encounter" is used to refer to any interaction between a health-care provider and the person with asthma within community care, home care, and ambulatory-care settings (e.g., primary care clinics, emergency departments). In institutionalized-care settings (e.g., hospitals, long-term care), the term may refer to interactions that occur on admission, or when the person experiences a change in health status, care needs, or location (either within, between, or across settings).

With regard to the assessment recommendations, in institutional settings an assessment of the person's asthma symptoms should be completed at every *interaction* (e.g., at the start of each shift) at a minimum. A complete assessment of the person's asthma control and future risk should be based on clinical context and professional judgment.

Use of the Terms "Asthma Control[G]" and "Uncontrolled Asthma[G]" in this Guideline

The RNAO expert panel adopted the control criteria for asthma outlined in the *CTS 2012 Guideline Update* (Lougheed et al., 2012), which characterizes a person's asthma as being either *controlled or uncontrolled* (see **Table 2** in **Recommendation 1.2a**). Therefore, throughout this Guideline, asthma is referred to as being either controlled or uncontrolled. Exceptions to the use of this terminology occur in discussions of literature (e.g., studies, reports, etc.) that use alternative cut-points (i.e., frequencies or values) or terms to define asthma control status (e.g., poorly controlled, poorer control, etc.).

Interpretation of Evidence

Levels of evidence are assigned to study designs to rank how well particular designs are able to eliminate alternate explanations of the phenomena under study. The higher the level of evidence, the greater the likelihood that the relationships presented between the variables are true. Levels of evidence do not reflect the merit or quality of individual studies.

For the recommendations in this Guideline, the highest level evidence that aligns most closely with the recommendation statement is assigned. In cases where there are multiple studies of various design with similar findings, the studies with the highest level of evidence are assigned (and cited) in support of the recommendation.

In some cases, recommendations are assigned more than one level of evidence. This reflects the varied study designs that support the multiple components of a recommendation. For transparency, the level of evidence for each component of the recommendation statement is identified in the discussion of evidence.

In addition to the levels of evidence, the methodological quality of each of the studies cited in the discussion of evidence is measured and categorized as strong, moderate, or weak based on reliable instruments and independent reviewers. The quality of a study is described within the discussion of evidence.

LEVEL	SOURCE OF EVIDENCE
Ia	Evidence obtained from meta-analysis[G] or systematic reviews of randomized controlled trials[G], and/or synthesis of multiple studies primarily of *quantitative* research.
Ib	Evidence obtained from at least one randomized controlled trial.
IIa	Evidence obtained from at least one well-designed controlled study[G] without randomization.
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study[G], without randomization.
III	Synthesis of multiple studies primarily of *qualitative* research[G].
IV	Evidence obtained from well-designed non-experimental observational studies, such as analytical studies[G] or descriptive studies[G], and/or qualitative studies.
V	Evidence obtained from expert opinion or committee reports, and/or clinical experiences of respected authorities.

Adapted from the Scottish Intercollegiate Guidelines Network (Scottish Intercollegiate Guidelines Network [SIGN], 2011) and Pati (2011).

For information on the systematic review process and how studies are appraised for quality, see **Appendix C.**

Summary of Recommendations

This Guideline replaces the RNAO BPG *Adult Asthma Care Guidelines for Nurses: Promoting Control of Asthma* (2004a) and its supplement (2007a).

+ The recommendation and supporting evidence were updated with systematic review evidence.
NEW A new recommendation was developed based on evidence from the systematic review.

PRACTICE RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
1.0 Assessment	Recommendation 1.1: At initial encounter, identify adults with an asthma diagnosis by reviewing the health record for an established asthma diagnosis, supported by the use of objective lung function measurements, and by asking two questions: 1. Have you ever been told by a health-care provider that you have asthma? 2. Have you ever used a puffer/inhaler or asthma medication for breathing problems?	V	+
	Recommendation 1.2a: At every encounter, assess the person's **current** level of asthma control according to the following criteria: ■ Need for a fast-acting beta$_2$-agonist < 4 doses/week (including for exercise); ■ Daytime symptoms < 4 days/week; ■ Nighttime symptoms < 1 night/week; ■ Normal physical activity levels; ■ Mild, infrequent exacerbations; ■ No absences from work or school; ■ Forced expiratory volume in first second (FEV$_1$) or peak expiratory flow (PEF) ≥ 90% of personal best*‡; ■ Diurnal PEF variation < 10–15%*‡; and ■ Sputum eosinophils < 2–3%*‡. * Indicates important objective information for a complete assessment of asthma control, but may not be available. ‡ Performed and interpreted within health-care-provider scope of practice (including appropriate knowledge and skills) and in alignment with organizational policies and procedures.	V	+

PRACTICE RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
1.0 Assessment	Recommendation 1.2b: For adults with uncontrolled asthma, determine whether the person is currently experiencing an asthma exacerbation and, if so, the severity and need for urgent medical attention.	V	+
	Recommendation 1.3: At every encounter, assess the person's risk of future asthma exacerbations according to the following criteria: ■ Current control of asthma, ■ Severe exacerbations experienced, ■ Exacerbations requiring systemic corticosteroids, and ■ Use of emergency care or hospitalizations for asthma.	V	NEW
	Recommendation 1.4: At every encounter, identify factors affecting the complexity of asthma management for the person, including age, sex, smoking habits, social determinants of health, triggers, and co-morbidities.	IV	NEW
2.0 Planning	Recommendation 2.1: Develop an individualized, person-centred asthma education plan that addresses the following: ■ Learning needs (level of evidence = Ib), ■ Culture (level of evidence = Ib), ■ Health literacy (level of evidence = IV), and ■ Empowerment (level of evidence = IV).	Ib, IV	NEW
3.0 Implementation	Recommendation 3.1a: Provide asthma education as an essential component of care.	Ia	+

PRACTICE RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
3.0 Implementation	Recommendation 3.1b: Educate the person on the essential skills and self-management of asthma based on the person's learning needs, including: ■ Pathophysiology of asthma, ■ Medications and device technique, ■ Self-monitoring, ■ Action plans, ■ Trigger identification and management, and ■ Smoking cessation (if applicable).	Ib	✚
	Recommendation 3.2: Evaluate non-pharmacological interventions for effectiveness and for potential interactions with pharmacological interventions.	V	NEW
	Recommendation 3.3a: At every encounter, actively educate on correct inhaler device technique through observation, feedback, physical demonstration, and written instructions.	Ib	✚
	Recommendation 3.3b: Engage the person with asthma in shared decision-making with regard to the selection of an inhaler device.	Ia	NEW
	Recommendation 3.3c: Educate the person with asthma on the difference between controller and reliever medications, their indications, and their potential side effects.	V	✚
	Recommendation 3.4: Where appropriate, assist and educate persons with asthma to measure their peak expiratory flow.	V	✚

PRACTICE RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
3.0 Implementation	Recommendation 3.5: To support self-management, collaborate with the person with asthma to develop and review a documented asthma action plan (level of evidence = Ib), in one or a combination of the following formats: ■ In writing, on paper (level of evidence = Ib), ■ Electronically (level of evidence = V), or ■ Pictorially (level of evidence = IIa).	Ib, IIa, V	+
	Recommendation 3.6: Provide integrated asthma self-management support to adults with uncontrolled asthma who are at risk for severe exacerbations through multiple modalities/formats, such as: ■ Home-care visits (level of evidence = Ib), or ■ Telehealthcare (level of evidence = Ia).	Ia, Ib	NEW
	Recommendation 3.7: Refer and connect persons with asthma to a: ■ Primary care provider, and ■ Certified asthma educator or certified respiratory educator.	IV	+
4.0 Evaluation	Recommendation 4.1: At every encounter, evaluate the effectiveness of the overall plan of care in achieving asthma control.	V	NEW

EDUCATION RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
5.0 Education	Recommendation 5.1a: Develop multifaceted education programs that reinforce standardized, evidence-based asthma care for: ■ Health-care providers (level of evidence = IIb), and ■ Students entering health-care professions (level of evidence = V).	IIb, V	NEW

EDUCATION RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
5.0 Education	Recommendation 5.1b: Implement evidence-based education programs for health-care providers and students entering health-care professions that are facilitated by knowledgeable and skilled educators, and that focus on the core competencies of asthma care.	V	NEW
	Recommendation 5.2: Asthma educators obtain and maintain a certified asthma educator or certified respiratory educator designation.	V	+
	Recommendation 5.3: Provide a quality assurance program and standardized training for health-care providers who perform spirometry.	V	NEW

ORGANIZATION AND POLICY RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
6.0 Organization and Policy	Recommendation 6.1: Organizations establish a corporate priority focused on the integration and evaluation of best practice asthma care across all care settings.	V	NEW
	Recommendation 6.2: Organizations provide the resources and professional training necessary to integrate best practices for the assessment and management of adult asthma across all care settings.	V	NEW

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Declarations of interest that might be construed as constituting an actual, potential, or apparent conflict were made by all members of the Registered Nurses' Association of Ontario expert panel, and members were asked to update their disclosures regularly throughout the Guideline development process. Information was requested about financial, intellectual, personal, and other interests, and documented for future reference. No limiting conflicts were identified.

Further details are available from the Registered Nurses' Association of Ontario.

Stakeholder Acknowledgement

As a component of the Guideline development process, RNAO is committed to obtaining feedback from nurses from a wide range of practice settings and roles, knowledgeable administrators and funders of health-care services, and stakeholder[G] associations. Stakeholders representing diverse perspectives were solicited* for their feedback, and RNAO wishes to acknowledge the following individuals for their contribution in reviewing this Guideline:

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* Stakeholder reviewers are individuals who have expertise in the subject matter of the Guideline, are representatives of organizations involved in implementing the Guideline, or are affected by the implementation of the Guideline. Reviewers may be nurses and other point-of-care health-care providers, nurse executives, administrators, research experts, members of interdisciplinary teams, educators, nursing students, or individuals who have personal experience with asthma. RNAO aims to solicit stakeholder expertise and perspectives representing a diversity of health-care sectors, roles within nursing and other professions (e.g., clinical practice, research, education, and policy), and geographic locations.

Stakeholder reviewers for RNAO BPGs are identified in two ways. First, stakeholders are recruited through a public call issued on the RNAO website (http://RNOA.ca/bpg/get-involved/stakeholder). Second, individuals and organizations with expertise in the Guideline topic area are identified by the RNAO Guideline development team and expert panel, and are directly invited to participate in the review.

Reviewers are asked to read a full draft of the Guideline and participate in the review prior to its publication. Stakeholder feedback is submitted online by completing a survey questionnaire. The stakeholders are asked the following questions about each recommendation:

- Is this recommendation clear?
- Do you agree with this recommendation?
- Is the discussion of evidence thorough and does the evidence support the recommendation?

The survey also provides an opportunity for stakeholders to include comments and feedback for each section of the Guideline.

Survey submissions are compiled and feedback is summarized by the RNAO Guideline development team. The RNAO development team and expert panel reviews and considers all feedback and, if necessary, modifies the Guideline content and recommendations prior to publication to address the feedback received.

Stakeholder reviewers have given consent to the publication of their names and contact details in this Guideline.

Background Context

What Is Asthma?

Asthma is the most common chronic respiratory disease in Canada (Gershon, Wang, Cicutto, & To, 2007). According to Statistics Canada, in 2014, 910,054 Ontarians and approximately 2.4 million Canadians aged 12 and over reported being diagnosed with asthma by a health-care provider (Statistics Canada, 2014). Internationally, it is estimated that 300 million people are affected by asthma, and notably, over the past 40 years the prevalence of asthma has increased (World Health Organization [WHO], 2007). In addition to having a significant impact on individuals' health-related quality of life, asthma is associated with both direct (e.g., hospitalizations and medications) and indirect (e.g., work/school absenteeism) costs to society (Bahadori et al., 2009).

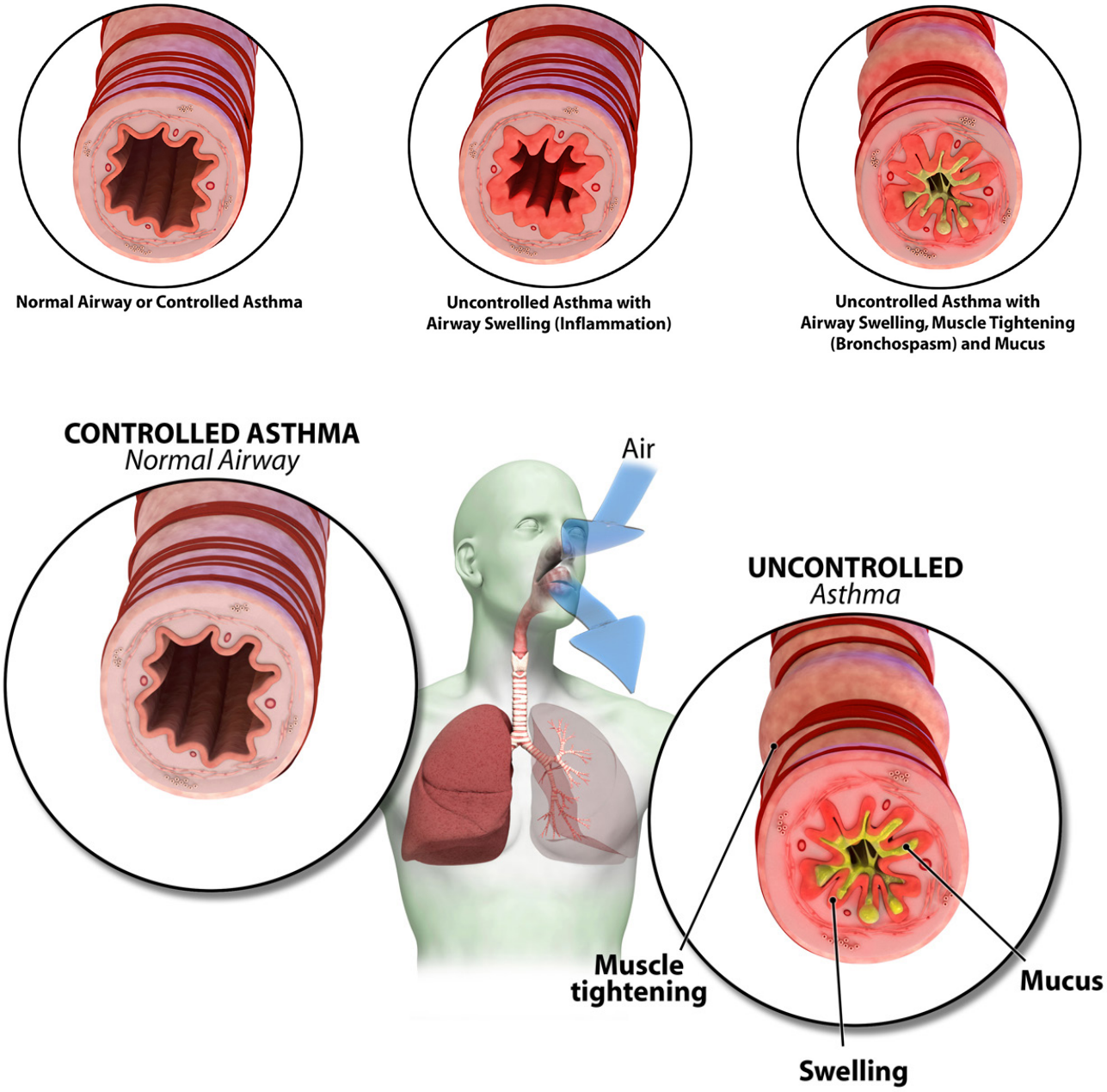
This Guideline adopts the *CTS 2012 Guideline Update's* definition of asthma. Asthma is defined as "an inflammatory disorder of the airways characterized by paroxysmal or persistent symptoms[G] such as dyspnea[G], chest tightness, wheezing, sputum production and cough, associated with variable airflow limitation and airway hyper-responsiveness[G] to endogenous or exogenous stimuli" (Lougheed et al., 2012, p. 128). Although the exact cause of asthma has not been well established (National Institutes of Health [NIH], 2007), asthma is generally thought to develop as a result of a gene–environment interaction (GINA, 2015). Factors that are believed to be involved in the development of asthma include genetics (i.e., having a family history of asthma or a personal or family history of atopy[G]), exposure to tobacco smoke (e.g., children whose mothers smoked while pregnant are more likely to develop asthma), exposure to outdoor air pollution, and occupational exposures (GINA, 2015; NIH, 2007; RNAO, 2004a; The Lung Association—Ontario [OLA], 2015b).

The underlying pathophysiology of asthma is the interaction of airway inflammation, airway hyper-responsiveness, and airway narrowing (NIH, 2007). *Hyper-responsiveness* refers to the tendency of airway smooth muscle in persons with asthma to contract more intensely in response to a given stimulus or trigger[G] than the airway smooth muscle in persons without asthma (NIH, 2007). For a list of common triggers, please see **Appendix E**. It is important to note that some persons with asthma react only to one trigger, while others react to several. Furthermore, a person's triggers and thresholds of exposure change over time (RNAO, 2004a, 2007a).

Airway narrowing is the result of airway inflammation, airway smooth muscle contraction (i.e., bronchospasm[G]) and excess mucus. *Airway inflammation* and *airway hyper-responsiveness* are directly related. The greater the degree of airway inflammation, the more hyper-responsive (or "twitchy") the person's airway will be; thus, the degree of hyper-responsiveness changes with the level of airway inflammation. For example, individuals who can usually complete an exercise class without experiencing symptoms of asthma (e.g., coughing, difficulty breathing) may experience such symptoms when they have a cold and their asthma is uncontrolled.

Understanding the pathophysiology of asthma is important, as it directs pharmacotherapy and management approaches. **Figure 1** provides illustrations of both normal/controlled asthma airways and uncontrolled asthma airways.

Figure 1: Pathophysiology of Asthma—Controlled Versus Uncontrolled Asthma Airways



Source: Created by L. Cicutto and B. Jacobson at National Jewish Health. Reprinted with permission.

Diagnosing Asthma

According to the *CTS 2012 Guideline Update*, "asthma is diagnosed by the combination of a compatible clinical history ... and objective measures of lung function" (Lougheed et al., 2012, p. 158); the compatible pulmonary function criteria supportive of an asthma diagnosis are listed in **Table 1** (in **Recommendation 1.1**). Although it is not within the current scope of practice of registered nurses[1] or registered practical nurses in Ontario to diagnose asthma (*Nursing Act, 1991*), it is important for nurses to understand how a diagnosis of asthma (as defined by the CTS) is made by the appropriate member of the interprofessional health-care team. Nurses who identify uncertainty regarding a diagnosis of asthma (i.e., whether or not the person has met the CTS diagnostic criteria) should liaise with the appropriate health-care provider to ensure appropriate follow-up to confirm or refute the diagnosis.

Achieving Asthma Control

The primary goal of asthma care is to help persons with asthma achieve and maintain control of their disease, thereby improving their health outcomes and quality of life. It is important for nurses to emphasize asthma *control* rather than asthma *severity*[G] when conducting assessments, because classifying asthma in terms of severity can be misleading (RNAO, 2007a). Severity refers to the intrinsic intensity of the asthma disease process (NIH, 2007). Life-threatening asthma exacerbations can occur in *all* persons with asthma, regardless of whether the asthma is "mild" or "severe" (RNAO, 2007a).

Asthma exacerbations[G] may be marked by a slow onset with a gradual loss of asthma control, or they may occur suddenly as severe—and potentially fatal—exacerbations (RNAO, 2004a, 2007a). According to Statistics Canada, 228 people died as a result of asthma in 2009; in the majority of cases, the victim's asthma showed signs of being uncontrolled and could have been treated (Statistics Canada, 2009). Asthma control assessment is essential for guiding asthma care. The best way to help prevent deaths due to asthma is by helping individuals keep their disease under control, regardless of the severity (RNAO, 2007a). As mentioned, this Guideline adopts the CTS parameters for defining asthma control (Lougheed et al., 2012). See **Table 2** (in **Recommendation 1.2a**) for the asthma control criteria and associated cut-points for determining asthma control according to the CTS.

Despite advances in asthma treatment, uncontrolled asthma remains a problem in Canada and internationally (GINA, 2015; McIvor, Boulet, FitzGerald, Zimmerman, & Chapman, 2007; Sadatsafavi et al., 2010). A Canadian national study conducted by McIvor et al. (2007) concluded that 53 percent of people with asthma had poorly controlled asthma, and that this figure had remained relatively unchanged since the previous survey in 1999. A recent Canadian national survey on asthma control commissioned by The Lung Association (2016a) revealed that while 93 percent of Canadians with asthma *believed* their asthma was controlled, only 1 out of 10 Canadians did in fact have their asthma "controlled" according to the CTS definition of control.

Barriers to Control

Barriers to asthma control identified by The Lung Association (2016a) include individuals' perceptions about the seriousness of their asthma, as well as behavioural and financial considerations. For instance, 14 percent of Canadians with asthma are not taking their medications as prescribed and 11 percent of this figure cites cost as a reason (The Lung Association, 2016a). Understanding how to use medications properly and taking medications as prescribed is crucial for

[1] On February 23, 2017, Minister Hoskins announced that he will introduce changes to the Nursing Act. When passed, these changes would expand RNs' scope of practice to include communicating diagnoses and prescribing medication. Following amendments to the Nursing Act, the College of Nurses of Ontario (CNO) will work closely with government to create regulations for the expanded RN scope of practice. Only after the CNO's regulations are approved by the Ontario government will it become legal for RNs to independently perform these activities.

achieving asthma control. For instance, one study found that compared to persons with controlled asthma, persons with uncontrolled disease were significantly more likely to have changed their controller[G] medication in response to symptoms without consulting a health-care provider (31 percent versus 18 percent) (FitzGerald, Boulet, McIvor, Zimmerman, & Chapman, 2006). The same study found that some people with asthma stopped using their controller therapy when their symptoms improved, suggesting a misunderstanding regarding the importance of daily controller therapy in achieving asthma control (FitzGerald et al., 2006).

The findings on asthma control highlighted above point to the gap between what is achievable through the provision of evidence-based asthma care and where asthma care currently stands today. Identifying and addressing this gap is important, because persons with uncontrolled asthma experience poorer quality of life and have higher rates of health-care utilization (Bahadori et al., 2009; McIvor et al., 2007; Sadatsafavi et al., 2010) compared to those with controlled asthma. A study conducted by Sadatsafavi and colleagues (2010) in British Columbia revealed that the 63.5 percent of patients with uncontrolled asthma were responsible for 94 percent of asthma-related resource use.

Role of Nurses in Asthma Control

Nurses provide care for persons with asthma in a multitude of settings and are in a unique position to promote asthma control. Evidence-based asthma care can lead to optimal asthma control. Evidence-based care includes self-management[G] education, creating documented asthma action plans[G] in collaboration with persons with asthma, promoting appropriate medication use, and coordinating appropriate follow-up care. Optimizing asthma control can improve quality of life for the person with asthma and can reduce urgent/emergent related health-care visits and health-care costs (RNAO, 2004a, 2007a).

Practice Recommendations

1.0 ASSESSMENT

RECOMMENDATION 1.1:

At initial encounter, identify adults with an asthma diagnosis by reviewing the health record for an established asthma diagnosis, supported by the use of objective lung function measurements, and by asking two questions:

1. Have you ever been told by a health-care provider that you have asthma?
2. Have you ever used a puffer/inhaler or asthma medication for breathing problems?

Level of Evidence = V

Discussion of Evidence:

Determining whether a person is affected by asthma is important in order to identify persons in need of asthma care. It is also a preliminary step for subsequently assessing, developing, implementing, and evaluating an asthma plan of care.

A review of the person's health record for prior documentation of an established diagnosis of asthma—ideally, supported by objective lung function measurements—can identify whether an asthma diagnosis was documented and relayed to the person. For pulmonary function criteria supportive of an asthma diagnosis, please see **Table 1**. Although diagnosing asthma is not within the current scope of practice of registered nurses or registered practical nurses in Ontario (*Nursing Act, 1991*), it is important for nurses to understand how a diagnosis of asthma is established.

If reviewing the person's health record is not possible due to the practice setting (e.g., during a home visit), the expert panel recommends that the nurse ask the person the following two questions:

1. Have you ever been told by a health-care provider that you have asthma?
2. Have you ever used a puffer/inhaler or asthma medication for breathing problems?

A "yes" response to the second question should prompt a follow-up investigation to determine what medication(s) were prescribed and the person's response to the medication(s). This includes asking whether the person experienced temporary relief from breathing problems by using an asthma reliever[G] medication, and/or whether the use of an asthma controller medication over several days or weeks resulted in a gradual relief from breathing problems.

A "yes" response to either of the two questions should prompt the nurse to continue with subsequent asthma assessment recommendations (as outlined below) at the clinical encounter. However, if a person reports using asthma medications without a confirmed diagnosis of asthma, it is recommended that the nurse liaise with their interprofessional health-care team to ensure appropriate follow-up in order to confirm the diagnosis of asthma.

Table 1: Diagnosis of Asthma: Pulmonary Function Criteria

PULMONARY FUNCTION MEASUREMENT	CHILDREN (6 YEARS OF AGE AND OVER)	ADULTS
Preferred: Spirometry showing reversible airway obstruction Reduced FEV_1/FVC **AND** Increase in FEV_1 after a bronchodilator or after course of controller therapy	Less than lower limit of normal based on age, sex, height and ethnicity (< 0.8-0.9)* **AND** ≥ 12%	Less than lower limit of normal based on age, sex, height and ethnicity (< 0.75-0.8)* **AND** ≥ 12% (and a minimum ≥ 200 mL)
Alternative: Peak expiratory flow variability Increase after a bronchodilator or after course of controller therapy **OR** Diurnal variation†	≥ 20% **OR** Not recommended	60 L/min (minimum ≥ 20%) **OR** > 8% based on twice daily readings; > 20% based on multiple daily readings
Alternative: Positive challenge test Methacholine challenge **OR** Exercise challenge	PC_{20} < 4 mg/mL (4 mg/mL-16 mg/mL is borderline; > 16 mg/mL is negative) **OR** ≥ 10%-15% decrease in FEV_1 postexercise	

* Approximate lower limits of normal ratios for children and adults; †Difference between minimum morning prebronchodilator value in 1 week and maximum nighttime value as % of recent maximum. FEV_1 Forced expirator volume in 1s; FVC Forced vital capacity; PC_{20} Provocative concentration of methacholine producing a 20% fall in FEV_1.

Source: Reprinted from "Canadian Thoracic Society Asthma Management Continuum—2010 Consensus Summary for Children Six Years of Age and Over, and Adults," by M. D. Lougheed et al., 2010, *Canadian Respiratory Journal, 17*(1), 15–24. Reprinted with permission.

Note: It is important to note that the initial assessment questions used to identify persons with asthma may also identify persons with COPD, and they are *not* meant to diagnose or differentiate between the two conditions. Establishing a diagnosis of COPD and/or asthma requires pulmonary function testing, and cannot be based on a medical history alone. Asthma and COPD can present similarly in terms of symptom experience (i.e., cough, dyspnea, shortness of breath) and the medications used to manage the conditions (i.e., bronchodilators[G] and corticosteroids[G]). A diagnosis of asthma and/or COPD must be made by the appropriate health-care provider.

RECOMMENDATION 1.2a:

At every encounter, assess the person's **current** level of asthma control according to the following criteria:

- Need for a fast-acting beta$_2$-agonist < 4 doses/week (including for exercise);
- Daytime symptoms < 4 days/week;
- Nighttime symptoms < 1 night/week;
- Normal physical activity levels;
- Mild, infrequent exacerbations;
- No absences from work or school;
- Forced expiratory volume in first second (FEV$_1$) or peak expiratory flow (PEF) ≥ 90% of personal best*‡;
- Diurnal PEF variation < 10–15%*‡; and
- Sputum eosinophils < 2–3%*‡.

* Indicates important objective information for a complete assessment of asthma control, but may not be available.

‡ Performed and interpreted within health-care-provider scope of practice (including appropriate knowledge and skills) and in alignment with organizational policies and procedures.

Level of Evidence = V

Discussion of Evidence:

The goal of asthma management[G] is to achieve asthma control (Lougheed et al., 2012). Consequently, assessing a person's asthma control at every encounter is crucial, as it will guide clinical management decisions regarding the delivery of asthma care (Lougheed et al., 2012). Asthma control is defined as the extent to which symptoms, functional impairments, and risks of unwanted events are observed in the person with asthma or have been minimized by management and treatment (GINA, 2015; NIH, 2007).

Nurses should perform a complete assessment of asthma control at every encounter, with consideration to their scope of practice and the clinical setting. Nurses should be aware of the entire asthma control criteria to effectively liaise with the interprofessional health-care team and establish a plan of care.

The assessment of asthma control is multidimensional, and is not captured by a single question or measurement (Halbert, Tinkelman, Globe, & Lin, 2009). National and international guidelines differ regarding the frequency or value applied to the criteria used to determine asthma control (GINA, 2015; Lougheed et al., 2012; NIH, 2007; Veterans Affairs/Department of Defense, 2009). Consistent with Canadian practices, the expert panel has adopted the control criteria for asthma outlined in the *CTS 2012 Guideline Update* (Lougheed et al., 2012; see **Table 2**).

Assessing a person's asthma symptom control requires investigating the following over the past week:

- need for a fast-acting beta$_2$-agonist[G],
- the frequency of daytime and nighttime symptoms,

- the person's physical activity levels, and
- any absences from work or school.

The use of a reliever medication to prevent or treat exercise-induced symptoms should be included in the dose count when assessing the "need for a fast-acting beta$_2$-agonist" criterion (Lougheed et al., 2010). The criteria of *physical activity* and *exacerbations* are not associated with numerical cut-points, but rather with the qualitative criteria "normal" and "mild, infrequent," respectively. It is important to focus asthma control assessment on whether or not persons' physical activity is affected by their asthma symptoms—that is, are they modifying their behavior as a result of their disease? For example, do they avoid exercising due to perceived or experienced asthma symptoms, or avoid engaging in their desired types or level of activity? If a person's physical activity is interrupted or modified as a result of asthma, the criterion of "normal physical activity levels" is not met.

The criterion of asthma exacerbations provides an assessment of the person's current asthma control, as well as risk of asthma morbidity in the future. For instance, a person who has had multiple asthma exacerbations during the past year is more likely to experience a future exacerbation than someone who has had one or no asthma exacerbations. If at the time of assessment the person is having an exacerbation requiring an acute care visit, this indicates that the person's asthma is uncontrolled (Lougheed et al., 2010). For further guidance on assessing asthma symptom control, please refer to **Appendix D**.

Assessing a person's asthma control requires an understanding of the person's experiences living with the disease, as well as objective measurements. The preferred objective measurement for assessing asthma control is spirometry[G] (Lougheed et al., 2010), which measures flow rates in order to determine the asthma control criterion of forced expiratory volume in first second (FEV_1[G]) (Lougheed et al., 2010). An observational study of moderate quality found that spirometry was a useful marker of asthma control in persons with asthma (Manoharan, Anderson, Lipworth, & Lipworth, 2015). When spirometry is unavailable, peak expiratory flow (PEF)[G] is an appropriate alternative (Lougheed et al., 2010).

Other objective assessments of asthma control include diurnal PEF variation[G] and sputum eosinophil[G] count. Sputum eosinophil count and spirometry are not available in all health-care settings; moreover, they are to be ordered, performed, and interpreted only by members of the interprofessional health-care team who have the appropriate knowledge and skills, and who are practising within their professional scope of practice (CNO, 2009b; *Nursing Act, 1991*). In this context, the nurse would communicate with members of the interprofessional health-care team to determine the need for such objective measurements and to obtain the results, which will inform the asthma control assessment.

If any one of the control criteria exceeds the described frequency or value, then the person has not achieved asthma control. The factors that may lead to uncontrolled asthma should be reviewed in collaboration with the person and interprofessional health-care team, and the potential reasons for uncontrolled asthma should be addressed as part of a comprehensive plan of care.

Table 2: Asthma Control Criteria

CHARACTERISTIC	FREQUENCY OR VALUE
Daytime symptoms	< 4 days/week
Night-time symptoms	< 1 night/week
Physical activity	Normal
Exacerbations	Mild, infrequent
Absence from work or school due to asthma	None
Need for a fast-acting beta$_2$-agonist	< 4 doses/week
FEV$_1$ or PEF	≥ 90% personal best
PEF diurnal variation*	< 10%-15%
Sputum eosinophils†	< 2%-3%

* Diurnal variation is calculated as the highest peak expiratory flow (PEF) minus the lowest divided by the highest peak flow multiplied by 100 for morning and night (determined over a two-week period). †Consider in adults with uncontrolled moderate to severe asthma who are assessed in specialist centres. FEV$_1$ Forced expiratory volume in 1s. Adapted from refernce 4.

Source: Reprinted from "Canadian Thoracic Society 2012 Guideline Update: Diagnosis and Management of Asthma in Preschoolers, Children and Adults," by M. D. Lougheed et al., 2012, *Canadian Respiratory Journal, 19*(2), 127–164. Reprinted with permission.

RECOMMENDATION 1.2b:

For adults with uncontrolled asthma, determine whether the person is currently experiencing an asthma exacerbation and, if so, the severity and need for urgent medical attention.

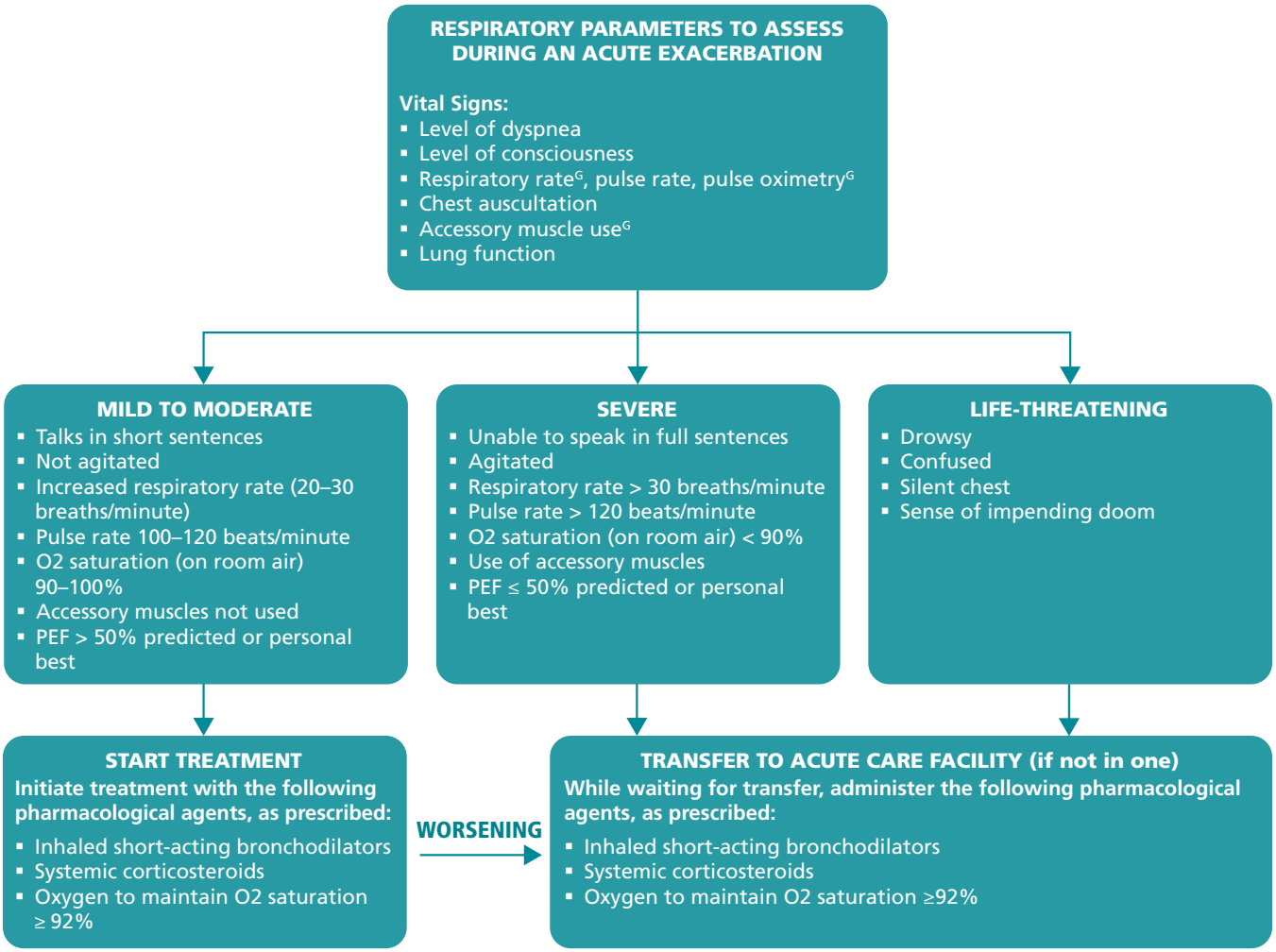
Level of Evidence = V

Discussion of Evidence:

The fact that a person's asthma is uncontrolled does not necessarily indicate that the person is currently experiencing an asthma exacerbation. However, by definition, if a person is experiencing an asthma exacerbation then the person's asthma is uncontrolled. An *asthma exacerbation* is an acute episode of worsening asthma symptoms, including shortness of breath, wheezing, coughing, and chest tightness. In objective measures of pulmonary function, exacerbations are marked by decreases from baseline measurements (British Medical Journal, 2016).

Determining whether a person is experiencing an asthma exacerbation, and the severity of the exacerbation, is crucial in order to ensure that appropriate therapy and medical support can be provided. **Figure 2** provides an overview of the parameters that nurses should assess in order to determine whether the person is experiencing an asthma exacerbation, the severity of the exacerbation, and the appropriate asthma management steps and medical attention (GINA, 2015).

Figure 2: Assessment and Management of Asthma Exacerbations



Developed by the RNAO expert panel, 2016.
Source: GINA, 2015.

RECOMMENDATION 1.3:

At every encounter, assess the person's risk of future asthma exacerbations according to the following criteria:

- Current control of asthma,
- Severe exacerbations experienced,
- Exacerbations requiring systemic corticosteroids, and
- Use of emergency care or hospitalizations for asthma.

Level of Evidence = V

Discussion of Evidence:

In addition to assessing a person's asthma control at every encounter, health-care providers should assess the person's risk of future asthma exacerbations. This is important, because persons whose asthma is currently controlled can still be at risk for future exacerbations. Identifying persons at higher risk for an asthma exacerbation alerts nurses and the interprofessional health-care team to the need for closer monitoring and follow-up, and informs the plan of care, including asthma self-management education.

The expert panel recommends that the assessment of a person's risk for future asthma exacerbations encompass specific criteria and parameters. People with asthma have a *higher* risk for *more severe exacerbations in the future* if they have or have had the following:

- Current uncontrolled asthma (see **Recommendation 1.2a** for details of this assessment),
- Severe exacerbations ≥ 1/year (GINA, 2015) (please see **Recommendation 1.2b** for details of determining a severe exacerbation),
- Exacerbations requiring systemic corticosteroids ≥ 2/year (NIH, 2007),
- Emergency care visits for asthma ≥ 2/year (Cowie, Underwood, Revitt, & Field, 2001; NIH, 2007), and
- Any hospitalization for asthma in the past year (Adams, Smith, & Ruffin, 2000; Eisner, Katz, Yelin, Shiboski, & Blanc, 2001; NIH, 2007).

If any one of the above parameters is met, then the person is at an increased risk of experiencing an asthma exacerbation.

The greater the number of parameters that are exceeded, the greater the risk that the person will experience a severe exacerbation in the future. Therefore, closer monitoring and regular follow-up care is required.

RECOMMENDATION 1.4:

At every encounter, identify factors affecting the complexity of asthma management for the person, including age, sex, smoking habits, social determinants of health, triggers, and co-morbidities.

Level of Evidence = IV

Discussion of Evidence:

Research suggests that certain modifiable and non-modifiable factors place persons with asthma at increased risk for experiencing uncontrolled asthma, reduced quality of life, and increased severity of exacerbations, which can affect the overall complexity of asthma management for the person. These risk factors include age and sex, smoking habits, social determinants of health[G], triggers, and co-morbidities.

It is recommended that a comprehensive assessment of these risk factors be conducted at the initial encounter. Knowledge of these factors should guide the nurse and interprofessional health-care team in developing an individualized plan of care and making decisions about the specific interventions required to promote asthma control for the person. Assessments occurring at subsequent encounters can be tailored, as appropriate. For example, because a person's asthma triggers can change over time (RNAO, 2004a, 2007a); a comprehensive review of asthma triggers may be warranted when a change in asthma control is noted.

Age and Sex

Several observational studies of moderate to strong methodological quality have found an association between older age and reduced control of asthma (Corrado, Renda, Polese, & Rossi, 2013; Krasnodebska, Hermanowicz-Salamon, Domagala-Kulawik, & Chazan, 2012; Vervloet et al., 2014), as well as between older age and a reduced health-related quality of life in adults with asthma (Gonzalez-Barcala, De La Fuente-Cid, Tafalla, Nuevo, & Caamano-Isorna, 2012). Various reasons have been proposed to explain the increased difficulty in controlling asthma in older adults, including a decline in lung function (GINA, 2015), an increase in co-morbid conditions (Hwang et al., 2012), reduced social supports (Ross, Yang, Song, Clark, & Baptist, 2013), and reduced cognitive abilities (O'Conor et al., 2015). It is important for members of the interprofessional health-care team to assess and consider these factors when caring for older adults with asthma.

A number of observational studies of varying methodological quality have also found an association between sex and asthma control. Specifically, being female has been associated with poorer asthma control (Corrado et al., 2013; Trzcinska, Zwierzchowska, Kozlowski, Derdowski, & Przybylski, 2013; Vervloet et al., 2014). The specific relationship and effect of sex and sex hormones on asthma has not been well established (NIH, 2007).

Smoking

A moderate quality cross-sectional study investigating the association of cigarette smoking with clinical outcomes in persons with severe asthma found that persons who smoked had poorer asthma control, more unscheduled health-care visits, more rescue courses of oral steroids, and higher anxiety and depression scores than ex-smokers or persons who never smoked (Thomson et al., 2013). The relationship between smoking and poor asthma control has been supported by several additional observational studies (Ouellet et al., 2012; Vervloet et al., 2014; Zaihra, Ernst, Tamblyn, & Ahmed, 2015). For guidance on the assessment of smoking status and smoking cessation, please see the RNAO BPG *Integrating Tobacco Interventions into Daily Practice* (RNAO, 2017). See also **Recommendation 3.1b**.

Social Determinants of Health

According to the World Health Organization (WHO, 2017, para. 1), the social determinants of health are "the conditions in which people are born, grow, live, work and age." Cross-sectional studies of varying methodological quality have demonstrated a direct relationship between lower socioeconomic status and poorer asthma control and health-related quality of life (Gonzalez-Barcala et al., 2012; Rajanandh, Nageswari, & Ilango, 2014; Vervloet et al., 2014; Zaihra et al., 2015). Measures for socioeconomic status include low income (Zaihra et al., 2015), low education (Gonzalez-Barcala et al., 2012; Rajanandh et al., 2014), and professional inactivity (Vervloet et al., 2014).

From the social determinants of health perspective, self-management of asthma may be challenging because of limited access for some individuals to health care, prescription drugs (as a result of costs), poor social support systems, and/or poor daily living conditions. For a review on the social determinants of health, please refer to the RNAO *Social Determinants of Health Brochure* (2013b).

Triggers

Asthma triggers can be an important contributing factor to poor asthma control (Vernon, Wiklund, Bell, Dale, & Chapman, 2012). In a moderate quality cross-sectional study investigating the impact of asthma triggers, adults reporting a high trigger burden (i.e., a greater number of triggers that cause asthma symptoms) were more likely to report uncontrolled asthma than those with a low trigger burden (Price, Dale, Elder, & Chapman, 2014). In addition, those with a high trigger burden experienced more severe asthma exacerbations, more hospitalizations, and more days of missed work or study (Price et al., 2014). For a list of common triggers (including allergens[G] and other inflammatory triggers, irritants[G], and occupational triggers), please see **Appendix E**.

Co-morbidities

Asthma management is complicated by co-morbid conditions (de Sousa et al., 2013). A moderate quality cross-sectional study showed that people with uncontrolled asthma had more co-morbidities than those with controlled asthma (Krasnodebska et al., 2012). Several co-morbid conditions are associated with asthma that is more difficult to control, including (but not limited to):

- Obstructive sleep apnea[G] (Kim et al., 2013; Teodorescu et al., 2012),
- Gastroesophageal reflux disease[G] (GERD) (Hayat, Borekci, & Gemicioglu, 2014; Liang, Yi, & Feng, 2013),
- Allergic rhinitis[G] (Hayat et al., 2014),
- Obesity[G] (Boudreau, Bacon, Ouellet, Jacob, & Lavoie, 2014; Ciprandi, Schiavetti, Bellezza Fontana, Sorbello, & Ricciardolo, 2014; Maalej et al., 2012; Vervloet et al., 2014),
- Anxiety (Favreau, Bacon, Labrecque, & Lavoie, 2014),
- Depression (Krauskopf et al., 2013; Mazurek, Knoeller, & Moorman, 2012; Ouellet et al., 2012; Ross et al., 2013; Trzcinska et al., 2013), and
- Life-threatening allergies, including food allergies (GINA, 2015).

The expert panel recommends that all medications, including those taken to manage co-morbid conditions, be documented and reviewed with the interprofessional health-care team, as some medications may exacerbate or affect the medical management of asthma.

For a list of co-morbid conditions associated with increased complexity of asthma management, please see **Appendix F**.

2.0 PLANNING

RECOMMENDATION 2.1:

Develop an individualized, person-centred asthma education plan that addresses the following:

- Learning needs (level of evidence = Ib),
- Culture (level of evidence = Ib),
- Health literacy (level of evidence = IV), and
- Empowerment (level of evidence = IV).

Level of Evidence = Ib, IV

Discussion of Evidence:

Asthma education has been shown to be effective at improving asthma control and self-management behaviours, and is therefore an essential component of care (Axelsson & Lotvall, 2012; Boulet et al., 2015; Tapp, Lasserson, & Rowe, 2013). Growing research suggests that education should be tailored to the needs and concerns of the person (Axelsson & Lotvall, 2012; Boulet et al., 2015; Goeman, Jenkins, Crane, Paul, & Douglass, 2013). As such, it is recommended that an individualized, person-centred asthma education plan be developed, implemented, and evaluated on a regular basis. The plan should be revisited whenever there is a change in the person's asthma control, general health status, or care needs. An individualized person-centred asthma education plan is part of an overall asthma plan of care which also includes a pharmacological management plan, a documented asthma action plan (refer to **Recommendation 3.5**) and planned follow-up care (refer to **Recommendation 3.7**).

An individualized, person-centred asthma education plan should incorporate and address the person's learning needs, culture[G], and health literacy[G], as well as empowerment[G] of the person.

Learning Needs

Asthma control can be improved by tailoring asthma education to address a person's individual learning needs and concerns (Axelsson & Lotvall, 2012; Goeman et al., 2013). Tailoring asthma education requires an assessment of the person's learning needs and concerns regarding asthma knowledge, as well as the person's self-management skills and abilities, prior to the delivery of the asthma education. This sets the foundation for the person to engage in the process of receiving and understanding the information that is presented. Assessing a person's learning needs requires recognizing and understanding that learning needs and priority concerns are unique to each person and clinical situation (RNAO, 2012a).

A rigorous randomized controlled trial investigated the effect of tailored, person-centred asthma education delivered to adults over the age of 55 on asthma outcomes, including asthma control and medication adherence, compared to a control group, which received usual care and brochure only information (Goeman et al., 2013). The tailored, person-centred intervention included an assessment to identify unmet needs and specific asthma concerns of participants. This included identifying perceptions of asthma control, fears or concerns surrounding asthma medication side effects and asthma exacerbations, asthma self-management knowledge and abilities, and person-specific concerns regarding asthma and asthma medications (Goeman et al., 2013).

Participants who received the tailored education experienced statistically significant improvements in asthma control and quality of life compared to control group (Goeman et al., 2013). There was also a statistically significant improvement in medication adherence within the intervention group, but not the control group; however, the difference between groups was not statistically significant (Goeman et al., 2013).

Culture

A strong quality systematic review noted the limited research investigating whether culturally tailored asthma education is more effective than usual care in promoting improved asthma outcomes (Press et al., 2012). Some studies within the review demonstrated success with culturally tailored education interventions, and identified language-appropriate materials as an important component of such interventions (Press et al., 2012). A weak quality Canadian community-based study, which developed culturally and linguistically appropriate educational materials to improve asthma self-management among persons with asthma, demonstrated that asthma education that draws on the life experiences and cultural context of the person can promote increased knowledge about asthma and self-management behaviours (Poureslami et al., 2012). Study participants in the intervention groups were assigned to view three types of educational materials: *knowledge videos, community videos*, or *pictorial pamphlets*. These materials were developed through direct involvement of the community. The *knowledge video* included scientific information related to symptoms, trigger management, and how to manage an asthma exacerbation. In the *community video*, a key informant (an educated elder) addressed potential misconceptions about asthma management by addressing cultural beliefs and practices and providing correct information (Poureslami et al., 2012).

Participants' asthma knowledge, inhaler use, and understanding of asthma management instructions significantly improved in all intervention groups, with the most notable improvements observed in the group that watched both the *community* and *knowledge videos* (Poureslami et al., 2012). This suggests that culturally and linguistically appropriate interventions can promote knowledge gain. It also suggests that information drawn from community knowledge combined with scientific information from health-care providers can help support persons' engagement in self-management of asthma (Poureslami et al., 2012).

Health Literacy

Health literacy is defined as a person's ability "to access, understand, evaluate and communicate information as a way to promote, maintain and improve health in a variety of settings across the life-course" (Rootman & Gordon-El-Bihbety, 2008, p. 11). In several moderate to strong quality observational studies, low health literacy has been associated with poorer asthma self-management outcomes, such as medication behaviours and management (including poor adherence to controller therapy and incorrect inhaler device technique) (Federman et al., 2014; O'Conor et al., 2015), and with erroneous health beliefs (for example, the belief that one has asthma only when symptoms are present, or the belief that asthma can be cured) (Federman et al., 2013). Given the impact of low health literacy on asthma self-management practices, it is recommended that strategies to address low health literacy be explored and implemented in developing an asthma education plan. Such strategies support clear communication, in order to decrease barriers for persons of all literacy levels, and minimize risks for everyone (RNAO, 2012a). For more details on strategies to address health literacy, please refer to **Appendix G.**

Empowerment of the Person

The educational plan should be based on adult learning principles, and should empower and engage the person in the learning process—for example, through goal-setting and shared decision-making[G] (Axelsson & Lotvall, 2012). Findings from a moderate quality cross-sectional study indicate that empowerment is a positive and significant predictor of asthma self-management practices (Londono & Schulz, 2015). A moderate quality meta-analysis examining interventions targeting asthma self-care found that active engagement of participants was associated with a reduction in unscheduled health-care visits (Denford, Taylor, Campbell, & Greaves, 2014). In this study, active engagement was defined as the participant being involved in intervention processes such as planning, monitoring progress, and problem solving as opposed to being a passive consumer of information or ideas (Denford et al., 2014). In practice, actively engaging a person may include encouraging the person to identify learning goals, supporting the person to identify ways to overcome barriers to behavior change, and involving the person in decision-making through a shared-care model.

For additional information to support this recommendation, please refer to the CNO resource *Culturally Sensitive Care* (2009a), and the RNAO BPGs *Embracing Cultural Diversity in Health Care: Developing Cultural Competence* (2007b), *Facilitating Client Centred Learning* (2012a), and *Person- and Family-Centred Care* (2015).

3.0 IMPLEMENTATION

RECOMMENDATION 3.1a:

Provide asthma education as an essential component of care.

Level of Evidence = Ia

RECOMMENDATION 3.1b:

Educate the person on the essential skills and self-management of asthma based on the person's learning needs, including:

- Pathophysiology of asthma,
- Medications and device technique,
- Self-monitoring,
- Action plans,
- Trigger identification and management, and
- Smoking cessation (if applicable).

Level of Evidence = Ib

Discussion of Evidence:

Evidence has demonstrated that providing asthma education improves asthma outcomes, including medication adherence, asthma control, health-care utilization, and quality of life (Boulet et al., 2015; Goeman et al., 2013; Tapp et al., 2013; Taskin Yilmaz & Cinar, 2015). A strong quality Cochrane meta-analysis conducted by Tapp and colleagues (2013) investigated the effect of education provided to adults with asthma after presentation to an emergency setting. The provision of educational interventions either during or following emergency department visits decreased the risk of future hospital admissions, and improved scheduled appointment attendance and symptom control. However, the reduction of risk in re-presentation to the emergency department did not reach statistical significance (Tapp et al., 2013).

Nurses and other health-care providers should recognize that educational interventions must extend beyond simply providing basic information, and should include strategies to improve the skills and behaviours that will help support self-management (Boulet et al., 2015; GINA, 2015; NIH, 2007). Education programs that include such strategies, as well as a personalized written asthma action plan, have been shown to lead to better asthma outcomes than providing information alone (Gibson et al., 2003 as cited in RNAO, 2007a). For additional information on self-management support, please refer to the RNAO BPG *Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients* (2010b).

It is important to acknowledge that asthma education is a process, not a single event. Every interaction is an opportunity to review and extend individuals' knowledge, behaviour, and skills regarding their asthma (British Thoracic Society [BTS]/SIGN, 2014; Taskin Yilmaz & Cinar, 2015). Further, asthma education programs must use a variety of educational strategies and methods, and should be tailored to the person's needs (Boulet et al., 2015; Taskin Yilmaz & Cinar, 2015) and goals (see **Recommendation 2.1**).

Research, including a strong quality randomized controlled trial (RCT), and practice guidelines generally indicate that asthma education to support self-management should include the following (Boulet et al., 2015; Goeman et al., 2013; NIH, 2007; Veterans Affairs/Department of Defense, 2009):

- basic pathophysiology of asthma (i.e., what is asthma);
- information regarding treatment, including an overview of medications and device techniques;
- self-monitoring[G] (e.g., monitoring the symptoms of asthma);
- the use of an asthma action plan; and
- information regarding how to avoid exacerbations (including trigger identification/management and smoking cessation, if applicable).

For more details regarding the key components of asthma education and additional practice resources, please see **Table 3**.

Table 3: Key Components of Asthma Education

COMPONENT	DETAILS	ADDITIONAL INFORMATION & RESOURCES
Pathophysiology of Asthma	■ Normal, controlled asthma, and uncontrolled asthma	See **Figure 1**.
Medications and Device Technique	■ Inhaler device technique ■ Mechanisms of action and rationale for medications ■ Indications for when to use reliever versus controller medications ■ Side effects ■ The importance of taking medications as prescribed	Refer to **Recommendation 3.3a** for further detail on inhaler device technique. Refer to **Recommendation 3.3c** for further detail on medication education. See **Appendix H** for tips on improving self-management, including supporting persons with asthma to take their medications as prescribed.

COMPONENT	DETAILS	ADDITIONAL INFORMATION & RESOURCES
Self-Monitoring	■ What is asthma control? ■ Signs and symptoms of controlled and uncontrolled asthma ■ Symptom monitoring ■ PEF technique and monitoring (if applicable) ■ Monitoring asthma control ■ Recognizing loss of asthma control (assessed through symptoms or PEF or both) ■ Trigger exposure monitoring ■ Use of an asthma diary[G] to monitor asthma control by recording symptoms and PEF	Refer to **Recommendation 1.2a** for asthma control criteria. Refer to **Recommendation 3.4** for peak flow monitoring. See **Appendix I** for further information on asthma diaries and a sample asthma diary.
Action Plans An asthma action plan is developed in partnership with the person with asthma. It is an individualized written, electronic, and/or pictorial plan developed for the purpose of self-management of asthma. The plan guides self-monitoring of asthma based on symptoms, reliever use, and perhaps peak flow measurements, and details the management steps to take according to asthma control. The action plan is tailored to the person's preferences, treatment, and usual pattern of exacerbations, and may incorporate triggers.	■ What is an action plan? ■ How to use the action plan ■ Steps to take when asthma is uncontrolled (e.g., medications to add or increase, and when and how to seek additional medical help)	Refer to **Recommendation 3.5** for further information on asthma action plans.

COMPONENT	DETAILS	ADDITIONAL INFORMATION & RESOURCES
Trigger Identification and Management	■ Identification of triggers, and strategies that can be used to reduce or avoid trigger exposure, including workplace exposures and triggers	Refer to **Recommendation 1.4** and **Appendix E** for more information on triggers.
Smoking Cessation (if applicable)	■ Information regarding the higher risk, for smokers, of having inadequately controlled asthma ■ Educate that the person will likely require more medication to control his asthma than if he did not smoke	Refer to **Recommendation 1.4**. See the RNAO BPG *Integrating Tobacco Interventions into Daily Practice* (2017) for smoking cessation strategies.

Compiled by the RNAO expert panel, 2016.
Sources: Boulet et al., 2015; BTS/SIGN, 2014; Goeman et al., 2013; GINA, 2015; NIH, 2007; and RNAO, 2004a, 2007a.

RECOMMENDATION 3.2:

Evaluate non-pharmacological interventions for effectiveness and for potential interactions with pharmacological interventions.

Level of Evidence = V

Discussion of Evidence:

Non-pharmacological interventions, including complementary therapies[G], whether physical or psychological, may be used by individuals to assist with the management of their asthma (Huo, Ray, Mehta, & LoBello, 2015). Complementary therapies are widely used in combination with conventional medicine. However, non-pharmacological approaches should not be used as a *substitute* for adequate pharmacological management in the treatment of asthma.

The expert panel recommends that the interprofessional health-care team should first explore the person's beliefs about and use of complementary or alternative forms of care. The expert panel also recommends that nurses, in collaboration with the interprofessional health-care team and the person with asthma, explore the effectiveness and perceived benefits of any physical, psychological, and complementary interventions proposed or used, taking into consideration the person's asthma control, health conditions, cultural beliefs, and age group, and determine the potential for interactions[G] with prescribed pharmacologic interventions. Having a complete picture of what persons with asthma are doing to manage their asthma and health is important to ensuring coordinated and safe care.

Physical Exercise

Due to the overall health benefits of exercise, the expert panel recommends that persons with asthma participate in physical exercise in conjunction with pharmacological therapy to manage their asthma. To support the person's participation in physical activity, nurses should discuss precautions and strategies for managing exercise-induced asthma, and addressing symptoms experienced during exercise (GINA, 2015). For information regarding precautions and management of exercise-induced asthma, please visit The Lung Association's website (https://www.lung.ca) and type "exercise" into the search bar.

Most exercise interventions do not demonstrate improvements in lung function. At best, there is mixed evidence as to whether physical activity improves measures of lung function or airway inflammation in people with asthma (Eichenberger, Diener, Kofmehl, & Spengler, 2013; Franca-Pinto et al., 2015; Pakhale, Luks, Burkett, & Turner, 2013). However, improvements in symptom-free days and quality of life have been reported in the literature more consistently for those who exercise regularly compared to those who do not (Eichenberger et al., 2013; Franca-Pinto et al., 2015; Mancuso et al., 2013; Meyer, Gunther, Volmer, Taube, & Baumann, 2015). For instance, a moderate quality RCT (Franca-Pinto et al., 2015) observed that aerobic training improved clinical control by reducing asthma exacerbations in participants in the treatment group compared to the control group.

To access physical activity guidelines, please visit the Canadian Society for Exercise Physiology website at http://www.csep.ca/home.

Weight Loss

A Cochrane systematic review investigated the effect of various interventions for weight loss on measures of asthma control among overweight[G] or obese persons with asthma (Adeniyi & Young, 2012). Of the four studies that were included in the review, two showed a significant reduction in symptom scores for the intervention group, one demonstrated that weight reduction was associated with some improvement in lung function, and one did not report a significant reduction in symptom scores or improvement in lung function. However, the overall quality of evidence included in the systematic review was low (Adeniyi & Young, 2012). Given the association between overweight/obesity and poorer asthma control and quality of life (Juel & Ulrik, 2013; Maalej et al., 2012) and the overall health benefits of maintaining a healthy weight, the expert panel recommends weight loss in persons with asthma who are overweight or obese. Weight loss may help facilitate asthma symptom control and assist with overall asthma management (BTS/SIGN, 2014).

To access Canada's Food Guide and related tools/information, please visit the Food and Nutrition section of the Health Canada website (http://www.hc-sc.gc.ca/index-eng.php).

Breathing Exercises

Breathing exercises[G] are therapeutic exercises to deepen inspiration or expiration, and may even alter the rate and rhythm of breathing (National Centre of Biotechnology Information, 2016, para 1). A Cochrane review (Freitas et al., 2013) evaluating breathing exercises for adults with asthma concluded that they are safe and well tolerated among persons with asthma. Overall, the included studies differed significantly in terms of intervention characteristics, such as the type of breathing exercises (including diaphragmatic breathing, Papworth method, Buteyko method, and yoga breathing exercises) and the duration of sessions and outcomes. Meta-analyses were therefore conducted on only two outcomes—asthma symptoms and quality of life—and demonstrated that breathing exercises improved both outcomes (Freitas et al., 2013). The effects of breathing exercises on lung function were inconsistent, with no difference reported in 5 of the 11 studies that assessed this outcome. Despite this finding, the expert panel suggests that

breathing exercises can be offered as a supplement to conventional asthma management strategies, as they may improve individuals' quality of life and symptoms. For validated asthma-specific quality-of-life assessment tools, please refer to **Appendix J**.

For additional resources on the use of non-pharmacological interventions for the management of asthma, including complementary therapies, please refer to the National Centre for Complementary and Alternative Medicine website (https://nccam.nih.gov/).

RECOMMENDATION 3.3a:

At every encounter, actively educate on correct inhaler device technique through observation, feedback, physical demonstration, and written instructions.

Level of Evidence = Ib

Discussion of Evidence:

The most commonly used method for administering pharmacological therapy for asthma management is inhalation (Toumaa-Shehata, Price, Basheti, & Bosnic-Anticevich, 2014). However, incorrect inhaler device technique remains a problem for many persons with asthma (Crane, Jenkins, Goeman, & Douglass, 2014), and is associated with poor asthma control and an increased use of unscheduled health resources (Al-Jahdali et al., 2013). It is therefore critical that persons with asthma receive the necessary training and support in order to achieve correct inhaler device technique.

Persons with asthma should be provided education on the proper use of their inhaler device through technique coaching, which includes:

- Observation of the person's device technique,
- Technique feedback,
- Physical demonstration of correct technique by a health-care provider, and
- Written instructions (as appropriate).

Actively educating (i.e., one-on-one coaching) persons with asthma on correct inhaler device technique has been shown to lead to improved technique (Crane et al., 2014; Rahmati, Ansarfard, Ghodsbin, Ghayumi, & Sayadi, 2014; Toumaa-Shehata et al., 2014; Yildiz et al., 2014). The literature highlights the need to evaluate and coach for accurate techniques through actual demonstration and feedback on technique (Crane et al., 2014; Toumaa-Shehata et al., 2014; Yildiz et al., 2014). Feedback plays an important role in enhancing device technique (Toumaa-Shehata et al., 2014), and should include explicit identification of incorrect inhaler device steps or techniques, as well as strategies for correcting these errors. In a moderate quality RCT, passive education (that is, information alone) was not sufficient to help persons achieve correct inhalation device technique (Crane et al., 2014). This study investigated the effects of one-on-one coaching, including critical observation of device technique, verbal feedback on improving technique, demonstration of correct technique, and encouragement and distribution of an information pamphlet, compared to passive information (i.e., pictorial device information and usual care). The active education (i.e., the one-on-one coaching) significantly improved device technique among participants, which was not demonstrated in the passive education group (Crane et al., 2014).

Nurses and other health-care providers should ensure that persons with asthma have received education and training on how to use their prescribed device, and that they can demonstrate satisfactory technique using a device-specific checklist at each visit. For video demonstrations of correct inhaler techniques for various devices, refer to The Lung Association website at https://www.lung.ca/lung-health/get-help/how-use-your-inhaler. Written instructions on device technique should follow the principles of health literacy. For more information on the principles of health literacy, please refer to **Appendix G**. For information on where to download samples of written instruction reference sheets for device use and device technique assessment tools, please refer to **Appendix K**.

RECOMMENDATION 3.3b:

Engage the person with asthma in shared decision-making with regard to the selection of an inhaler device.

Level of Evidence = Ia

Discussion of Evidence:

It is recommended that nurses engage the person with asthma in shared-decision making regarding inhaler device selection, taking into consideration the availability of devices, the person's preference, the person's cognitive and physical abilities (which determine the person's ability to use the device), and the cost (GINA, 2015). After educating on correct inhaler device technique (refer to **Recommendation 3.3a**), the nurse can determine the ability of the person to correctly utilize the device and, subsequently, engage the person in shared decision-making regarding the selection of a device. This process requires collaboration between the nurse, the person, and the interprofessional health-care team, including the prescriber.

Taking medications as prescribed is crucial to asthma control and health outcomes (Rifaat, Abdel-Hady, & Hasan, 2013). A weak quality systematic review on asthma medication adherence concluded that involving persons with asthma in treatment decisions appears to have favourable effects on medication adherence (Axelsson & Lotvall, 2012). For example, increased adherence was seen among patients who shared in decision-making regarding medication treatment, and among patients whose medication problems and own treatment goals were considered (Axelsson & Lotvall, 2012).

Individuals' cognitive and physical abilities can affect their ability to use their medication devices correctly and should be considered when selecting a device. For persons prescribed a pressured metered dose inhaler[G] (MDI), the addition of a spacer[G] or valved-holding chamber[G] helps improve technique, thereby enhancing drug delivery and potentially decreasing the side effects of inhaled corticosteroids (GINA, 2015). A moderate quality RCT found that, with appropriate training, both methods of inhalation using a MDI (i.e., with and without a spacer) improved peak expiratory flow rates among participants (Rahmati et al., 2014). Spacers should be used as they can improve drug delivery; however, is it recognized that some people may not be prepared to carry or purchase a spacer (BTS/SIGN, 2014).

The cost of the inhaler medication is also a factor to discuss with the person with asthma, as this can be a prohibitive factor for some devices. Overall, device selection should involve the person in the decision-making process, taking into consideration the person's skills and abilities to use the device correctly, the cost, preference, and acceptance. Please see **Appendix L** for a resource of available respiratory medications in Ontario and associated provincial drug coverage information, and an overview of the advantages and disadvantages of different inhaler devices.

RECOMMENDATION 3.3c:

Educate the person with asthma on the difference between controller and reliever medications, their indications, and their potential side effects.

Level of Evidence = V

Discussion of Evidence:

Medications used to treat asthma can generally be divided into two categories: (1) controllers, and (2) relievers. *Controller medications* are designed to be, and should be taken, regularly in order to improve asthma control and to prevent exacerbations. *Reliever medications* are used primarily on an as-needed basis either to relieve asthma symptoms or to prevent asthma symptoms prior to exercise or other triggers. Both types of medications are available in various forms and are delivered through a variety of devices. The expert panel recommends that education be provided to persons with asthma regarding the general classifications of medications, their indications and actions (i.e., controller versus reliever function), and their potential side effects. This education can be provided following actively educating on correct inhaler device technique (see **Recommendation 3.3a**) and inhaler device selection (see **Recommendation 3.3b**).

Many barriers exist with regard to the correct use of medications, which prevent people with asthma from adequately controlling their disease (Axelsson & Lotvall, 2012; GINA, 2015; Krauskopf et al., 2013; O'Conor et al., 2015; Rifaat et al., 2013). These include knowledge deficits, and beliefs regarding the relationship between asthma symptoms and the mechanism of action of asthma medications, as well as medication side effects (Axelsson & Lotvall, 2012; Rifaat et al., 2013). Studies conducted on asthma education programs commonly found that an educational component related to medications (i.e., understanding of medications and promoting medication use) was included in successful programs (Boulet et al., 2015; Goeman et al., 2013; Saito et al., 2013; Taskin Yilmaz & Cinar, 2015). For instance, a weak quality prospective study investigating whether an asthma education program is associated with asthma control concluded that asthma education may be useful in achieving control among persons with poor adherence to therapy and medications (Saito et al., 2013). One component of the education included information on medications including side effects, the differences between controller and reliever agents, and the importance of treatment (Saito et al., 2013). Thus, the expert panel recommends that education on the difference between controller and reliever medications, their indications, and their potential side effects be included when providing asthma education.

For more information on medication indications and potential side effects, please see **Appendix L**.

RECOMMENDATION 3.4:

Where appropriate, assist and educate persons with asthma to measure their peak expiratory flow.

Level of Evidence = V

Discussion of Evidence:

Individualized written asthma action plans should specify self-management strategies in response to a person's symptom monitoring and/or peak expiratory flow monitoring (see **Recommendation 3.5** for further details on asthma action plans). International guidelines do not recommend a particular method of self-monitoring—specifically, peak expiratory flow (PEF) versus symptom monitoring only (BTS/SIGN, 2014; GINA, 2015; NIH, 2007). Peak flow measurements provide an objective measurement of lung function, but have their limitations (RNAO, 2004a, 2007a). PEF is effort-dependent which increases the risk of inaccurate readings resulting from poor technique, as well as misinterpretation of results (Self, George, Wallace, Patterson, & Finch, 2014) or device failure (RNAO, 2004a, 2007a).

Every person with asthma should have a documented action plan that will help guide self-management when asthma control is lost (see **Recommendation 3.5**). When a documented asthma action plan is developed, PEF monitoring may or may not be part of an individual's self-monitoring plan. It may be considered for certain persons such as those who have difficulty recognizing the severity of their symptoms (i.e., "poor perceivers"), those with uncontrolled asthma, and those who have recently required emergency department use or hospitalization (GINA 2015; NIH, 2007; RNAO, 2004a, 2007a). The expert panel recommends that the choice of peak flow and/or symptom monitoring should be based on the person's ability to recognize the symptoms of uncontrolled asthma, the availability of peak flow meters[G] and most importantly, the person's preferences and ability to perform correct technique (NIH, 2007; RNAO, 2004a, 2007a).

A weak methodological quality review found that many adults with asthma do not utilize their peak flow meters correctly (Self et al., 2014). As peak flow measurements are dependent on technique, the expert panel recommends that persons with asthma receive instruction and observation to ensure correct device use and accurate PEF measurement. Therefore, when home peak flow monitoring is deemed appropriate, the nurse or health-care provider should assist and educate the person with asthma on the purpose and correct technique for obtaining such measurements. The person's PEF technique should be observed until the nurse or health-care provider is satisfied that the technique is producing accurate readings. Persons using a PEF meter should be instructed on how to establish their personal best PEF. A person's personal best peak flow is the highest number achieved over a two-week period when asthma is controlled (RNAO, 2004a). The person's personal best PEF should be linked to the documented asthma action plan as the reference value (NIH, 2007). For peak flow monitoring tips and details on how to use a peak flow meter, please see **Appendix M**.

RECOMMENDATION 3.5:

To support self-management, collaborate with the person with asthma to develop and review a documented asthma action plan (level of evidence = Ib), in one or a combination of the following formats:

- In writing, on paper (level of evidence = Ib),
- Electronically (level of evidence = V), or
- Pictorially (level of evidence = IIa).

Level of Evidence = Ib, IIa, V

Discussion of Evidence:

Individualized documented action plans, developed in partnership with the interprofessional health-care team and the person are considered an essential element of asthma care (Andrews, Jones, & Mullan, 2014; Lougheed et al., 2012; Ring et al., 2007). Asthma action plans specify self-management strategies for achieving and maintaining control, such as when and how to adjust reliever and controller therapy in response to loss of control, and when to seek medical attention (Lougheed et al., 2012; RNAO, 2004a, 2007a). Asthma action plans with escalation of pharmacological therapy must be authorized by a prescriber. Please refer to **Appendix N** for further details regarding action plans.

It is recommended that every adult with asthma be provided with a documented asthma action plan to support guided self-management. Research demonstrates that asthma action plans contribute to improved asthma outcomes, such as self-management behaviours, asthma control, and health-related quality of life (Andrews et al., 2014; Araujo et al., 2012; Patel, Valerio, Sanders, Thomas, & Clark, 2012; Pur Ozyigit, Ozcelik, Ozcan Ciloglu, & Erkan, 2014). Additionally, greater satisfaction with care has been reported when plans were developed in partnership with the person (Patel et al., 2013).

An asthma action plan can be written on paper, in an electronic format, or can be provided pictorially, depending on the clinical context and the person's preferences and needs. There are examples of web-based asthma self-management programs that incorporate asthma action plans and positive outcomes have been reported with the use of electronic action plans within the context of such programs (Araujo et al., 2012; van Gaalen et al., 2013). In a moderate quality randomized cross-over trial that compared standard paper-based and web-based self-management programs (i.e., diary and asthma action plans), improvements in asthma control and quality of life were reported for users of both web- and paper-based plans (Araujo et al., 2012). No harms or significant differences in outcomes were observed between users of the two types of plans and neither group showed improvements in lung function (Araujo et al., 2012). To assist with self-management, the web-based asthma self-management program included automatic messages and alerts (triggered when predefined conditions were met based on action plans or scheduled appointments), making it difficult to discern whether the web-based outcomes were related solely to the format of the action plan (i.e., electronic) or may also be attributable to the messages and alerts.

Given that electronic action plans are a safe and feasible option, the expert panel recommends this format based on individuals' preferences and their ability to utilize such plans accurately. An additional factor to consider in determining the format of the action plan is the person's health literacy (Andrews et al., 2014). A pictorial format was investigated through a weak quality controlled trial to identify the effectiveness of pictorial asthma action plans among a population of socioeconomically disadvantaged and illiterate women in Turkey (Pur Ozyigit et al., 2014). In

addition to a pictorial asthma action plan, interactive asthma education was provided. Asthma control and health-related quality-of-life scores improved in both study groups at every single assessment point compared with baseline (Pur Ozyigit et al., 2014). Asthma control and health-related quality of life were statistically higher in the study group than in the control group, but this significance was only maintained for health-related quality of life at six months (Pur Ozyigit et al., 2014). Importantly, women in the experimental group had fewer emergency department visits over the six-month period that reached statistical significance (Pur Ozyigit et al., 2014).

It is the role of the nurse to facilitate the attainment, understanding, and effective use of an individualized action plan tailored to the person's disease experience and life circumstances (Andrews et al., 2014). An individualized asthma action plan should be developed, reviewed, and/or revised at every encounter in partnership with the person (BTS/SIGN, 2014). Please refer to **Appendix O** for sample written action plans.

RECOMMENDATION 3.6:

Provide integrated asthma self-management support to adults with uncontrolled asthma who are at risk for severe exacerbations through multiple modalities/formats, such as:

- Home-care visits (level of evidence = Ib), or
- Telehealthcare (level of evidence = Ia).

Level of Evidence = Ia, Ib

Discussion of Evidence:

Persons with asthma can learn self-management skills in a variety of settings (Krieger, Song, & Philby, 2015). Some people with asthma who are high users of health services require non-traditional modalities and formats for the provision of integrated self-management support. These programs may lead to reductions in hospitalizations (McLean et al., 2012), and improvements in quality of life and symptom-free days (Krieger et al., 2015; Pare, Moqadem, Pineau, & St-Hilaire, 2010). These non-traditional modalities and formats include home-care visits and telehealthcare[G].

Home-Care Visits

The provision of an in-home asthma self-management support program for low-income adults with uncontrolled asthma has been shown to improve asthma control. A strong quality RCT investigated the effect of home visits compared to usual care on asthma outcomes for low-income adults with uncontrolled asthma (Krieger et al., 2015). An average of five visits were conducted over the year by community health workers which included providing education, self-management support, and service coordination. The community health workers were supported to deliver this care by a nurse and health educator. Statistically significant and clinically meaningful improvements were observed in symptom-free days and quality of life compared to usual care, but not in terms of unscheduled health-care use (Krieger et al., 2015).

Telehealthcare

Telehealthcare can include telephone calls to support home self-management, or telemonitoring[G]. A Cochrane review assessed the effectiveness of providing telehealthcare interventions to people with asthma (McLean et al., 2012). To be included in the review, interventions needed to have a focus on the proactive use of information communication technology in the provision of information to health-care providers for decision-making and feedback to the

participant. The investigators concluded that telehealthcare interventions are unlikely to result in clinically relevant improvements for persons with mild asthma, but that they may be beneficial for those who are at higher risk of hospital admission. Specifically, the meta-analysis, which included four studies representing 499 individuals, observed a significant reduction in hospitalizations over a 12-month period, with the effect being most marked for persons with uncontrolled disease (McLean et al., 2012).

The result of this meta-analysis is highly reliant on two particular studies (Kokubu et al., 2000 and Donald et al., 2008), both of which selected participants with uncontrolled asthma defined through admission to hospital or requiring oral steroids at least three times in the previous year (McLean et al., 2012). These results demonstrate that telehealthcare may reduce hospital admission rates (and associated costs) in appropriately selected populations (McLean et al., 2012).

RECOMMENDATION 3.7:

Refer and connect persons with asthma to a:

- Primary care provider, and
- Certified asthma educator or certified respiratory educator.

Level of Evidence = IV

Discussion of Evidence:

Persons with asthma should have a primary care provider[G] (physician or nurse practitioner) to monitor their asthma control and prescribe appropriate therapy, as well as to order necessary diagnostic and clinical investigations. Without a primary care provider, persons with asthma are at a greater risk for uncontrolled asthma and have greater difficulty accessing appropriate therapy. In addition, persons with asthma may need to be referred to a specialist through their primary care provider, if their asthma diagnosis is in doubt or their asthma is difficult to control (BTS/SIGN, 2014; GINA, 2015; Sveum et al., 2012).

Accessing a regular primary care provider can be difficult for people in rural communities, and can lead to asthma care and health disparities (Lutifyya, McCullough, & Lipsky, 2011; Roy, McGinty, Hayes, & Zhang, 2010). The RNAO expert panel acknowledges that connecting people with asthma to regular primary care providers in rural areas can be challenging and is a need that deserves attention.

Persons with asthma should also be referred and connected to a certified asthma educator[G] (CAE) or certified respiratory educator[G] (CRE) in their community. Evidence suggests that asthma is better managed when persons receive care supplemented by a respiratory educator (RNAO, 2004a, 2007a; Sari & Osman, 2015). A moderate quality observational study found that individuals who received primary care supplemented with a CRE were more likely to receive comprehensive asthma care that included asthma education and regular follow-up care (Sari & Osman, 2015).

It is the role of the nurse to facilitate connections for persons with asthma to primary care providers and CAEs/CREs in the person's community. If a CAE or CRE is not available, the person can instead be connected to The Lung Association's Lung Health Information Line, which is staffed by certified respiratory educators. For more information, visit The Lung Association's website (https://www.lung.ca/lung-health/get-help/lung-health-information-line).

4.0 EVALUATION

RECOMMENDATION 4.1:

At every encounter, evaluate the effectiveness of the overall plan of care in achieving asthma control.

Level of Evidence = V

Discussion of Evidence:

The expert panel recommends that the plan of care be evaluated at every encounter, guided by asthma control assessment (GINA, 2015; Lougheed et al., 2012).

An overall asthma plan of care includes an individualized person-centred asthma education plan, a pharmacological management plan, a documented asthma action plan and planned follow-up care. Evaluation of the plan of care requires collaboration and coordination between the nurse, the person with asthma, and the interprofessional health-care team. Ongoing evaluation of the plan of care should include an assessment of the person's asthma control, as well as engagement and satisfaction with the asthma plan of care (both pharmacologic and non-pharmacological, including actual use of prescribed medications). The evaluation should address the person's progress and responsiveness to the educational plan and self-management abilities, including understanding and use of the individualized documented asthma action plan. It is also important to evaluate any underlying factors that can negatively affect the person's asthma control and that should be addressed in the plan of care.

It is extremely important to evaluate individuals' understanding of and engagement with both the pharmacological and non-pharmacological aspects of their asthma plan of care. Self-management of asthma is complex, and includes self-monitoring of asthma control, taking medications as prescribed, applying accurate inhaler technique, avoiding and/or managing asthma triggers, and engaging in health-promoting behaviours. Many barriers to following their asthma plan of care exist for persons with asthma, including misperceptions about asthma control and misunderstanding medication instructions (GINA, 2015). For a list of barriers and methods for supporting asthma self-management and the person's engagement in the asthma plan of care, please see **Appendix H**.

Overall, an evaluation of the plan of care in achieving asthma control should include a reassessment and evaluation of the following:

- Current and past asthma control (see **Table 2** in **Recommendation 1.2a**);
- Demonstration of correct inhaler technique for prescribed devices;
- Understanding of and ability to follow the individualized documented asthma action plan (including knowledge and skills);
- Ability to follow the plan of care (pharmacological and non-pharmacological aspects);

- Actual use of asthma medications (relievers and controllers). Methods to identify this include:
  - Best Possible Medication History[G]
  - Self-reporting
  - Pharmacy reports or records
  - Prescription records; and
- Satisfaction with the plan of care.

Findings from the evaluation should be used to adjust the plan of care and the interventions in order to improve the person's asthma control.

Education Recommendations

5.0 EDUCATION

RECOMMENDATION 5.1a:

Develop multifaceted education programs that reinforce standardized, evidence-based asthma care for:

- Health-care providers (level of evidence = IIb), and
- Students entering health-care professions (level of evidence = V).

Level of Evidence = IIb, V

RECOMMENDATION 5.1b:

Implement evidence-based education programs for health-care providers and students entering health-care professions that are facilitated by knowledgeable and skilled educators, and that focus on the core competencies of asthma care.

Level of Evidence = V

Discussion of Evidence:

Clinical educators and faculty members should develop multifaceted education programs that reinforce guideline-based asthma care for nurses, other health-care providers, and students entering health-care professions, in order to ensure foundational learning regarding the evidence-based practices associated with quality asthma assessment and management. The expert panel recommends that approaches aimed at developing health-care providers' knowledge and skills in evidence-based asthma care are: (1) multifaceted, whereby multiple modalities are utilized to deliver the education; (2) facilitated by knowledgeable and skilled educators within the field of asthma; and (3) focused on the core competencies of asthma care.

Multifaceted, Guideline-Based Education

In order to improve the quality of asthma care provided for persons with asthma, a number of studies have investigated the implementation of guideline-based asthma education programs (Adeyeye, Kuyinu, Bamisile, & Oghama, 2015; Bender et al., 2011; Cicutto, Dingae, & Langmack, 2014; Cleland, Hall, Price, & Lee, 2007; Policicchio, Nelson, & Duffy, 2011; Taylor-Fishwick, Okafor, & Fletcher, 2015). In a number of before-and-after study designs of weak to moderate methodological quality, educational interventions were found to have positive results on a variety of outcomes, including health-care provider confidence, knowledge, and behaviours consistent with evidence-based practice (Adeyeye et al., 2015; Bender et al., 2011; Cicutto et al., 2014; Policicchio et al., 2011; Taylor-Fishwick et al., 2015). To achieve these outcomes, the programs utilized multiple interactive learning strategies, including:

- Training and on-site coaching (Bender et al., 2011; Cicutto et al., 2014),
- Lectures (Cicutto et al., 2014),
- Case studies (Cicutto et al., 2014),
- Role play (Cicutto et al., 2014), and
- Video demonstrations (Policicchio et al., 2011; Taylor-Fishwick et al., 2015).

The expert panel recommends that multifaceted education programs that reinforce standardized, guideline-based asthma care should also be offered to students entering health-care professions.

Facilitation by Knowledgeable and Skilled Educators

Most of the continuing or professional development programs described above were delivered by a team of health-care providers with clinical expertise in asthma, as well as training in the delivery of effective education programs (Adeyeye et al., 2015; Bender et al., 2011; Cicutto et al., 2014; Cleland et al., 2007). The expert panel recommends that the delivery of asthma educational programs be facilitated by well-informed health-care providers and skilled educators within the field of asthma. The experience and confidence of the health-care provider is vital to ensuring that education is delivered in a consistent and relevant manner, and that it addresses the varying needs of learners while accomplishing educational objectives. The expert panel recognizes that certified asthma and respiratory educators are skilled and knowledgeable educators, that are regularly assessed to ensure attainment and maintenance of competency in the areas of evidence-based asthma care practices (i.e., what to teach) and educational theory and processes (i.e., how to teach).

Core Competencies of Asthma Care

In order to provide the necessary support and education to adults with asthma, health-care providers require basic knowledge and skills to achieve core competency attainment for evidence-based asthma assessment and management. The expert panel recommends that all health-care providers be educated to possess the appropriate knowledge and skills to identify the person's level of asthma control; provide basic asthma self-management education; demonstrate accurate inhaler techniques; and explain, utilize, and work through an asthma action plan.

Health-care providers must be able to assess and monitor a person's asthma control (Lougheed et al., 2012; please see **Recommendation 1.2**), as this guides them in developing a responsive and appropriate management plan. Managing asthma is a dynamic process that requires specific knowledge, understanding, and skills in order to achieve control. Health-care providers need adequate knowledge and skills in order to be able to provide effective asthma self-management education to people with asthma. Such education requires recognition of the importance of shared decision-making that involves giving information, and assisting with the acquisition of skills, as well as supporting behaviour change on the part of the individual with asthma through strong communication skills and assessing and addressing potential barriers (RNAO, 2004a; GINA, 2015; NIH, 2007).

Asthma control is achieved by accurately using devices. People with asthma must learn how to use their devices properly, but health-care providers must also possess this skill in order to support successful self-management. Results from a weak quality systematic review of 20 studies assessing health-care providers' ability to use asthma inhalation devices highlighted inadequate skills in using MDIs, spacers, and dry-powder inhalers[G] (DPIs) by a majority of health-care providers (Self, Arnold, Czosnowski, Swanson, & Swanson, 2007). Workshops on inhaler device technique can significantly improve health-care providers' skill levels (Basheti, Qunaibi, Hamadi, & Reddel, 2014), as well as their attitudes toward teaching device technique to persons with asthma (Leung et al., 2015).

As explained in **Recommendation 3.5**, asthma action plans are recommended as an essential element of asthma care (GINA, 2015; Lougheed et al., 2012; NIH, 2007); however, they are typically under-utilized in practice (Andrews et al., 2014; Ring et al., 2007). A cross-sectional study of moderate quality identified lack of familiarity with plans and poor self-efficacy as possible reasons for under-utilization of action plans among health-care providers (Wisnivesky et al., 2008). In response to these identified barriers, a moderate quality cluster randomized trial of training designed to support the provision of individualized asthma action plans was provided to nurses (Cleland et al., 2007). The training—which included case

studies to practice formulating action plans, reviews of individualized asthma action plans, and role-play with actors, including feedback on the use of asthma action plans—was shown to lead to improved asthma quality of life (for example, in the areas of symptoms and emotions) among persons with poorly controlled asthma as a result of the action plans. Notably, asthma control and medication use remained unchanged (Cleland et al., 2007).

RECOMMENDATION 5.2:

Asthma educators obtain and maintain a certified asthma educator or certified respiratory educator designation.

Level of Evidence = V

Discussion of Evidence:

The expert panel recommends that health-care providers specializing in the area of asthma care obtain and maintain certification as an asthma educator (CAE) or respiratory educator (CRE). This consensus[G] recommendation acknowledges that educational programs for asthma and respiratory educators resulting in national certification may standardize the information provided to persons with asthma, improve the quality of education, and improve self-management support skills (RNAO, 2007a).

The Canadian Network for Respiratory Care established a national certification for asthma and respiratory educators that addresses two aspects of asthma educator education: (1) up-to-date knowledge about asthma, and (2) a better understanding on the part of educators about educational theory and process. National learning objectives (core curricula) have been developed to provide a common set of technical and teaching competences for asthma and respiratory educators, and proficiency in these competencies is required for national certification (Canadian Network for Respiratory Care [CNRC], 2013).

For access to resources that provide information on achieving CRE or CAE certification, please refer to **Appendix P**.

RECOMMENDATION 5.3:

Provide a quality assurance program and standardized training for health-care providers who perform spirometry.

Level of Evidence = V

Discussion of Evidence:

Evidence-based clinical practice guidelines recommend spirometry testing for the diagnosis and management of asthma (GINA, 2015; Lougheed et al., 2012). Performing spirometry, whether for diagnostic purposes or for ongoing assessment of asthma control, requires standardized training, including education, supervision in performance, and quality control of spirometry testing (Coates et al., 2013; GINA, 2015).

The expert panel recommends that nurses and other health-care providers who perform or will perform spirometry receive formal preparatory training to ensure they have the required knowledge and skills to perform tests to a high standard. After initial training, the panel recommends that a quality assurance program[G] be established for health-care providers to receive follow-up assessment of competency (knowledge and skills) in the performance of spirometry, and to ensure continual acceptable quality of tests, through quality control of equipment, techniques, and procedures (Coates et al., 2013).

In an effort to improve access to spirometry testing and concordance between clinical practice and asthma guidelines, researchers evaluated the quality of spirometry performed by nationally certified asthma and COPD educators with limited spirometry training in primary care, compared to experienced pulmonary function technicians (Licskai, Sands, Paolatto, Nicoletti, & Ferrone, 2012). The study was a pre-post design of moderate methodological quality. The nationally certified educators (including nurses with limited spirometry training) were trained to perform spirometry by an experienced pulmonary function technician during two, two-hour workshop sessions and were supervised for up to six patient sessions. Following the training period a technician was available as a resource person. In addition, the spirometer was programmed to provide automated in-session quality feedback on test acceptability. Findings from the study indicate that health-care providers with limited training and experience, who were operating within a simple quality program, achieved quality spirometry in the majority of sessions in a primary-care setting (77 percent), which approaches pulmonary function laboratory standards (91 percent) (Licskai et al., 2012).

Appendix P includes a list of resources that nurses and other health-care providers can refer to for more information on spirometry and spirometry education.

Organization and Policy Recommendations

6.0 ORGANIZATION AND POLICY

RECOMMENDATION 6.1:

Organizations establish a corporate priority focused on the integration and evaluation of best practice asthma care across all care settings.

Level of Evidence = V

Discussion of Evidence:

Organizations should recognize that persons with asthma have the right to integrated, high-quality, evidence-based asthma care across all clinical and care settings. However, components of evidence-based asthma care remain poorly integrated into clinical practice (Andrews et al., 2014; Pinnock et al., 2015; Wisnivesky et al., 2008) despite evidence of improved quality of care (Cicutto et al., 2014; Doherty, Jones, Davis, Ryan, & Treeve, 2007; To, Cicutto, Degani, McLimont, & Beyene, 2008). The expert panel recommends that organizations establish the integration and evaluation of best practice asthma care across all care settings as a corporate priority. This means recognizing best practices in asthma care as a priority and establishing policies, programs, and practices for conducting operations in a manner that is consistent with asthma care best practices (Leipziger, 2010). Best practices in asthma care should be integrated at all points where persons with asthma interact with health-care providers, including in clinics, hospitals, and communities (NIH, 2007; Sveum et al., 2012). Making best practices in asthma care a corporate priority across the continuum of care will ensure that care is provided within a timely and coordinated system that provides evidence-based assessment, management, and follow-up care for adults with asthma.

Organizational-level implementation of comprehensive, evidence-based asthma care has demonstrated improvements in quality and clinical outcomes within primary care (Cicutto et al., 2014; To et al., 2008), and improvements in asthma management within acute care (Doherty et al., 2007). A systematic review conducted by Pinnock and colleagues (2015) evaluated the implementation of asthma self-management, a component of evidence-based asthma management, into routine clinical care. Interventions that explicitly addressed education, professional training, and organizational commitment demonstrated the most consistent improvements in asthma outcomes, such as markers of asthma control and reduced use of unscheduled health care. This suggests that effective integration of best practices must occur within an organization where best practices are valued, supported, and monitored.

Organizations need to consider how to promote a culture of actively supporting the integration of best practices in asthma care. To achieve this, the literature and expert panel suggest that organizations require the following:

- Buy-in from leadership and management in terms of understanding the importance of addressing asthma best practices as a corporate priority;
- Training and ongoing support of all professional staff in best practice asthma care (Cicutto et al., 2014; To et al., 2008);
- Collaborative multidisciplinary teams (Kaferle & Wimsatt, 2012; Pinnock et al., 2015);

- The provision of adequate physical, human, and financial resources (RNAO, 2007a) (e.g., adequate dollars allocated for teaching equipment needs such as spacer devices, sample action plan templates, educational materials, peak flow equipment, time allotted for staff to attend training, etc.); and
- Ongoing monitoring and evaluation of implementation of asthma best practice processes and outcomes measures (Doherty et al., 2007; RNAO, 2007a). For more information on monitoring and evaluating knowledge, please refer to the RNAO *Toolkit: Implementation of Best Practice Guidelines* (2012b).

RECOMMENDATION 6.2:

Organizations provide the resources and professional training necessary to integrate best practices for the assessment and management of adult asthma across all care settings.

Level of Evidence = V

Discussion of Evidence:

In order to integrate adult asthma best practices at the organizational level, the expert panel recommends that adequate resources and training be devoted to the implementation of evidence-based recommendations. Successful implementation of these best practice recommendations requires (1) organizational support, (2) clinical decision supports, and (3) communication processes.

Organizational Supports

Appropriate fiscal and human resources are required in order to implement best practices in organizations. For example, additional funding may be required to purchase equipment (e.g., peak flow monitoring equipment, patient resource materials, etc.) and to hire staff to ensure adequate staffing levels and the ability of staff to provide quality asthma care. Organizations will also be required to allocate time and resources to support professional staff knowledge and skills regarding best practices in asthma care (for example, through professional development).

The literature identifies that uptake of asthma best practices is enhanced when organizations apply the following knowledge translation strategies:

- Providing clinical support and coaching opportunities to all staff (Cicutto et al., 2014);
- Providing interactive, multidisciplinary educational workshops on best practices related to asthma management (Cicutto et al., 2014; Wisnivesky et al., 2008);
- Developing Champions[G] within the organization to support uptake and implementation of best practices (Cicutto et al., 2014; Doherty et al., 20107);
- Providing clinical support tools (e.g., asthma action templates, patient education checklists, and access to guidelines in a usable format) (Cicutto et al., 2014; Doherty et al., 2007); and
- Conducting audit and feedback (Cicutto et al., 2014; Doherty et al., 2007). For example, a controlled trial implementation of adult asthma guidelines in the emergency department conducted audits of key clinical indicators based on identified practice gaps. Aggregate data was posted in the emergency department at approximately monthly intervals for staff viewing (Doherty et al., 2007). Similarly, a quasi-experimental study implementing evidence-based asthma practices in primary care provided regular reports to primary-care providers based on chart audits of documented quality asthma care indicators regularly over an 18-month period (Cicutto et al., 2014). Both of these examples demonstrate that feedback is important to support knowledge transfer.

Clinical Decision Supports

Clinical decision supports refer to reminders and algorithms or pathways to promote the use of guideline-based asthma management during decision-making (RNAO, 2012b). Studies have reported that electronic reminders have helped increase provider completion of asthma action plans in both primary care (Kaferle & Wimsatt, 2012) and outpatient settings (Kuhn et al., 2015). Furthermore, a controlled study involving ten Canadian hospitals investigated whether a standardized emergency department (ED) asthma care pathway for adults would be accepted by staff and would improve adherence to Canadian emergency department guidelines (Lougheed et al., 2009). Despite modest uptake, findings indicated beneficial changes in specific aspects of asthma care delivery, including referrals and new knowledge attained by persons with asthma during the ED visits without any substantial increase in the length of ED stays (Lougheed et al., 2009).

For more information on the emergency department care pathway, visit The Lung Association—Ontario's website (http://www.on.lung.ca/edacp). In light of these findings, the expert panel recommends that clinical decision supports informed by best practices are important to assist health-care teams in the appropriate management of asthma.

Communication and Coordination Processes

The expert panel recognizes the need for effective communication processes to ensure that all members of the interprofessional health-care team, including the person (with asthma), are aware of the person's asthma diagnosis, asthma control status, and asthma plan of care across transitions in care (e.g., when a person returns home following an emergency department visit). As asthma is a chronic disease, communication and coordination of care is necessary because care is provided across health settings, throughout the course of illness, and between health-care providers. Communication and coordination are also important to maintain consistency with an asthma plan of care, including the individualized education plan and documented asthma action plan. Further, nurses and other health-care providers should be informed and knowledgeable about the asthma services and referral processes in their communities in order to support persons with asthma in navigating the local health system. For additional information on effective interprofessional care and communication strategies, please refer to the RNAO BPG *Developing and Sustaining Interprofessional Health Care: Optimizing Patient, Organizational and System Outcomes* (2013a). For additional information on facilitating transitions in care, please refer to the RNAO BPG *Care Transitions* (2014).

The health system and health-care organizations need to involve and collaborate with interprofessional health-care teams in order to identify the resources required to support best practices in asthma care. The successful implementation of best practices for asthma assessment and management is a complex process. Organizations can use frameworks such as the "Knowledge-to-Action" process (Straus, Tetroe, Graham, Zwarenstein, & Bhattacharyya, 2009) to identify key considerations, strategies, and the resources needed to facilitate a culture of evidence-based practice. To view an example of a knowledge-to-action progress framework, please refer to the RNAO *Toolkit: Implementation of Best Practice Guidelines* (2012b).

Research Gaps and Future Implications

The RNAO Best Practice Guidelines Program Team and expert panel, in reviewing the evidence for this Guideline, identified the priority areas for research set out in **Table 4**. They are broadly categorized into practice, outcome, and health-system research.

Table 4: Priority Practice, Outcome, and Health-System Research Areas

CATEGORY	PRIORITY RESEARCH AREA
Practice Research	Stronger evidence to support cut-points for asthma control criteria to determine asthma control status
	Best practices for incorporating health literacy and cultural relevance into adult asthma care
	Continued development of validated tools to assess for anxiety or fear in adults with asthma
	Validation of assessment tools to determine the cognition and capacity to self-manage in adults with asthma
	How to engage the person–caregiver (unpaid) dyad in delivering asthma care
Outcome Research	Most effective layout and elements of an asthma action plan for adults in order to achieve asthma control
	Effectiveness of complementary therapies in improving asthma control (e.g., music therapies, expressive writing, psychological therapies, etc.)
Health-System Research	Evaluation of the implementation of asthma guidelines in clinical settings beyond primary care
	Evidence to support effective staff mix and staffing levels in the community for quality asthma outcomes
	The impact of Canadian health inequities on asthma care and asthma care outcomes
	Stronger level of evidence to support the effectiveness of CREs and CAEs at improving quality of care and asthma outcomes

The above table, though not exhaustive, is an attempt to identify and prioritize the research needed with respect to adult asthma care. Many of the recommendations in this Guideline are based on quantitative and qualitative research evidence; others are based on RNAO expert panel opinion. Further substantive research is required to validate some of these recommendations. Increasing the research evidence will lead to improved adult asthma care practices.

Implementation Strategies

Implementing guidelines at the point of care is multifaceted and challenging; it takes more than awareness and distribution of guidelines to get people to change how they practice. Guidelines must be adapted for each practice setting in a systematic and participatory way, to ensure recommendations fit the local context (Harrison, Graham, Fervers, & van den Hoek, 2013). The RNAO *Toolkit: Implementation of Best Practice Guidelines* (2012b) provides an evidence-informed process for doing this (see **Appendix Q**).

The Toolkit is based on emerging evidence that successful uptake of best practice in health care is more likely when:

- Leaders at all levels are committed to supporting guideline implementation;
- Guidelines are selected for implementation through a systematic, participatory process;
- Stakeholders for whom the guidelines are relevant are identified and engaged in the implementation;
- Environmental readiness for implementing guidelines is assessed;
- The guideline is tailored to the local context;
- Barriers and facilitators to using the guideline are assessed and addressed;
- Interventions to promote use of the guideline are selected;
- Use of the guideline is systematically monitored and sustained;
- Evaluation of the guideline's impact is embedded in the process; and
- There are adequate resources to complete all aspects of the implementation.

The *Toolkit* uses the "Knowledge-to-Action" framework (Straus et al., 2009) to demonstrate the process steps required for knowledge inquiry and synthesis. It also guides the adaptation of the new knowledge to the local context and implementation. This framework suggests identifying and using knowledge tools, such as guidelines, to identify gaps and to begin the process of tailoring the new knowledge to local settings.

RNAO is committed to widespread deployment and implementation of our Best Practice Guidelines (BPGs). We use a coordinated approach to dissemination, incorporating a variety of strategies, including:

1. The Nursing Best Practice Champion Network®, which develops the capacity of individual nurses to foster awareness, engagement, and adoption of BPGs;
2. Nursing Order Sets[G] which provide clear, concise, actionable intervention statements derived from the BPGs' practice recommendations that can be readily embedded within electronic medical records, but may also be used in paper-based or hybrid environments; and
3. The Best Practice Spotlight Organization® (BPSO®) designation, which supports implementation at the organization and system levels. BPSOs® focus on developing evidence-based cultures with the specific mandate to implement, evaluate, and sustain multiple RNAO BPGs.

In addition, we offer capacity-building learning institutes on specific BPGs and their implementation annually. Information about our implementation strategies can be found at:

- RNAO Best Practice Champions Network®: http://RNAO.ca/bpg/get-involved/champions
- RNAO Nursing Order Sets: http://RNAO.ca/bpg/initiatives/nursing-order-sets
- RNAO Best Practice Spotlight Organizations®: http://RNAO.ca/bpg/bpso
- RNAO capacity-building learning institutes and other professional development opportunities: http://RNAO.ca/events.

Evaluating and Monitoring This Guideline

As you implement the recommendations in this Guideline, we ask you to consider how you will monitor and evaluate its implementation and impact.

Table 5 is based on a framework outlined in the RNAO's *Toolkit: Implementation of Best Practice Guidelines* (2012b) and illustrates some specific indicators for monitoring and evaluating implementation of this Guideline.

Table 5: Structure, Process, and Outcome Indicators

TYPE OF INDICATOR		
Structure	**Process**	**Outcome**
These indicators refer to the supports and resources required for a health system, health service organization, or academic institution to enable the successful implementation of the RNAO BPG *Adult Asthma Care: Promoting Control of Asthma*.	These indicators evaluate whether best practices directed at the education, training, and practice of health-care providers to improve asthma care have been implemented.	These indicators evaluate the impact of implementing the Guideline recommendations on health-care organizations, health-care providers, and person-level outcomes.
	Person-specific process indicators	**Person-specific outcome indicators**
Organizations provide multifaceted, guideline-based education facilitated by knowledgeable and skilled educators in order for nurses and other health-care providers to attain core competencies of adult asthma care (*yes/no*). Academic institutions provide multifaceted, guideline-based education facilitated by knowledgeable and skilled educators in order for students entering nursing and other health-care professions to attain core competencies of asthma care (*yes/no*).	*Diagnosis:* Percentage of adults with asthma whose health record was reviewed for an asthma diagnosis and who were asked the two questions outlined in **Recommendation 1.1**. *Asthma control:* Percentage of adults with asthma who had their asthma control assessed as per **Recommendation 1.2a** at every encounter. *Asthma exacerbations:* Percentage of adults with asthma currently experiencing an asthma exacerbation who receive appropriate asthma management as per **Recommendation 1.2b**.	*Diagnosis:* Percentage of adults with a confirmed diagnosis of asthma. *Asthma control:* Percentage of adults with controlled asthma as defined in **Recommendation 1.2a**. *Uncontrolled asthma:* Percentage of adults with uncontrolled asthma as defined in **Recommendation 1.2a**. *Future exacerbations:* Percentage of adults with asthma at risk for future asthma exacerbation as defined in **Recommendation 1.3**.

TYPE OF INDICATOR		
Structure	**Process**	**Outcome**
Organizations establish policies, programs, and practices consistent with best practices and the recommendations of *Adult Asthma Care: Promoting Control of Asthma* (*yes/no*). Organizations provide the resources required to support evidence-based care of adults with asthma (e.g., peak flow meter, educational materials, etc.) (*yes/no*). Availability of evidence-based educational resources and decision aids to support informed decision-making pertaining to adult asthma care and management (*yes/no*). Organizations provide annual professional development activities related to the care of adults with asthma for all members of the interprofessional health-care team (e.g., in-services, clinical training/orientation, development of policies and procedures, documentation forms) (*yes/no*). Organizations implement initial training and a quality assurance program for nurses and other health-care providers who provide spirometry for adults with asthma and ensure quality control of equipment, techniques, and procedures (*yes/no*).	*Future risk of exacerbations:* Percentage of adults with asthma who have had their future risk of asthma exacerbations assessed as per **Recommendation 1.3** at every encounter. *Risk factors affecting management:* Percentage of adults with asthma who have been assessed for risk factors affecting the complexity of asthma management, including: age, sex, smoking habits, social determinants of health, triggers, and co-morbidities. *Education plan:* Percentage of adults with asthma who have a person-centred asthma education plan that addresses learning needs, culture, health literacy, and empowerment. *Education:* Percentage of adults with asthma who have received education on the essential skills and self-management of asthma as per **Recommendation 3.1a** & **3.1b**. *Inhaler technique:* Percentage of adults with asthma who have received active education (observation, feedback, physical demonstration, and written instructions) on correct inhaler technique at every encounter. *Inhaler device:* Percentage of adults with asthma who were engaged in shared decision-making for the selection of an inhaler device.	*Inhaler technique:* Percentage of adults with asthma who demonstrate accurate inhaler technique. *PEF:* Percentage of adults with asthma who have received education on measuring PEF and that demonstrate accurate use. *Satisfaction with care:* Percentage of adults satisfied with their asthma plan of care. *Quality of life:* Percentage of adults with asthma who have non-impaired quality of life scores (e.g., asthma quality of life questionnaire [AQLQ]).

TYPE OF INDICATOR		
Structure	**Process**	**Outcome**
	PEF: Percentage of adults with asthma (of those deemed appropriate) who have received education in measuring peak expiratory flow rates. *Documented action plan:* Percentage of adults with asthma involved in the development and review of an individualized documented asthma action plan (i.e., in writing). *Self-management:* Percentage of adults with uncontrolled asthma at risk for severe exacerbations who are provided with self-management support through home-care visits and/or telehealthcare (e.g., telephone call, telemonitoring). *Refer:* Percentage of adult persons with asthma who did not have a primary care provider and were referred and connected to a primary care provider and a CAE or CRE (if available) for their first visit. *Evaluation:* Percentage of adults with asthma who have their plan of care reassessed and evaluated as per **Recommendation 4.1** at every encounter. This includes: ■ Percentage of adults with asthma assessed for actual use of prescribed medications (e.g., self-report, pharmacy reports), ■ Percentage of adults with asthma assessed for barriers to medication use, and	

TYPE OF INDICATOR		
Structure	**Process**	**Outcome**
	■ Percentage of adults with asthma identified with barriers to medication use who were provided with supports to address the identified barriers.	
	Health-care-provider-specific process indicators	**Health-care-provider-specific outcome indicators**
	Percentage of nurses and other health-care providers who receive multifaceted, guideline-based education facilitated by knowledgeable and skilled educators to attain core competencies of asthma care. Percentage of students entering nursing and other health-care professions who receive multifaceted, guideline-based education facilitated by knowledgeable and skilled educators and attain core competencies of asthma care. Percentage of asthma educators who obtain and maintain the designation of CRE or CAE. Percentage of health-care providers who receive standardized education and training to perform spirometry.	Percentage of new graduates/nursing and other health-care providers who can demonstrate the core competencies of asthma care. Percentage of new graduates/nursing and other health-care providers who report increased confidence in the core competencies of asthma care.

Other RNAO resources for the evaluation and monitoring of Best Practice Guidelines:

- Nursing Quality Indicators for Reporting and Evaluation® (NQuIRE®) were designed for RNAO's Best Practice Spotlight Organizations® (BPSO®) to systematically monitor the progress and evaluate the outcomes of implementing RNAO Best Practice Guidelines in their organizations. NQuIRE is the first international quality improvement initiative of its kind consisting of a database of quality indicators derived from recommendations of selected RNAO clinical BPGs. Please visit http://RNAO.ca/bpg/initiatives/nquire for more information.
- Nursing Order Sets embedded within electronic medical records provide a mechanism for electronic data capture of process indicators. The ability to link structure and process indicators with specific client outcome indicators aids in determining the impact of BPG implementation on specific client health outcomes. Please visit http://RNAO.ca/ehealth/nursingordersets for more information.

Process for Update and Review of Best Practice Guidelines

The Registered Nurses' Association of Ontario (RNAO) commits to updating its Best Practice Guidelines (BPG) as follows:

1. Each BPG will be reviewed by a team of specialists in the topic area every five years following publication of the previous edition.
2. RNAO International Affairs and Best Practice Guideline (IABPG) Centre staff regularly monitor for new systematic reviews, randomized controlled trials, and other relevant literature in the field.
3. Based on that monitoring, IABPG Centre staff may recommend an earlier revision period for a particular BPG. Appropriate consultation with members of the original expert panel and other specialists and experts in the field will help inform the decision to review and revise the BPG earlier than the targeted milestone.
4. Three months prior to the review milestone, IABPG Centre staff commence planning of the review by:
   a) Inviting specialists in the field to participate on the expert panel. The panel will be composed of members from the original expert panel as well as other recommended specialists and experts.
   b) Compiling feedback received and questions encountered during the implementation, including comments and experiences of BPSOs® and other implementation sites regarding their experiences.
   c) Compiling new clinical best practice guidelines in the field and conducting a systematic review of the evidence.
   d) Developing a detailed work plan with target dates and deliverables for developing a new edition of the BPG.
5. New editions of BPGs will be disseminated based on established structures and processes.

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Appendix A: Glossary of Terms

Accessory muscle use: The use of the muscles of the neck, back, chest, and abdomen that assist the diaphragm in respiration. When assessing accessory muscle use within the context of an asthma exacerbation, assess for in-drawing, sub-costal or intercostal muscle retractions.

Allergen: A substance that is capable of inducing an allergic reaction or hypersensitivity. Common allergens include house dust mites, animals, food, mould, and pollen (RNAO, 2004a).

Allergic rhinitis: Condition characterized by sneezing and nasal obstruction, often accompanied by itching of the eyes and nose. Postnasal drip and cough are other common symptoms (Ng, Warlow, Chrishanthan, Ellis, & Walls, 2000).

Analytical studies: Analytical studies test hypotheses about exposure–outcome relationships. The investigators do not assign an intervention, exposure, or treatment but do measure the association between exposure and outcome over time, using a comparison group (Centers for Disease Control and Prevention, 2013). Analytical study designs include case-control studies and cohort studies.

Case-control study: A study that compares people with a specific disease or outcome of interest (cases) to people from the same population without that disease or outcome (controls) (The Cochrane Collaboration, 2005).

Cohort study: An observational study in which a defined group of people (the cohort) is followed over time, either prospectively or retrospectively (The Cochrane Collaboration, 2005).

Asthma: "An inflammatory disorder of the airways characterized by paroxysmal or persistent symptoms such as dyspnea, chest tightness, wheezing, sputum production and cough, associated with variable airflow limitation and a variable degree of hyper-responsiveness of the airways to endogenous or exogenous stimuli" (Lougheed et al., 2012, p. 128).

Asthma action plan: "A collaboratively written set of instructions that assist the person to adjust their asthma medication and/or to seek medical attention according to their severity and frequency of symptoms and/or peak flow rate in order to maintain control" (RNAO, 2004a, p. 22).

Asthma control: Control is defined by the following parameters (Lougheed et al., 2012, p. 161):

- Need for a fast-acting beta$_2$-agonist < 4 doses/per week (including for exercise);
- Daytime symptoms < 4 days/week;
- Nighttime symptoms < 1 night/week;
- Normal physical activity levels;
- Mild, infrequent exacerbations;

Asthma control (cont.):

- No absences from work or school;
- Forced expiratory volume in first second (FEV_1) or peak expiratory flow (PEF) ≥ 90% of personal best*‡;
- Diurnal PEF variation < 10–15%*‡; and
- Sputum eosinophils < 2–3%*‡.

* Indicates important objective information for a complete assessment of asthma control, but may not be available.

‡ Performed and interpreted within health-care-provider scope of practice (including appropriate knowledge and skills) and in alignment with organizational policies and procedures.

Asthma–COPD overlap syndrome (ACOS): Condition characterized by "persistent airflow limitation with several features usually associated with asthma and several features usually associated with COPD. ACOS is therefore identified in clinical practice by the features that is shares with both asthma and COPD" (GINA, 2015, p. 75).

Asthma diary: A tool to assist persons in monitoring their asthma that can be used to track asthma symptoms, medication use, peak flow meter readings, and asthma triggers.

Asthma management: Establishing and maintaining control of one's asthma includes self-management education, environmental control measures, appropriate medications, action plans, and regular follow-up care (RNAO, 2004a).

Atopy: "Development of an immunoglobulin E (IgE) mediated response to common allergens" (RNAO, 2004a, p. 66) that includes eczema, allergic rhinitis, and asthma.

Best Possible Medication History (BPMH): "A Best Possible Medication History (BPMH) is a history created using 1) a systematic process of interviewing the client/family; and 2) a review of at least one other reliable source of information to obtain and verify all of a client's medication use (prescribed and non-prescribed). Complete documentation includes drug name, dosage, route and frequency" (Canadian Patient Safety Institute and Institute for Safe Medication Practices Canada, 2015, p. 7).

Best practice guidelines: Systematically developed statements to assist practitioner and client decisions about appropriate health care for specific clinical (practice) circumstances (Field & Lohr, 1990); also called *clinical practice guidelines*.

$Beta_2$-agonists: "A group of bronchodilators resulting in smooth muscle relaxation and bronchodilation through stimulation of beta-2 receptors found on airway smooth muscle" (RNAO, 2004a, p. 66).

Breathing exercises: Therapeutic exercises to deepen inspiration or expiration or even to alter the rate and rhythm of breathing (National Centre for Biotechnology Information, 2016, para 1). May include such interventions as: diaphragmatic breathing exercises, Papworth method, Buteyko method, and yoga training involving breathing exercises as a major component.

Bronchodilators: "A category of medications that produce relaxation of the smooth muscles surrounding the bronchi, resulting in dilatation of the airways" (RNAO, 2004a, p. 66). Bronchodilators are either short-acting or long-acting. Short-acting medications provide quick relief from acute bronchoconstriction. Long-acting bronchodilators help to control and prevent symptoms of asthma (The Lung Association, 2015).

Bronchospasm: A contraction of smooth muscle in the walls of the bronchi and bronchioles, causing narrowing of the lumen (airway) (RNAO, 2007a).

Certified asthma educator (CAE): This credential recognizes health-care providers who provide asthma education to persons with asthma (CNRC, 2013). Health-care providers who are certified have taken extensive, specific courses in asthma and asthma education, and are required to recertify every five years.

Certified respiratory educator (CRE): This credential recognizes health-care providers who provide respiratory education to persons with asthma, including education in both asthma and COPD (CNRC, 2013). Health-care providers who are certified have taken extensive, specific courses in asthma, COPD, and education in these areas, and are required to recertify every five years.

Champions: Nurses or other health-care providers who are educated and trained to better understand evidence-based practice and the process of introducing evidence-based practice into clinical settings. Champions are effective in carrying out roles in mentoring, educating, and initiating policy and practice changes (Ploegg et al., 2010).

Chronic obstructive pulmonary disease (COPD): Condition characterized by airflow limitation that is not fully reversible. The airflow limitation is generally progressive and is normally associated with an inflammatory response of the lungs commonly associated with smoking. The person complains of dyspnea with physical exertion, difficulty in inhaling or exhaling deeply, and sometimes of a chronic cough. COPD can include chronic bronchitis and emphysema (Nettina, 2014; RNAO, 2005, 2010a).

Complementary therapies: "Therapies used to complement conventional health-care practices. They include a wide range of treatment modalities, such as herbal therapies, and manual healing, such as reflexology and acupuncture. The therapies are not discipline-specific, and the knowledge required to provide them is not specific to nursing. They are considered mainstream by some members of the public and some health professionals, and extremely controversial by others" (CNO, 2014a, p. 3).

Consensus: A process for making policy decisions, not a scientific method for creating new knowledge. Consensus development makes the best use of available information, be that scientific data or the collective wisdom of the participants (Black et al., 1999).

Controlled study: A clinical trial in which the investigator assigns an intervention, exposure, or treatment to participants who are not randomly allocated to the experimental and comparison or control group (The Cochrane Collaboration, 2005).

Controllers: Medications that are taken regularly on a daily basis to minimize the occurrence of asthma symptoms and prevent exacerbations (RNAO, 2004a). Corticosteroids, a type of anti-inflammatory agent, are the most common and effective type of asthma controller therapy (RNAO, 2004a; The Lung Association, 2015).

Corticosteroids: "A group of synthetic hormones that suppress the various inflammatory processes involved with asthma" (RNAO, 2004a, p. 67).

Inhaled corticosteroids: Corticosteroids that are administered by inhalation so that they are delivered straight to the site of action.

Systemic corticosteroids: Corticosteroids that are administered by oral, intravenous, or intramuscular routes.

See *controllers*

Culture: Culture refers to the shared and learned values, beliefs, norms, and ways of life of an individual or a group. It influences thinking, decisions, and actions (CNO, 2013).

Descriptive studies: Studies that generate hypotheses and describe characteristics of a sample of individuals at one point in time. The investigators do not assign an intervention, exposure, or treatment to test a hypothesis, but merely describe the who, where, or when in relation to an outcome (CDC, 2013; The Cochrane Collaboration, 2005). Descriptive study designs include cross-sectional studies.

Cross-sectional study: A study measuring the distribution of some characteristic(s) in a population at a particular point in time (also called a survey) (The Cochrane Collaboration, 2005).

Diurnal PEF variation: "Diurnal variation is calculated as the highest peak expiratory flow (PEF) minus the lowest divided by the highest peak flow multiplied by 100 for morning and night (determined over a two-week period)" (Lougheed et al., 2012, p. 161).

Dry-powder inhaler (DPI): A breath-activated device used to deliver medication in powder form to the lungs.

Dyspnea: Breathlessness or difficulty breathing.

Education recommendations: Statements of educational requirements and educational approaches/strategies for the introduction, implementation, and sustainability of the Best Practice Guideline.

Empowerment: Term used to refer to "a person having the confidence and knowledge to participate in making informed decisions for their health care. Health-care providers help empower persons to make decisions by discussing evidence-based care and treatment options (according to the person's desired level of involvement and their preferences) that meet the person's health needs and fit their life circumstances" (RNAO, 2015, p. 71).

Evidence: Information that comes closest to the facts of a matter. The form it takes depends on context. The findings of high-quality, methodologically appropriate research provide the most accurate evidence. Because research is often incomplete and sometimes contradictory or unavailable, other kinds of information are necessary supplements to, or stand-ins for, research. The evidence base for a decision is the multiple forms of evidence combined to balance rigour with expedience while privileging the former over the latter (Canadian Health Services Research Foundation, 2005).

Exacerbation: "An acute or subacute episode of progressive worsening of symptoms of asthma, including shortness of breath, wheezing, cough, and chest tightness. Exacerbations are marked by decreases from baseline in objective measures of pulmonary function, such as peak expiratory flow rate and FEV_1" (British Medical Journal, 2016). If a person is experiencing a current asthma exacerbation, then the person's asthma is uncontrolled.

A severe exacerbation may be life-threatening and is defined by the following clinical parameters (GINA, 2015, p. 64):

- Unable to speak in full sentences
- Agitated
- Respiratory Rate > 30 breaths/minute
- Pulse rate > 120 beats/minute
- O2 saturation (on room air) < 90%
- Uses of accessory muscles, and
- PEF ≤ 50% predicted or personal best.

Forced expiratory volume in first second (FEV_1): "Volume of air exhaled in the first second of the performance of the FVC" (Nettina, 2014, p. 209). FVC refers to forced vital capacity, and is the maximum volume of air exhaled after a maximum inspiration performed with a maximally forced expiratory effort (Nettina, 2014). FEV_1 is the most important measurement for monitoring obstructive lung disease and determines the severity of airway obstruction (RNAO, 2004a).

See *spirometry*

Gastroesophageal reflux disease (GERD): Condition in which gastric contents flow into the esophagus due to an incompetent lower esophageal sphincter (Nettina, 2014).

Health-care provider: In this guideline, the term refers to regulated health-care providers or professionals who provide care and services to persons and their families in any setting (acute, long-term care, home health care, primary care, and community) (RNAO, 2015).

Regulated health-care provider: In Ontario, the Regulated Health Professions Act, 1991 (RHPA) provides a framework for regulating 23 health professions, outlining the scope of practice and the profession-specific controlled or authorized acts that each regulated professional is authorized to perform when providing health care and services (CNO, 2014a, as cited in RNAO, 2015, p. 72).

Health-care provider (Cont.):

Unregulated health-care provider: Unregulated health-care providers (UCPs) fulfill a variety of roles in areas that are not subject to the RHPA. They are accountable to their employers but not to an external regulating professional body (e.g., College of Nurses of Ontario). UCPs fulfill a variety of roles and perform tasks that are determined by their employer and employment setting. UCPs only have the authority to perform a controlled act as set out in the RHPA if the procedure falls under one of the exemptions set out in the Act (CNO, 2013c, as cited in RNAO, 2015, p. 72).

Health literacy: "The ability to access, understand, evaluate and communicate information as a way to promote, maintain and improve health in a variety of settings across the life-course" (Rootman & Gordon-El-Bihbety, 2008, p. 11).

Hyper-responsiveness: "The tendency of the smooth muscle of the airway [in persons with asthma] to contract more intensely in response to a given stimulus/irritant than it does in a normal airway. This condition is present in virtually all symptomatic individuals with asthma. The most prominent manifestation of this smooth muscle contraction is airway narrowing" (RNAO, 2004a, p. 67).

Interactions: A situation in which another substance affects the activity of a drug when the two are administered together. This includes potential interactions (adverse reactions) between prescription drugs and complementary and alternative medicines (cross-therapy) (Taylor, Walsham, Taylor, & Wong, 2006). It can also include potential interactions (adverse reactions) resulting from any two drugs being administered together, drugs reacting with foods or beverages, and when an existing medical condition makes certain drugs potentially harmful (U.S. Food and Drug Administration, 2013).

Interprofessional health-care team: A team comprised of multiple health-care providers (regulated and unregulated) who work collaboratively to deliver comprehensive and quality health care and services to people within, between, and across health-care settings (Health Care Innovation Working Group, 2012; RNAO, 2013a).

Irritants: "A class of triggers that are non-allergenic that can provoke asthma symptoms" (RNAO, 2004a, p. 67). For example, dust, weather/temperature, smoke, exercise.

Meta-analysis: A systematic review of randomized controlled trials that uses statistical methods to analyze and summarize the results of the included studies (The Cochrane Collaboration, 2005).

Metered dose inhaler (MDI): "A hand activated device used for delivering an aerosolized medication to the lungs" (RNAO, 2004a, p. 67).

Nurse: Term used to refer to registered nurses, licensed practical nurses (referred to as registered practical nurses in Ontario), registered psychiatric nurses, and nurses in advanced practice roles such as nurse practitioners and clinical nurse specialists (CNO, 2014b; RNAO, 2013a).

Nursing order set: A group of evidence-based interventions specific to the domain of nursing. Nursing order sets are ordered independently by nurses (i.e., without a physician's signature) to standardize the care provided for a specific clinical condition or situation (in this case, adult asthma).

Obstructive sleep apnea (OSA): Condition characterized by excessive disruptive snoring, repeated episodes of upper airway obstruction during sleep, and nocturnal hypoxemia (Strohl & Redline, 1996).

Organization and policy recommendations: Statements of conditions required for a practice setting that enable the successful implementation of the Best Practice Guideline. The conditions for success are largely the responsibility of the organization.

Overweight and obesity: "Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. ... For adults, WHO defines overweight and obesity as follows: overweight is a BMI greater than or equal to 25; and obesity is a BMI greater than or equal to 30" (WHO, 2013, para. 2–3).

For assistance calculating BMI, visit the National, Heart, Lung and Blood Institute at https://www.nhlbi.nih.gov/ and type "BMI" into the search bar.

Peak expiratory flow (PEF): The "[m]ost rapid flow during a forced expiration after a minimum inspiration" (Nettina, 2014, p. 209). "It provides a simple, quantitative and reproducible measure of the existence of airflow obstruction. The measurement is effort dependent" (RNAO, 2004a, p. 68).

Peak flow meter: "A portable hand-held device used to measure peak expiratory flow" (RNAO, 2004a, p. 68).

Person (persons, people): An individual with whom a health-care provider is engaged in a therapeutic relationship. In most circumstances, the person is an individual, but the term may also include the person's family members and/or substitute decision-makers (group or community) (CNO, 2013a).

Practice recommendations: Statements of best practice directed at health-care providers which enable the successful implementation of the Best Practice Guideline; ideally, they are based on evidence.

Primary care provider: In this Guideline, the term primary care provider refers to a nurse practitioner or physician.

Pulse oximetry: A routine and non-invasive assessment that measures peripheral arterial oxygen saturation (SpO_2) as a marker of tissue oxygenation (Jubran, 2004).

Qualitative research: Research that uses an interactive and subjective approach to investigate and describe phenomena (e.g., lived experience) and to give them meaning. The nature of this type of research is exploratory and open-ended. Analysis involves the organization and interpretation of non-numerical data (e.g., Phenomenology, Ethnography, Grounded Theory, Case Study, etc.) (Speziale & Carpenter, 2007).

Quality: The degree to which health-care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (WHO, 2009).

Quality assurance program: A program that monitors staff competency, equipment performance, laboratory technique, procedure reporting, safety, and utilization; any office, clinic, or facility providing spirometry testing must be responsible for ensuring tests are performed to a high standard (Coates et al., 2013).

Quasi-experimental study: A study that lacks randomization and a control group and therefore is not considered a "true" experimental design (e.g., a randomized controlled trial). The investigator controls the assignment to the intervention, exposure, or treatment by using some criterion other than random assignment (e.g., pre-post design) (Polit, Beck, & Hungler, 2001).

Randomized controlled trial (RCT): An experiment in which the investigator assigns an intervention, exposure, or treatment to participants who are randomly allocated to either the experimental group (receives intervention) and the comparison (conventional treatment) or control group (no intervention or placebo) (The Cochrane Collaboration, 2005). The participants are followed and assessed to determine the efficacy of the intervention. Includes double-blind, single-blind, and non-blind trials.

Relievers: "Relievers are medications that are used to relieve asthma symptoms and to prevent asthma symptoms prior to exercise, exposure to cold air or other triggers" (RNAO, 2004a, p. 68). Relievers are best represented by short-acting beta2-agonists, a type of bronchodilator (RNAO, 2004a).

Respiratory rate: "The rate, rhythm, effort and depth of breathing. Count the number of breaths in one minute. Usually, adults take 14 to 20 breaths per minute in a quiet, regular pattern" (Stephen, Skillen, Day & Bickley, 2010, p. 114).

Self-management: The tasks and behaviours that individuals must undertake and adopt to live well with one or more chronic conditions. These include having the confidence to deal with medical management, role management, and emotional management of their conditions (Adams, Greiner, & Corrigan, 2004).

Self-monitoring: Periodic measurement that guides the management of a chronic or recurrent condition (Glasziou, Irwig, & Mant, 2005). Asthma self-monitoring involves monitoring asthma control (such as how often one has symptoms and uses reliever inhalers); it can also include checking peak flow, and identifying triggers and what works to control triggers and asthma.

Severity: The intrinsic intensity of the disease process (NIH, 2007). As used in this Guideline, it refers to the intrinsic intensity of the asthma disease process.

Shared decision-making: This approach to making decisions is based on an acknowledgment of each person's individual autonomy and right to self-determination (i.e., the freedom to make one's own decisions and control one's life). It relies on information from two experts: the health-care provider (the expert on evidence-based practices) and the person making the decisions for their health. The person is the expert on themselves (i.e., their beliefs, culture, spirituality, and values), their experience of health, and their life circumstances (social world and lived experiences with health). Together, these experts share and discuss the best options for health care and services so the person can make a decision and choose the best option for them (Elwyn et al., 2012; Légaré et al., 2010; National Voices, 2014).

Social determinants of health: "The social determinants of health are the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. The social determinants of health are mostly responsible for health inequities—the unfair and avoidable differences in health status seen within and between countries" (WHO, 2017, para. 1).

Spacer: "A holding chamber device for aerosolized medication that attaches to metered-dose inhalers to make it easier to use, and to deliver more medication to the lungs. They are available in various sizes with and without masks" (RNAO, 2004a, p. 68).

Spirometry: A test performed to objectively assess the person's pulmonary function (Coates et al., 2013). Spirometry is a simple, non-invasive breathing test that measures flow rates and lung volumes, or lung mechanics, to assess obstruction and determine appropriate treatment options.

Sputum eosinophils: An additional measure of asthma control typically used in specialized centres for persons with moderate to severe asthma. Sputum eosinophils are not normally present in healthy, non-atopic individuals, but are increased in individuals with asthma following exposure to common aeroallergens or a reduction in steroid treatment (Lougheed et al., 2012).

Stakeholder: An individual, group, or organization that has a vested interest in the decisions and actions of organizations and may attempt to influence decisions and actions (Baker et al., 1999). Stakeholders include all individuals and groups who will be directly or indirectly affected by the change or solution to the problem.

Symptoms of asthma: Symptoms of asthma typically include difficulty breathing, feeling short of breath (at rest or when exercising), chest tightness, coughing, and wheezing (OLA, 2015a).

Systematic review: A review that "attempts to collate all empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question" (The Cochrane Collaboration, 2011). A systematic review uses systematic, explicit, and reproducible methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review (The Cochrane Collaboration, 2005, 2011).

Telehealthcare: "Telehealthcare is healthcare delivered remotely, facilitated by information and communication technology and involving the exchange of information through personalized interaction between a healthcare professional using their skills and judgement and the person" (McLean et al., 2012, p. 1).

Telemonitoring: Telemonitoring includes the flow of data (e.g., peak flow and symptom monitoring) through information technology from a person's home to support health-care-provider decision-making (Pare et al., 2010).

Triggers: Factors that can provoke asthma symptoms by irritating or inflaming the airways; includes both allergens and irritants. Every individual with asthma has a unique set of triggers for asthma symptoms (OLA, 2015b; RNAO, 2004a).

Uncontrolled asthma: Asthma is uncontrolled when one or more of the following parameters is ***not*** met (Lougheed et al., 2012, p. 161):

- Need for a fast-acting $beta_2$-agonist < 4 doses/per week (including for exercise);
- Daytime symptoms < 4 days/week;
- Nighttime symptoms < 1 night/week;
- Normal physical activity levels;
- Mild, infrequent exacerbations;
- No absences from work or school;
- Forced expiratory volume in first second (FEV_1) or peak expiratory flow (PEF) ≥ 90% of personal best*‡;
- Diurnal PEF variation < 10–15%*‡; and
- Sputum eosinophils < 2–3%*‡.

* Indicates important objective information for a complete assessment of asthma control, but may not be available.

‡ Performed and interpreted within health-care-provider scope of practice (including appropriate knowledge and skills) and in alignment with organizational policies and procedures.

Valved holding chamber: A type of spacer that includes a one-way valve at the mouthpiece. This device traps and holds medicine, which gives the person time to take slow, deep breaths, which supports inhalation of all the medication.

See *Spacer*

Work-related asthma: Asthma that is caused by or exacerbated by a substance or condition in the workplace. There are two types of work-related asthma: (1) work-exacerbated asthma, and (2) occupational asthma. *Work-exacerbated* asthma occurs when existing asthma gets worse due to exposures and conditions in the work environment. *Occupational asthma* refers to cases of asthma caused by specific agents in the workplace (Canadian Centre for Occupational Health and Safety, 2017; OLA, 2016).

Appendix B: Guideline Development Process

The Registered Nurses' Association of Ontario (RNAO) has made a commitment to ensuring that every BPG is based on the best available evidence. To meet this commitment, a monitoring and revision process has been established for each Guideline every five years.

For this revised Guideline, RNAO assembled a panel of experts who represent a range of sectors and practice areas (see the RNAO Expert Panel section at the beginning of this Guideline). A systematic review of the evidence was based on the purpose and scope of the original Guideline, *Adult Asthma Care Guidelines for Nurses: Promoting Control of Asthma* (2004a) and the revision supplement (2007a), and was supported by the four clinical questions listed below. The systematic review captured relevant peer-reviewed literature and guidelines published between May 2006 and December 2015. The following research questions were established to guide the systematic review:

1. What are the appropriate nursing assessment strategies to use with adults living with asthma to achieve optimal asthma control?
2. What are the appropriate nursing management strategies to use with adults living with asthma to achieve optimal asthma control?
3. What education and training do nurses require to assist persons living with asthma to achieve optimal asthma control?
4. What organization or health-system level supports are needed to enable health-care providers to assist persons living with asthma to achieve optimal asthma control?

The expert panel's mandate was to review the original Guideline and the revision supplement in light of the new evidence to ensure the continuing validity, appropriateness, and safety of the recommendations. This new revised Guideline is the result of the expert panel's work to integrate the most current and best evidence into the recommendations with the supporting evidence from original Guideline and the revision supplement (where applicable).

Appendix C: Process for Systematic Review and Search Strategy

Guideline Review

The RNAO Guideline development team's project coordinator searched an established list of websites for guidelines and other relevant content published between May 2006 and December 2015. This list was compiled based on knowledge of evidence-based practice websites, recommendations from the literature, and key websites related to adult asthma care. Furthermore, expert panel members were asked to provide guidelines from their own personal libraries. (See the **Guidelines Review Process Flow Diagram** on page 89). Detailed information about the search strategy for existing guidelines, including the list of websites searched and inclusion criteria, is available at www.RNAO.ca.

The RNAO research team critically appraised 12 international guidelines using the *Appraisal of Guidelines for Research and Evaluation Instrument II* (Brouwers et al., 2010). Four guidelines were removed based on their relatively low methodological quality. Members of the expert panel reviewed the remaining eight guidelines and associated quality appraisal scores. From this review, the following six guidelines were selected to inform the recommendations and discussions of evidence:

1. British Thoracic Society/Scottish Intercollegiate Guidelines. (2014). *British guideline on the management of asthma: A national clinical guideline*. Retrieved from https://www.brit-thoracic.org.uk/document-library/clinical-information/asthma/btssign-asthma-guideline-2014/.
2. Global Initiative for Asthma. (2015). *Global strategy for asthma management and prevention* (2015 update). Retrieved from: http://ginasthma.org/
3. Lougheed, M. D., Lemière, C., Ducharme, F. M., Licskai, C., Dell, S., Rowe, B., ... Boulet, L. P. (2012). Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults. *Canadian Respiratory Journal, 19*(2), 127–164. Retrieved from http://www.respiratoryguidelines.ca/sites/all/files/2012_CTS_Guideline_Asthma.pdf
4. National Institute of Health—National Heart, Lung, and Blood Institute. (2007). Expert panel report 3: *Guidelines for the diagnosis and management of asthma* (3rd ed.). Retrieved from http://www.nhlbi.nih.gov/files/docs/guidelines/asthgdln.pdf
5. Sveum, R., Bergstrom, J., Brottman, G., Hanson, M., Heiman, M., Johns, K., ... Uden, D. (2012). Institute for Clinical Systems Improvement. *Diagnosis and Management of Asthma*. Updated July 2012.
6. Veterans Affairs/Department of Defense. (2009). *Clinical practice guideline for the management of asthma in children and adults*. Retrieved from http://www.healthquality.va.gov/guidelines/CD/asthma/ast_2_full.pdf.

Systematic Review

A comprehensive search strategy was developed by RNAO's research team and a health sciences librarian, based on inclusion and exclusion criteria created with the RNAO expert panel. A search for relevant articles in English published between May 2006 and December 2015 was applied to the following databases: Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews (CDSR), Education Resources Information Center (ERIC [research question #3 only]), Embase, MEDLINE, MEDLINE in Process, and PsycINFO. In addition to this systematic search, panel members were asked to review personal libraries for key articles not found through the above search strategies.

Detailed information about the search strategy for the systematic review, including the inclusion and exclusion criteria as well as search terms, is available at http://RNAO.ca/bpg/guidelines/adult-asthma-care.

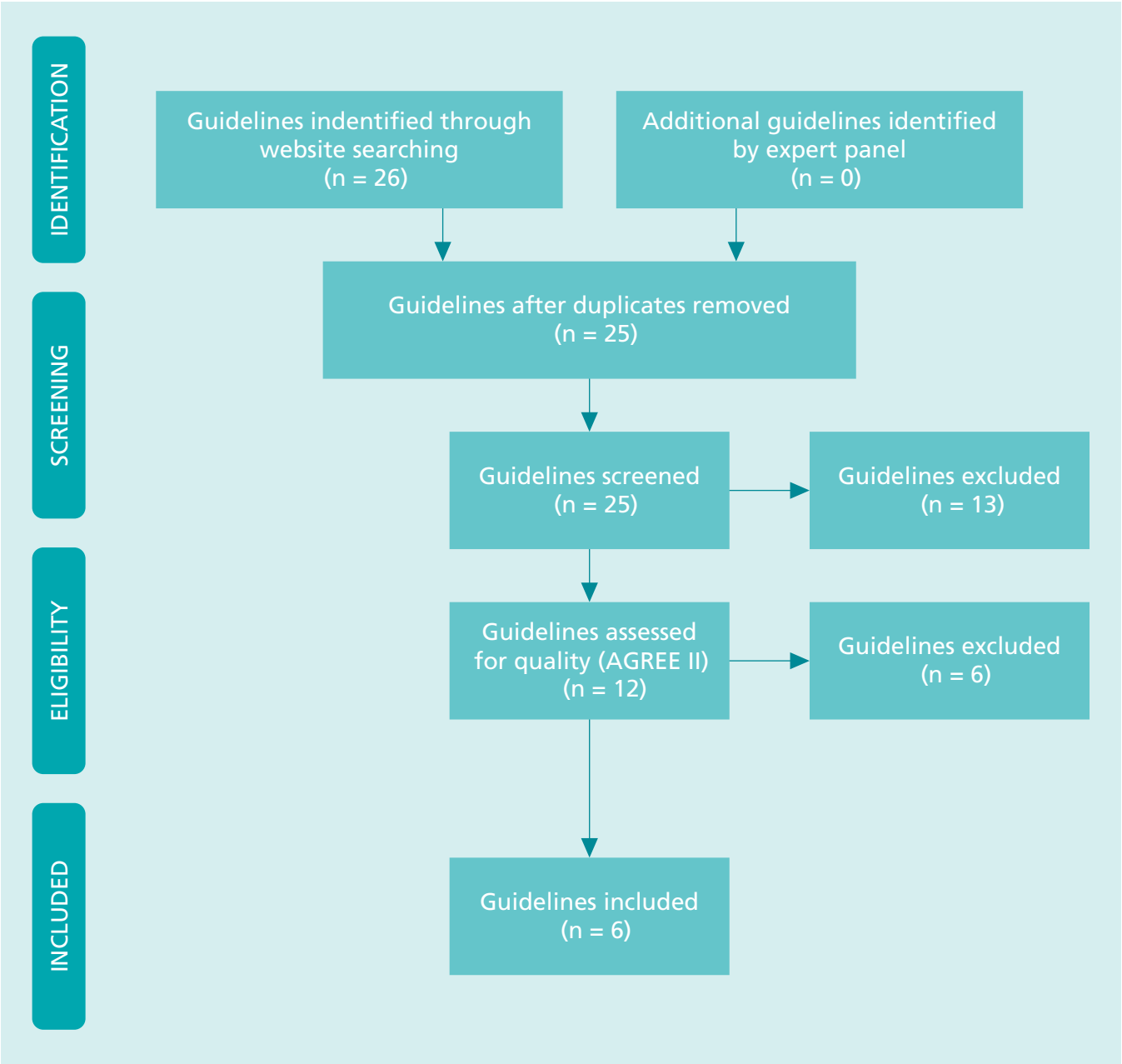
Once articles were retrieved, three RNAO BPG nursing research associates (nurses holding master's degrees) independently assessed the eligibility of the studies according to established inclusion/exclusion criteria. The RNAO's BPG program manager involved in supporting the RNAO expert panel, resolved disagreements.

Quality appraisal scores for 41 articles (a random sample of approximately 25 percent of articles eligible for data extraction and quality appraisal) were independently assessed by three RNAO BPG research associates. Acceptable inter-rater agreement between all three research associates (kappa statistic, K=0.97, 0.87and 0.89) justified proceeding with quality appraisal and data extraction by dividing the remaining studies equally between the three research associates (Fleiss, Levin, & Paik, 2003). A final summary of literature findings was completed. The comprehensive data tables and summary were provided to all expert panel members for review and discussion.

A review of the most recent literature and relevant guidelines published between May 2006 and December 2015 resulted in an update of the existing recommendations as well as the inclusion of new recommendations.

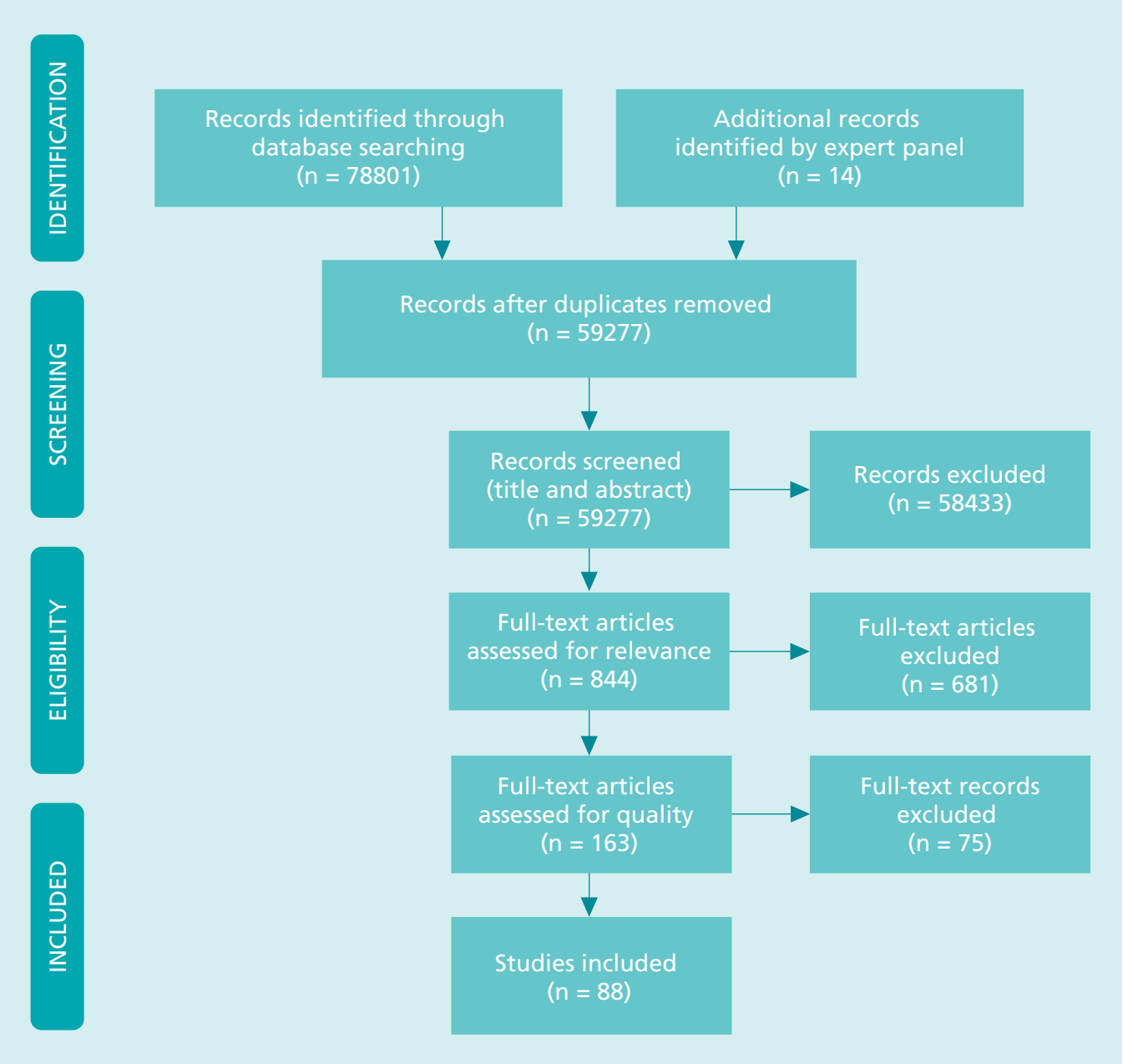
A complete bibliography of all full-text articles screened for inclusion is available at: http://RNAO.ca/bpg/guidelines/adult-asthma-care.

Guidelines Review Process Flow Diagram



Flow diagram adapted from D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, and The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analysis: The PRISMA Statement. *BMJ, 339*, b2535, doi: 10.1136/bmj.b2535

Article Review Process Flow Diagram



Flow diagram adapted from D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, and The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analysis: The PRISMA Statement. *BMJ, 339*, b2535, doi: 10.1136/bmj.b2535

Appendix D: Guide for Assessing Asthma Control

The following questions are recommended by the RNAO expert panel as a guide for assessing a person's asthma control:

1. **When was the last time you used your reliever inhaler?**
   - If the person has used the quick relief inhaler within the past week, ask:
     - What was going on that made you need to use your inhaler?
   - Probe: Was it used for exercise or physical activity?
     - How often have you used your quick relief inhaler this week? How about the week before?
   - If using more than 3 times in a week, indicates asthma is not controlled.

2. **Has your asthma awakened you at night or in the early morning in the last two weeks?**
   - If answer is yes, indicates asthma is not controlled.

3. **Over the past week, how many days have you experienced asthma symptoms (e.g., cough, trouble breathing, wheeze)?**
   - If experiencing asthma symptoms more than 3 days in a week, indicates asthma is not controlled.

4. **Are you participating in your usual and desired activities, including physical activity?**
   - If answer is no, explore how asthma is interfering with desired activities.
   - Controlled asthma does not interrupt normal activity and should permit physical activity/exercise.

5. **Have you needed any urgent medical care for your asthma, such as an unscheduled visit to your provider, a walk-in clinic, or the emergency department?**
   - If answer is yes, ask: "Did you need to add or change any of your asthma medications as a result?"
     - Often, the use of quick relief or fast-acting beta2-agonists was changed from use on an as-needed basis to every 4–6 hours and as needed. If this occurred, discuss and review the need to return to use on an as-needed basis and not regularly (e.g., every 4-6 hours).
     - A short course of treatment with oral corticosteroids may have been advised, so review whether the treatment was completed and the person's response to the therapy.

6. **Have you missed work or school due to asthma symptoms in the past month?**
   - People with controlled asthma do not regularly miss school or work due to asthma.
   - If answer is yes, ask: "How many days of work/school did you miss due to asthma symptoms?"

7. **If the person measures peak expiratory flow rates, ask: "Have you noticed any changes in your peak flow rates, either up or down?"**

Appendix E: Common Asthma Triggers

The following is a list of common asthma triggers for which persons with asthma can be assessed; the list is not exhaustive. The triggers below have been compiled from information identified within the systematic review, from AGREE II-appraised guidelines, by the expert panel, or by external stakeholder feedback.

For additional information on asthma triggers across all settings (including in specific settings, such as workplaces) and avoidance and management strategies, see the Lung Association—Ontario's (2009) resource *All About Asthma Triggers: A Practical Guide for Health-Care Providers*, available for download on The Lung Association—Ontario's website (www.on.lung.ca/resources).

Common Asthma Triggers

ALLERGENS & OTHER INFLAMMATORY TRIGGERS	IRRITANTS	OCCUPATIONAL EXPOSURES & TRIGGERS
■ Pollen ■ Moulds ■ Dust mites ■ Animal/pet dander ■ Cockroach allergen ■ Upper respiratory infections/viral infections	■ Dust ■ Weather/temperature (extremes in heat, cold, humidity, wind) ■ Smoke, including tobacco smoke ■ Chemical fumes ■ Air pollutants ■ Strong odours/sprays ■ Household products (e.g., cleaning, paint, solvents) ■ Exercise	■ Dust (including wood dusts, flour dusts, grain dusts, and construction/renovation dusts) ■ Animals ■ Mould ■ Latex ■ Smoke, including tobacco smoke ■ Humidity and heat ■ Cold environment ■ Strenuous work ■ Formaldehyde ■ Isocyanates ■ Other chemicals and chemical fumes and vapours

Compiled by the RNAO expert panel, 2016.

Sources: BTS/SIGN, 2014; GINA, 2015; NIH, 2007; OLA, 2009, 2016; RNAO 2004a, 2007a; and Sveum et al., 2012.

Appendix F: Co-morbidities and Conditions

The following is a list of co-morbidities and conditions for which persons with asthma can be assessed; the list is not exhaustive. The conditions below have been compiled from information identified within the systematic review, from AGREE II-appraised guidelines, by the expert panel, and/or by external stakeholder feedback.

Co-morbidities and Conditions That May Affect the Complexity of Asthma Management

CO-MORBIDITY/ CONDITION	LITERATURE THAT SUPPORTS THE ASSOCIATION WITH THE COMPLEXITY OF ASTHMA MANAGEMENT
Acetylsalicylic acid sensitivity	■ Data from a large nation-wide moderate quality cross-sectional study found that acetylsalicylic acid-exacerbated respiratory disease contributed significantly to hospitalization and emergency department admissions in a population with asthma (Steppuhn, Langen, Scheidt-Nave, & Keil, 2013).
Allergic rhinitis	■ Data from a moderate quality cross-sectional study found that 80% of all asthma patients had rhinitis symptoms. A negative correlation was found between allergic rhinitis and asthma-related quality of life, but not asthma control (Hayat et al., 2014). ■ Additional cross-sectional studies that support allergic rhinitis as a common co-morbid condition in persons with asthma: Hwang et al. (2012) and Steppuhn et al. (2013). ■ Additional references that support allergic rhinitis as a factor in the complexity of management: GINA (2015) and NIH (2007).
Anxiety and Depression	■ Data from a strong quality cross-sectional study demonstrated that having an anxiety disorder and having a mood disorder are independently associated with poorer asthma control (Ouellet et al., 2012). ■ Additional references that identify anxiety as a potential factor in the complexity of asthma management: Favreau et al. (2014) and GINA (2015). ■ A number of observational studies have documented a relationship between co-morbid depression and poorer asthma control or greater asthma severity (Krauskopf et al., 2013; Mazurek et al., 2012; Ross et al., 2013; Trzcinska, Przybylski, Kozlowski, & Derdowski, 2012; Wiltens, Theunissen, Glasser, & Zeitz, 2012). ■ Additional references that support depression as a factor in the complexity of management: GINA (2015) and NIH (2007).
Atopic dermatitis	■ Data from a moderate quality cross-sectional study indicated atopic dermatitis as an independent factor associated with poorly controlled asthma (Vervloet et al., 2014)
Cardiovascular disease	■ Persons with cardiovascular disease and asthma may have adverse reactions to inhaled SABA therapy (NIH, 2007). ■ NIH (2007) indicates co-morbid cardiovascular disease as one risk factor for death from asthma.

CO-MORBIDITY/ CONDITION	LITERATURE THAT SUPPORTS THE ASSOCIATION WITH THE COMPLEXITY OF ASTHMA MANAGEMENT
Conditions associated with beta-blocker use	■ Use of beta-blockers may make asthma symptoms worse (GINA, 2015; NIH, 2007). ■ Examples of conditions associated with beta-blocker use include (but are not limited to) hypertension, cardiovascular disease, eye disease, anxiety, and migraines.
Gastroespohageal reflux (GERD)	■ A moderate quality cross-sectional study found that GERD negatively affected quality of life and asthma control in persons with asthma (Hayat et al., 2014). ■ Additional references that support the association between GERD and complexity of asthma management: GINA (2015), Liang and Feng (2013) and NIH (2007).
Obstructive sleep apnea (OSA)	■ Data from a moderate quality cross-sectional study on a large sample of asthma patients showed that symptoms indicative of high OSA risk or diagnosed and untreated OSA (e.g., pauses in breathing during sleep, sudden gasping arousals from sleep, worsening of snoring while supine or following alcohol consumption) are associated with persistent asthma symptoms during the daytime. Further, continuous positive airway pressure (CPAP), used in the treatment of OSA, reduced the likelihood of persistent daytime asthma symptoms (Teodorescu et al., 2012). ■ Additional references that support the association of OSA and the complexity of asthma management: GINA (2015), Kim et al. (2013), Liang and Feng (2013) and NIH (2007).
Overweight and Obesity	■ Data from a moderate quality cross-sectional study found obesity to be significantly associated with greater asthma severity and poorer asthma control and quality of life (Maalej et al., 2012). ■ Additional references that support the relationship between obesity and its affect on asthma management: Boudreau et al. (2014), Ciprandi et al. (2014), GINA (2015), NIH (2007), BTS/SIGN (2014) and Vervloet et al. (2014). ■ References that support the relationship between overweight and poorer asthma outcomes: Boudreau et al. (2014), Ciprandi et al. (2014) and Maalej et al. (2012).
Pregnancy	■ Asthma may improve, worsen or remain unchanged during pregnancy (BTS/ SIGN, 2014).
Vocal cord dysfunction (VCD)	■ Abnormal movement of the vocal cords is often mistaken for asthma, and therefore should be considered in asthma that is difficult to treat (NIH, 2007). VCD and asthma may co-exist, which complicates management (NIH, 2007).

Appendix G: Principles of Health Literacy

Health Literacy Principles and Strategies

Health Literacy

Health literacy is "the ability to access, understand, evaluate and communicate information as a way to promote, maintain and improve health in a variety of settings across the life-course." (Rootman & Gordon-El-Bihbety, 2008, p. 11). It includes a broad set of skills that help persons and their families understand health information, participate in self-management, and navigate the complex health system. Health literacy is dependent on person and system factors, including (Rootman & Gordon-El-Bihbety, 2008):

- Knowledge of health topics,
- Culture,
- Mother language,
- Age,
- Literacy and numeracy, and
- Communication skills of health-care providers.

Persons who have low health literacy may lack the skills necessary to manage their own care and navigate the health system. They are more likely to have chronic medical conditions, be admitted to hospital, have higher use of the emergency department, and rate their health as poor (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011; Griffey, Kennedy, McGownan, Goodman, & Kaphingst, 2014).

Strategies

Plain Language

Plain language is a strategy to make written and oral information easier to understand, and is an important tool for mitigating low health literacy (RNAO, 2012a).

Key elements of plain language include:

- Organizing information so the most important points are first;
- Breaking up complex information into smaller segments that are easier to understand;
- Using simple, everyday language;
- Omitting unnecessary words;
- Avoiding medical jargon, and defining any complex terms or medical terminology that does need to be used;
- Using headings, lists, and tables to make reading easier;
- Using the active rather than the passive voice;
- Focusing on behaviour rather than on underlying medical principles;
- Using visuals to convey a message, not simply to decorate a page; and
- Using a minimum 12-point font and avoiding all capitals, italics, and fancy fonts.

Teach-Back Method

Teach-back is a method that places the accountability for learning on the provider. It engages the person (or key learner) in a shame-free manner by asking him to repeat, in his own words, what was just explained (RNAO, 2012a). This creates an opportunity for the provider to clarify any miscommunication or misunderstanding, and to evaluate the effectiveness of the education in a way that engages the person and their family. For example, after educating the person on different types of inhalers, the health-care provider may ask: "Please tell me when you would use your blue rescue inhaler?"

When closing the conversation, open-ended questions are preferred over yes/no questions, as they open the dialogue and let the person know that you expect them to have questions about the material taught. For example, asking: "What questions do you have for me?" is preferable to asking, "Do you have any questions?"

For further information on health literacy and facilitating learning, please refer to the RNAO BPG *Facilitating Client-Centred Learning* (2012a).

Appendix H: Barriers to and Methods for Improving Asthma Self-Management

The following is a list of barriers to asthma self-management for which persons with asthma can be assessed. The barriers and methods for supporting self-management below have been compiled from information identified within the systematic review, from AGREE II-appraised guidelines, by the expert panel, and/or by external stakeholder feedback.

For further information on self-management in chronic conditions, please refer to the RNAO BPG *Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients* (2010b).

BARRIERS TO SELF-MANAGEMENT OF ASTHMA	METHODS FOR IMPROVING SELF-MANAGEMENT
■ Lack of effective communication between the person and the health-care provider ■ Stigmatization	■ Build a partnership with the person by establishing mutual goals for asthma care ■ Shared decision-making ■ Discuss expectations, fears, and concerns ■ Display open communication by showing attentiveness (e.g., eye contact), providing encouragement with non-verbal communication (e.g., smiling, nodding), using verbal reinforcement for effective management strategies (e.g., "That is great" or "You did the right thing"), and using an interactive conversation style (i.e., asking open-ended questions) ■ If appropriately trained, use motivational interviewing techniques
■ Misperceptions regarding asthma control and asthma management	■ Assess barriers to the person's ability to follow the plan of care, including misperceptions regarding asthma and its management and cost ■ Assess any cultural beliefs or practices that may influence self-management activities (e.g., "In your community, what does asthma mean?"). ■ Provide asthma self-management education ■ Promote the use of a documented, individualized asthma action plan

BARRIERS TO SELF-MANAGEMENT OF ASTHMA	METHODS FOR IMPROVING SELF-MANAGEMENT
■ Erroneous beliefs that asthma medications are not needed ■ Concerns regarding medication side effects (real or perceived) ■ Misunderstanding about medication instructions ■ Misunderstanding regarding the importance of controller therapy in achieving asthma control ■ Forgetfulness	■ Education to improve the appropriate use of medications should address the following: □ The pros and cons of treatment options □ The consequences of not following the treatment plan □ Issues related to asthma medications (e.g., side effects of medications; clarify misperceptions—particularly related to the used of steroid medications) ■ Discuss expectations, fears, and concerns ■ Use technologies that are already part of a person's daily life (e.g., setting reminders on mobile devices) ■ Encourage the person to use activities of daily living (e.g., shaving, brushing teeth, meal time) as reminders to take medication
■ Difficulties using inhaler devices ■ Multiple inhalers	■ Review and reinforce accurate inhaler technique ■ Simplify management and the action plan as much as possible (e.g., determine whether multiple inhalers might be replaced with fewer; provide clear instruction on the action plan, etc.)
■ Health literacy ■ Socioeconomic factors, including poverty, low education, unemployment, low social support	■ Evaluate the person's health literacy ■ Tailor the level and amount of education to the person's level of health literacy ■ Use non-technical, plain language that is clear and unambiguous ■ Seek feedback from the person and confirm understanding (e.g., use teach-back) ■ Order information strategically, speak slowly, and spend more time with the person if necessary ■ Provide education using multiple teaching strategies (e.g., discussion, written materials, videos, interactive websites) ■ Discuss medication cost as a barrier and connect patients to appropriate financial and social supports as required ■ If appropriately trained, use motivational interviewing techniques

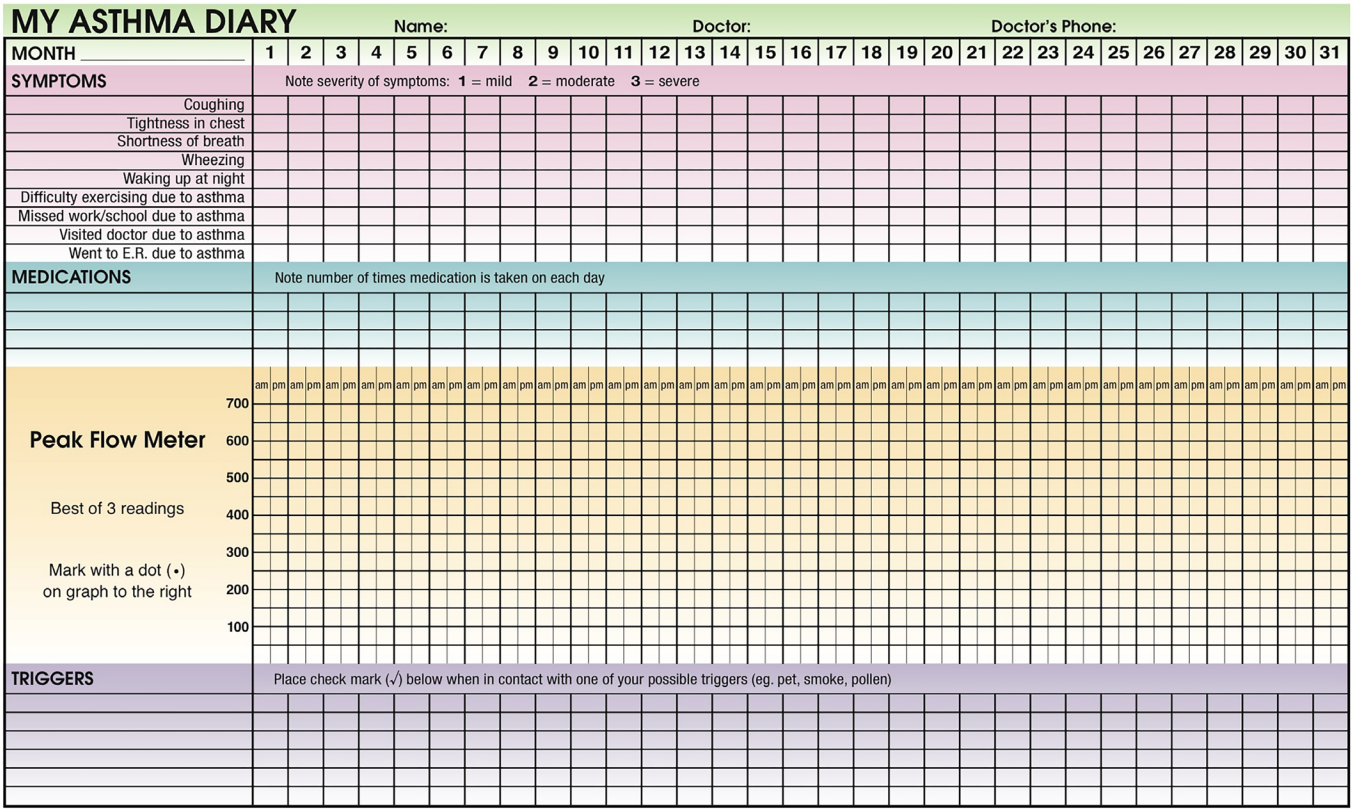
Compiled by the RNAO expert panel, 2016.

Sources: Buckstein, 2016; GINA, 2015; and RNAO, 2004a.

Appendix I: Sample Asthma Diary

An asthma diary can help persons with asthma better monitor their asthma. Asthma diaries, which may be paper-based or in an electronic format, can be used to track (1) asthma symptoms (and the severity of symptoms), (2) medication use, (3) peak flow readings, and (4) asthma triggers (OLA, 2015a). By tracking this information, individuals can assess whether their asthma is controlled or uncontrolled. If asthma is uncontrolled, the diary can help identify possible reasons why.

The following is an example of an asthma diary created by The Lung Association. Inclusion of this resource does not constitute an endorsement by RNAO.



MY ASTHMA DIARY Name: Doctor: Doctor's Phone:

MONTH _____	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
SYMPTOMS	Note severity of symptoms: **1** = mild **2** = moderate **3** = severe																														
Coughing																															
Tightness in chest																															
Shortness of breath																															
Wheezing																															
Waking up at night																															
Difficulty exercising due to asthma																															
Missed work/school due to asthma																															
Visited doctor due to asthma																															
Went to E.R. due to asthma																															
MEDICATIONS	Note number of times medication is taken on each day																														

Peak Flow Meter

Best of 3 readings

Mark with a dot (•) on graph to the right

am pm am pm

700
600
500
400
300
200
100

TRIGGERS	Place check mark (√) below when in contact with one of your possible triggers (eg. pet, smoke, pollen)

Source: Copyright 2015 by The Lung Association. Reprinted with permission. Available at http://www.on.lung.ca.

Appendix J: Assessment Tools

The following is a list of tools that can be used to assess asthma control; the list is not exhaustive. The tools below were identified from information within the systematic review, from AGREE II-appraised guidelines, by the expert panel, and/or by external stakeholder feedback. Inclusion of a tool in this list does not constitute an endorsement by RNAO. It is important to select a tool that is appropriate for use in the setting in which you practise and that is suitable for your scope of practice.

TOOL	DESCRIPTION OF TOOL	SOURCE/WEBSITE	VALIDATION STUDIES LOCATED
Asthma Control Test (ACT)	*Aim:* To identify patients with poorly controlled asthma. Intended population: 12+ The ACT has 5 questions: 3 related to symptoms, 1 to medication use, and 1 to overall control.	http://www.asthmacontroltest.com/	Yes
Asthma Control Questionnaire (ACQ)	*Aim:* To measure the adequacy of clinical asthma control. Intended population: adults with asthma (17 years and older). The ACQ has 7 questions: 5 related to symptoms, 1 to beta2-agonist use, and 2 related to FEV_1 (completed by clinic staff).	https://www.qoltech.co.uk/index.htm	Yes
Asthma Quality of Life Questionnaire (AQLQ)	*Aim:* The AQLQ was developed to measure the functional problems (physical, emotional, social, and occupational) that are most troublesome to adults (17–70 years) with asthma. There are 32 questions in the AQLQ in 4 domains: symptoms, activity limitation, emotional function, and environmental stimuli). The overall AQLQ score is the mean of all 32 responses and the individual domain scores are the means of the items in those domains.	https://www.qoltech.co.uk/index.htm	Yes

TOOL	DESCRIPTION OF TOOL	SOURCE/WEBSITE	VALIDATION STUDIES LOCATED
Mini Asthma Quality of Life Questionnaire (mini AQLQ)	*Aim:* The mini AQLQ is closely related to the larger questionnaire and was developed to measure the functional impairments that are most troublesome to adult patients (17–70) as a result of their asthma. There are 15 questions in 4 domains: symptoms, activity limitations, emotional function, and environmental stimuli.	https://www.qoltech.co.uk/index.htm	Yes

Appendix K: Device Technique Teaching Resources

The following are suggestions for written instruction reference sheets and assessment tools for inhaler devices that can be used to support inhaler device technique teaching in persons with asthma. The list is not exhaustive. Inclusion of these resources does not constitute an endorsement by RNAO.

For access to written instructions for inhaler devices and inhaler device instruction mastery sheets, visit The Lung Association—Saskatchewan's website (https://sk.lung.ca/). Tutorial videos demonstrating correct techniques for a variety of inhalers, and for spacer devices, may be viewed at https://sk.lung.ca/lung-diseases/inhalers. To download RESPTREC™ resource sheets, visit https://sk.lung.ca/health-professionals/resources/resptrec-resources.

For access to written instructions for inhalation devices, visit The Lung Association—Ontario's website at www.on.lung.ca/resources.

The Inhaler Device Assessment Tool ([IDAT] Davies et al., 2006) is a checklist that nurses can use to ensure that the essential steps of inhaler device techniques are performed accurately and that the delivery of medication is optimized. The IDAT has been validated in children with asthma (Davies et al., 2006) and adults with COPD (Woodend et al., 2007). The IDAT user guide is available to download at: http://RNAO.ca/bpg/guidelines/promoting-asthma-control-children.

Appendix L: Respiratory Medications

Medications used to treat asthma can generally be divided into two categories: relievers and controllers. They are available in various forms and are delivered through a variety of devices; however, the inhaled route is the preferred route as it minimizes systemic availability and therefore minimizes side effects.

a) Relievers

- Relievers are medications that are used primarily on an as-needed basis to relieve asthma symptoms. They may also be used to prevent asthma symptoms prior to exercise or other triggers.
- Relievers are to be used at the lowest dose and frequency required to relieve symptoms.

b) Controllers

- Controllers are medications that are taken regularly on a daily basis to minimize asthma symptoms from occurring and to prevent exacerbations by reducing inflammation.

Source: Adapted from RNAO (2004a) and updated by RNAO expert panel, 2016.

Advantages and Disadvantages of Metered Dose Inhalers (MDIs) and Dry Powder Inhalers (DPIs)

	MDIs	DPIs
Advantages	■ Portable and compact ■ Cheaper than DPIs ■ Minimal preparation ■ Use of a spacer improves medication delivery	■ Portable and compact ■ No propellant ■ No need for a spacer ■ Actuated by deep inspiration, so no need for coordination between actuation and inhalation ■ Include dose counters displaying the number of doses left in the device
Disadvantages	■ Require coordination of ac-tuation and inhalation if not used with a spacer ■ Spacers are not always available or practical for those with an active life-style, and are not always covered by drug plans ■ High oropharyngeal deposi-tion ■ Requires propellants ■ Drug delivery is highly de-pendent on technique (if a spacer is not used)	■ More costly ■ Ambient humidity and heat may affect emitted dose ■ Require higher inspiratory flow rates for good quality lung deposi-tion ■ Some have shorter expiry dates than others ■ Some contain lactose

* At all times, persons with asthma should be encouraged to use a spacer (valved holding chamber) when using an MDI.

Source: Developed by the RNAO expert panel, 2016.

For access to a respiratory medication chart of medications currently available in Ontario and information regarding Ontario Drug Benefit, Exceptional Access, and Non-Insured Health Benefits coverage, please visit The Lung Association—Ontario's website at: https://www.on.lung.ca/pcap-intranet/asthma-and-copd-medication-table.

For detailed information regarding indications, contraindications, adverse events, and administration of specific medications, please search the Health Canada Drug Product Database: http://www.hc-sc.gc.ca/dhp-mps/prodpharma/databasdon/index-eng.php.

Appendix M: Peak Flow Meters

How to Use a Peak Flow Meter

"To use a peak flow meter, follow the instructions on the package. In general, these are the steps you can follow:

1. Stand up or sit up with a straight back.
2. Make sure the indicator is at zero.
3. Take a deep breath, seal your lips around the mouthpiece, and blow as hard and as fast as you can into the peak flow meter.
4. Write down the reading (your score).
5. Set the marker back to zero. Take your peak flow reading two more times. Write down your readings (your score).
6. Each time you test your peak flow, do three blows. The best of the three scores is your actual score. That's the score you should write down and show the doctor.
7. Check with your asthma action plan to see if you need to make any adjustments to your daily care."

Source: The Lung Association, 2106b. Avaliable at https://www.lung.ca/lung-health/get-help/how-use-your-inhaler/peak-flow-meter

Finding the Personal Best Peak Flow Number

A person's personal best peak flow number is the highest peak flow number achieved over a two- to three-week period when asthma is controlled.

Each person's asthma is different, and one person's "best" peak flow value may be higher or lower than another person's of the same height, weight, and sex. The action plan needs to be based on the person's personal best peak flow value.

To identify the personal best peak flow number, the person should take peak flow readings:

- At least twice a day for 2 to 3 weeks,
- Upon awakening and before bed, and
- Prior to and 15 minutes after taking a short-acting inhaled bronchodilator (reliever).

Source: Adapted from RNAO (2004a) and updated by the RNAO expert panel, 2016.

Peak Flow Monitoring Tips

1. Monitoring Peak Expiratory Flow (PEF) may be useful in some persons, particularly those who are poor perceivers of airflow obstruction.
2. Caution should be exercised in interpreting PEF results, as they are extremely effort-dependent. They should be used in conjunction with other clinical findings.
3. The person's PEF technique should be observed until the practitioner is satisfied that the technique produces accurate readings. (See "How to Use a Peak Flow Meter," above.)
4. Home PEF monitoring should be linked to the assessment of symptoms in the action plan.
5. Persons who are using a PEF meter should be instructed on how to establish their personal best PEF and use it as the basis of their action plan.
6. PEF devices must be checked regularly for accuracy and reproducibility of results.
7. Baseline morning and evening monitoring should be carried out over a number of weeks and continued regularly, with the frequency adjusted to the severity of the disease.
8. Persons should be alerted to the significance of increased diurnal variation (i.e., evening to morning changes) in PEF that are greater than 15–20%.
9. The accuracy of a person's peak flow meter should be determined at least once per year or whenever there is a question about its accuracy. Values from spirometry or another portable meter should be compared.

Source: Adapted from RNAO (2004a) and updated by the RNAO expert panel, 2016.

Appendix N: Asthma Action Plans

What is an Asthma Action Plan?

An asthma action plan is an individualized written, electronic, and/or pictorial plan developed for the purpose of self-management of asthma. The plan guides self-monitoring of asthma based on symptoms, reliever use, and perhaps peak flow measurements, and details the management steps to take according to the person's asthma control. The action plan is tailored to the person's preferences, treatment, and usual pattern of exacerbations, and may incorporate triggers. Action plans should be developed in partnership with the person with asthma.

Asthma action plans often use a traffic light analogy utilizing a green, a yellow, and a red zone:

- The **green zone** represents acceptable and stable asthma control, and a "go ahead" with current therapy.
- The **yellow zone** represents a time of "caution," in that there are signs of worsening asthma and loss of asthma control. In response to this loss of control, suggestions may be made to adjust medications and/or seek medical assistance.
- The **red zone** represents a time of "danger" where asthma is identified as being out of control and severe enough to warrant urgent medical attention.

Action plans with escalation of medication therapy must be authorized by a prescriber. The level of detail in the plan is dependent on the person's understanding and preferences. Key components for teaching a person how to use an action plan include the signs and symptoms of worsening asthma control, how to adjust medications, and when to seek medical attention (either an office visit or urgent care). If the person has an action plan, careful questioning by the health-care provider about the person's most recent loss of control will help the health-care provider gauge the person's understanding of the plan, assess the skills required for proper execution of the plan, and identify the need for any further education.

Source: Adapted from RNAO (2004a) and updated by the RNAO expert panel, 2016.

Appendix O: Sample Written Asthma Action Plans

The following are examples of written asthma action plans that can be used for development of written asthma action plans with people with asthma. For an electronic fillable asthma action plan, please visit www.on.lung.ca/e-AAP. Inclusion as a sample resource does not constitute an endorsement by RNAO.

Sample 1: The Lung Association—Ontario

What is your asthma control zone?

For each item below think about the statement that most closely reflects what you are currently experiencing.

Step 1	What to Look for	CONTROLLED ASTHMA	UNCONTROLLED ASTHMA	DANGEROUSLY UNCONTROLLED ASTHMA
	Physical activity	Normal ☐	Some interruption with activities ☐	Difficulty talking ☐
	*Reliever use	Less than 4 times / week ☐	4 or more times / week ☐	Reliever inhaler doesn't work as usual *OR* Relief lasts less than 2 hours ☐
	Daytime symptoms: may include: cough, difficulty breathing, wheeze	Less than 4 days / week ☐	4 or more days / week ☐	All the time ☐
	Nighttime symptoms: may include: cough, difficulty breathing, wheeze	Less than 1 night / week ☐	1 or more nights / week ☐	Every night ☐
	Peak Flow Rates (optional)	Greater than _____	Between _____ and _____	Less than _____
Step 2	**What is my level of asthma control?**	If **all** checks are in the green column, your asthma is under control (Green Zone).	If you have any checks in the yellow column and zero checks in the red column, your asthma is uncontrolled and in the Yellow Zone.	If you have any checks in the red column, your asthma is *dangerously uncontrolled* (Red Alert Zone).
Step 3	**Steps to Take**	**Follow your current plan.**	**Make an appointment to see your doctor** ☐ Follow the steps below: • Continue this treatment for ____ days. • If asthma is not improving within ____ days see your doctor.	**Seek Immediate Medical Assistance** • Go to your nearest emergency room • Call 911 • Take your reliever inhaler as necessary. May take every 5 - 15 minutes on way to the hospital or as recommended by your doctor.

*Reliever medications quickly relieve symptoms. Examples are: salbutamol (Airomir®, Ventolin®), terbutaline (Bricanyl®)

THE LUNG ASSOCIATION™ Ontario Lung Health Information Line: 1-888-344-LUNG (5864) Ontario

Source: Copyright 2007 by The Lung Association. Reprinted with permission. Available at http://www.on.lung.ca.

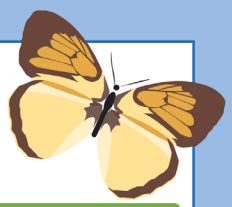
Sample 2: Asthma Society of Canada

Asthma Action Plan (Sample)

Name: _____ Hospital/Emergency Room Phone Number: _____

Doctor's Name: _____ Doctor's Phone Number: _____

Date: _____ This Action Plan is a guide only. Always see a doctor if you are unsure what to do.



Green Zone – I have symptom-free asthma

I have no symptoms:
- I have no cough, wheeze, chest tightness or shortness of breath
- I do not cough or wheeze when I exercise or sleep
- I can do all my usual activities
- I do not need to take days off work

To remain symptom-free, I need to take these controller medications every day

Medication	How much to take	When to take it

Yellow Zone – I have asthma symptoms

- I cough, wheeze, have chest tightness or shortness of breath during the day, when I exercise, or sleep
- I feel like I am getting a cold or the flu
- I need to use my reliever inhaler more than three times a week for my asthma symptom

I need to either increase my controller medication, or add on a different controller

First ■ Take _____ (Reliever) 2 puffs, every ____ hours, as needed.

Second ■ Increase _____ (Controller) to ____ day, for ____ days, or until you are back in the green zone.

If no improvement in _____ hours, call or visit your Doctor.

Red Zone – I am in danger and need help

Any of the following:
- I have been in the Yellow Zone for 24 hours
- My asthma symptoms are getting worse
- My reliever does not seem to be helping
- I can not do any type of activity
- I am having trouble walking or talking
- I feel faint or dizzy
- I have blue lips or fingernails
- I am frightened
- This attack came on suddenly

Go directly to the nearest Emergency Room of your local hospital

First This is an emergency. Dial 911.

Second While waiting for the ambulance, take

■ 2 puffs of _____ (Reliever inhaler) every 10 minutes.

Source: Copyright 2017 by the Asthma Society of Canada. Reprinted with permission. Available at http://asthma.ca/adults/control/actionPlan.php.

Appendix P: Additional Resources

The expert panel, with input from external stakeholder reviewers, has compiled a list of some of the main organizations that provide information and resources on asthma care.

Links to websites that are external to the RNAO website are provided for information purposes only. RNAO is not responsible for the quality, accuracy, reliability, or currency of the information provided through these sources. Further, RNAO has not determined the extent to which these resources have been evaluated. Questions related to these resources should be directed to the source. Inclusion in this list does not constitute an endorsement by RNAO.

WEBSITE	CONTENTS	LINK
American Thoracic Society (ATS)	The ATS is the world's leading medical association dedicated to advancing clinical and scientific understanding of pulmonary diseases, critical illnesses, and sleep-related breathing disorders. Resources for health-care providers include: ■ Asthma guidelines ■ ATS Asthma Reading List ■ ATS Clinical Asthma Cases ■ Other asthma resources.	https://www.thoracic.org/
Asthma and Allergy Information Association	The Asthma and Allergy Information Association is Canadian charity dedicated to allergy, asthma, and anaphylaxis. It provides resources for people with asthma.	http://www.aaia.ca/
Asthma Australia	Asthma Australia is a national asthma body. Its website provides information about asthma, research, training, and health-care-professional resources.	http://www.asthmaaustralia.org.au/
Asthma Society of Canada	The Asthma Society of Canada is a charitable organization that seeks to provide evidence-based, market-tested, age-appropriate asthma information, education, management tools, and support programs for Canadians with asthma. Its website includes resources for assisting people with asthma.	http://www.asthma.ca/

WEBSITE	CONTENTS	LINK
Canadian Network for Respiratory Care	Through its certified educators and member organizations, the Canadian Network for Respiratory Care (CNRC), works to improve the quality of life of individuals and their families living with respiratory diseases and tobacco use disorder, by developing, promoting, and advocating for the highest standards in health promotion and care. **Opportunities for Continuing Professional Development in Asthma and Respiratory Care:** The CNRC has approved several asthma and respiratory educator training programs as prerequisites to challenging the CAE and CRE exams. Please refer to their website (http://cnrchome.net/) for a full listing of approved programs. Subject to other criteria for certification, graduates of these approved programs will be eligible to sit for the Certified Asthma Educator (CAE) exam (for educators working in pediatrics) or Certified Respiratory Education (CRE) exam (for educators who also see adults in their practices). For additional information, visit http://cnrchome.net.	http://cnrchome.net/
Canadian Thoracic Society: Asthma	The CTS Asthma Committee encourages health-care providers to implement or adapt CTS asthma respiratory clinical practice guidelines into practice. Resources for health-care providers include: ■ Guidelines and Standards, including; □ *2012 CTS Guideline Update: Diagnosis and Management of Asthma in Preschoolers, Children and Adults* (http://www.respiratoryguidelines.ca/2012-cts-guideline-asthma-update) □ *CTS 2013: Spirometry in Primary Care* (http://www.respiratoryguidelines.ca/spirometry-in-primary-care-2013) ■ Tools and Resources.	http://www.respiratoryguidelines.ca/guideline/asthma
Centers for Disease Control and Prevention: Asthma	Resources: ■ Data, statistics, and surveillance ■ Links to research and asthma reports.	http://www.cdc.gov/asthma/default.htm

WEBSITE	CONTENTS	LINK
Family Physician Airways Group of Canada	The Family Physicians Airway Group of Canada is committed to helping those with airway diseases lead a full life. The group is dedicated to helping all family physicians maintain and increase their skills in assisting those with asthma and COPD. Their website includes tools and resources for patient and health-care-professional education.	http://www.fpagc.com/
Global Initiative for Asthma (GINA)	GINA is an international organization that works with health-care providers and public health officials around the world to reduce asthma prevalence, morbidity, and mortality. Its website includes evidence-based documents and reports.	http://ginasthma.org/
National Asthma Council Australia	The National Asthma Council Australia is a not-for-profit organization working to improve health outcomes and quality of life for people with asthma. Resources for health-care providers include: ■ Australian Asthma Handbook ■ Asthma and respiratory education program ■ Written asthma action plans ■ Inhaler device technique videos ■ Spirometry resources ■ Information papers.	http://www.nationalasthma.org.au/
National Institute of Health (US Department of Health and Human Services)—National, Heart, Lung, and Blood Institute	The National Heart, Lung, and Blood Institute (NHLBI) provides global leadership for a research, training, and education program to promote the prevention and treatment of heart, lung, and blood diseases and enhance the health of all individuals so that they can live longer and more fulfilling lives. Resources for health-care providers include: ■ Systematic evidence reviews and clinical practice guidelines ■ Resources ■ Continuing education.	http://www.nhlbi.nih.gov/

WEBSITE	CONTENTS	LINK
Ontario Occupational Health Nurses Association (OOHNA)	Since 1971, OOHNA has been the professional organization for registered nurses who provide occupational health care for Ontario's workers. They began as an affiliation of local groups of occupational health nurses, and in 1973 formally incorporated as a not-for-profit organization. OOHNA's website provides information regarding education and events related to occupational health nursing.	http://www.oohna.on.ca/
The Ontario Asthma Surveillance Information System (OASIS)	The Ontario Asthma Surveillance Information System (OASIS) was established in 2003 to provide a population-based longitudinal surveillance system for asthma. It continues to provide measures of asthma-related morbidity, mortality, health services use, and provider practice patterns. The OASIS website provides asthma statistics and asthma indicators in Ontario, as well as a peer-reviewed publication reference list.	http://lab.research.sickkids.ca/oasis/
Public Health Agency of Canada	The Public Health Agency of Canada aims to promote and protect the health of Canadians through leadership, partnership, innovation, and action in public health. The asthma section of its website includes general information about asthma, risk factors, managing asthma, facts and figures, and links to related resources.	http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/asthma-asthme-eng.php

WEBSITE	CONTENTS	LINK
RESPTREC™	In 1999, The Lung Association—Saskatchewan and The Lung Association—Manitoba created RESPTREC, a professional development program, to teach health-care providers how to better educate people with asthma and COPD. RESPTREC (the Respiratory Training and Educator Course) continues to evolve. The program's goal is to provide health-care providers with the knowledge, skills and competencies required to empower people and their caregivers to optimally manage their chronic disease. RESPTREC offers courses for health-care providers in: ■ Chronic disease management ■ COPD ■ Asthma ■ Spirometry	https://resptrec.org/
The Lung Association	The Lung Association is the leading organization in Canada working to promote lung health and prevent and manage lung disease through research, advocacy, education, and support.	https://www.lung.ca/
The Lung Association—Ontario	The Lung Association—Ontario is a Canadian not-for-profit health promotion organization focusing on the prevention and control of chronic lung disease, asthma, tobacco cessation and prevention, and air quality and its effects on lung health. Programs and services for patients and families include: ■ The Lung Health Information Line (1-888-344-LUNG [5864]), which provides help for people living with asthma or caring for others with asthma and other lung diseases. The line is staffed by certified respiratory educators. ■ Air Quality (1-888-344-LUNG [5864]): www.yourhealthyhome.ca ■ Work-related asthma program for industry: www.on.lung.ca/work-related-asthma ■ Asthma resources: www.on.lung.ca/resources.	http://www.on.lung.ca/

WEBSITE	CONTENTS	LINK
The Lung Association—Primary Care Asthma Program (PCAP)	PCAP is a standardized program based on best practices, outcomes from the PCAPP project, and the Canadian Asthma Consensus Guidelines. It uses specific tools designed to guide practitioners and clients through effective management of asthma. It is evolving as a program and continues to develop and evaluate resources needed to effectively provide asthma care in the primary care setting. PCAP tools and resources for asthma include: ■ PCAP General Manual ■ PCAP Spirometry Manual (includes Quality Assurance Considerations) ■ PCAP Asthma Action Plan ■ Asthma Care Map for Primary Care ■ Asthma Diagnosis and Management Algorithm.	http://www.on.lung.ca/pcap
The Lung Association—Provider Education Program (PEP)	The Lung Association—Ontario's Provider Education Program (PEP), funded by the Ministry of Health and Long-Term Care, has a mandate to develop, implement, and evaluate accredited continuing medication education programs and materials that promote the Canadian Thoracic Society respiratory guidelines. Provider education topics include: ■ Asthma ■ Spirometry interpretation ■ COPD vs. asthma ■ Work-related asthma ■ Preschool asthma.	http://olapep.ca/
Ontario Respiratory Care Society	Furthering excellence in the provision of interdisciplinary respiratory care through education, research, collaboration, provision of professional expertise, and support for Lung Association efforts to improve lung health. Functions/resources include education events, research programs, and publications.	http://www.on.lung.ca/page.aspx?pid=423

WEBSITE	CONTENTS	LINK
University Health Network—Asthma and Airway Centre	The Asthma and Airway Centre specializes in the diagnosis, treatment, and management of asthma, COPD, allergies, and other respiratory problems. The website provides educational resources.	http://www.uhn.ca/Surgery/PatientsFamilies/Clinics_Tests/Asthma_Airway
World Health Organization (WHO)	WHO recognizes that asthma is of major public health importance. The Organization plays a role in coordinating international efforts against the disease. The aim of its strategy is to support member states in their efforts to reduce the disability and premature death related to asthma. Its website includes general information about asthma, information about WHO's asthma-related activities, and other related links.	http://www.who.int/respiratory/asthma/activities/en/

Appendix Q: Description of the *Toolkit*

Best practice guidelines can only be successfully implemented if planning, resources, organizational, and administrative supports are adequate and there is appropriate facilitation. To encourage successful implementation, an RNAO expert panel of nurses, researchers, and administrators has developed the *Toolkit: Implementation of Best Practice Guidelines* (2012b). The *Toolkit* is based on available evidence, theoretical perspectives, and consensus. We recommend the *Toolkit* for guiding the implementation of any clinical practice guideline in a health-care organization.

The Toolkit provides step-by-step directions for the individuals and groups involved in planning, coordinating, and facilitating the guideline implementation. These steps reflect a process that is dynamic and iterative rather than linear. Therefore, at each phase, preparation for the next phases and reflection on the previous phase is essential. Specifically, the Toolkit addresses the following key steps, as illustrated in the "Knowledge-to-Action" framework (Straus et al., 2009):

1. Identify the problem: Identify, review, and select knowledge (best practice guideline).
2. Adapt knowledge to the local context:
   - Assess barriers and facilitators to knowledge use, and
   - Identify resources.
3. Select, tailor, and implement interventions.
4. Monitor knowledge use.
5. Evaluate outcomes.
6. Sustain knowledge use.

Implementing guidelines to effect successful practice changes and positive clinical impact is a complex undertaking. The *Toolkit* is one key resource for managing this process. It can be downloaded at http://RNAO.ca/bpg/resources/toolkit-implementation-best-practice-guidelines-second-edition.

Endorsements

Asthma.ca™
Asthma Society of Canada

January 4, 2017

Doris Grinspun, RN,MSN, PhD, LLD(hon), O.ONT
Chief Executive Officer
Registered Nurses' Association of Ontario (RNAO)
158 Pearl Street, Toronto, Ontario M5H 1L3

Letter of Endorsement: *Adult Asthma Care: Promoting Control of Asthma*

Dear Dr. Grinspun,

The Asthma Society of Canada is delighted to endorse RNAO's Clinical Best Practice Guideline – *Adult Asthma Care: Promoting Control of Asthma*. With its evidence-based focus on enhancing adult asthma care, this guideline will greatly strengthen the use of best practices associated with providing asthma education to meet the individual needs of the person with asthma, therefore optimizing clinical outcomes.

The Asthma Society of Canada exists to empower every child and adult with asthma to live an active and symptom-free life. This guideline directly relates to our mission of advancing optimal asthma self-management, research, and health-care. The recommendations address evidence-based practices associated with adult asthma care at the individual practitioner, organization and health-system level. We appreciate how important evidence-informed decision making is for achieving quality at all levels of care and across the health-care system.

The Asthma Society of Canada is committed to providing evidence-based asthma information, education, and management tools to support Canadians living with asthma. We believe that RNAO's *Adult Asthma Care: Promoting Control of Asthma* guideline will greatly support our work with Canadians living with asthma.

Best regards,

Vanessa Foran, CAE
President and CEO
Asthma Society of Canada

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Réseau canadien pour les soins respiratoires
Canadian Network for Respiratory Care

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January 17, 2017

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Chief Executive Officer
Registered Nurses' Association of Ontario (RNAO)
158 Pearl Street, Toronto, Ontario M5H 1L3

Letter of Endorsement: *Adult Asthma Care: Promoting Control of Asthma*

Dear Doris:

On behalf of the Canadian Network for Respiratory Care (CNRC), I am pleased to endorse the Registered Nurses' Association of Ontario's clinical best practice guideline (BPG), *Adult Asthma Care: Promoting Control of Asthma*. This updated guideline which replaces *Adult Asthma Care Guidelines for Nurses: Promoting Control of Asthma* (2004) and its supplement (2007) will strengthen the quality of care provided to adults with asthma across the continuum of care.

Through its certified educators and member organizations, CNRC works to improve the quality of life for individuals and their families living with respiratory diseases and tobacco use disorder, by developing, promoting and advocating for the highest standards in health promotion and care. We therefore appreciate how the recommendations in your best practice guideline recognize that respiratory certification programs for healthcare professionals standardize the information provided to persons with asthma and improve the quality of asthma education provided.

CNRC is committed to advancing excellence in respiratory care. In keeping with this mission, we believe *Adult Asthma Care: Promoting Control of Asthma* will be an important resource for nurses and other healthcare professionals.

Sincerely,

Cheryl Connors
Executive Director
Canadian Network for Respiratory Care (CNRC)

BREATHE
the lung association

The Lung Association – Ontario
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March 7, 2017

Doris Grinspun, RN, MSN, PhD, LLD(hon), O.ONT
Chief Executive Officer
Registered Nurses' Association of Ontario (RNAO)
158 Pearl Street, Toronto, Ontario M5H 1L3

Letter of Endorsement: ***Adult Asthma Care: Promoting Control of Asthma***

Dear Doris,

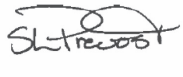
The Lung Association - Ontario is pleased to offer our support for and endorsement of your newest edition of the guideline on the topic of asthma. As you know, our organization is a leader in the prevention and control of chronic lung disease. We provide education and support to more than 2.8 million people living with lung disease in Ontario, as well as engage in advocacy, prevention and research to help all Ontarians breathe with ease. Our two health professional societies – the Ontario Thoracic Society and the Ontario Respiratory Care Society – promote respiratory health through medical research and education, and excellence in interdisciplinary respiratory care. We feel that RNAO's guideline, *Adult Asthma Care: Promoting Control of Asthma* will be a valuable resource to help nurses, other health-care professionals and patients achieve control over their asthma.

This guideline is directly related to our mandate to improve lung health. As an organization that promotes research and education in lung health, we appreciate that the guideline provides robust evidence-based recommendations for care at the individual practitioner level, and for educators and administrators.

With more than 2 million people in the province of Ontario with asthma, it is a disease commonly encountered by nurses. It is important that nurses and other health-care professionals understand the complexities involved in assessing and caring for this population. RNAO's best practice guideline on the topic of asthma will help support consistency and excellence in clinical practice. We commend you on the development of this evidence-based guideline which will help nurses and other health-care professionals provide high quality care to adults with asthma across the spectrum of care.

Sincerely,

George Habib
President and CEO
The Lung Association-Ontario



Shelly Prevost
Chair, Ontario Respiratory Care Society

George Chandy
Chair, Ontario Thoracic Society

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INTERNATIONAL
AFFAIRS & BEST PRACTICE
GUIDELINES

TRANSFORMING
NURSING THROUGH
KNOWLEDGE

Clinical Best
Practice Guidelines

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Adult Asthma Care: Promoting Control of Asthma

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RNAO
Registered Nurses' Association of Ontario
L'Association des infirmières et infirmiers autorisés de l'Ontario

Ontario