Nursing Best Practice Research Unit

Unité de recherche sur les pratiques exemplaires
en soins infirmiers

Inhaler Device Assessment Tool (IDAT) for Promoting Asthma Control in Children

NURSING BEST PRACTICE GUIDELINES

EVALUATION USER GUIDE

November 2006

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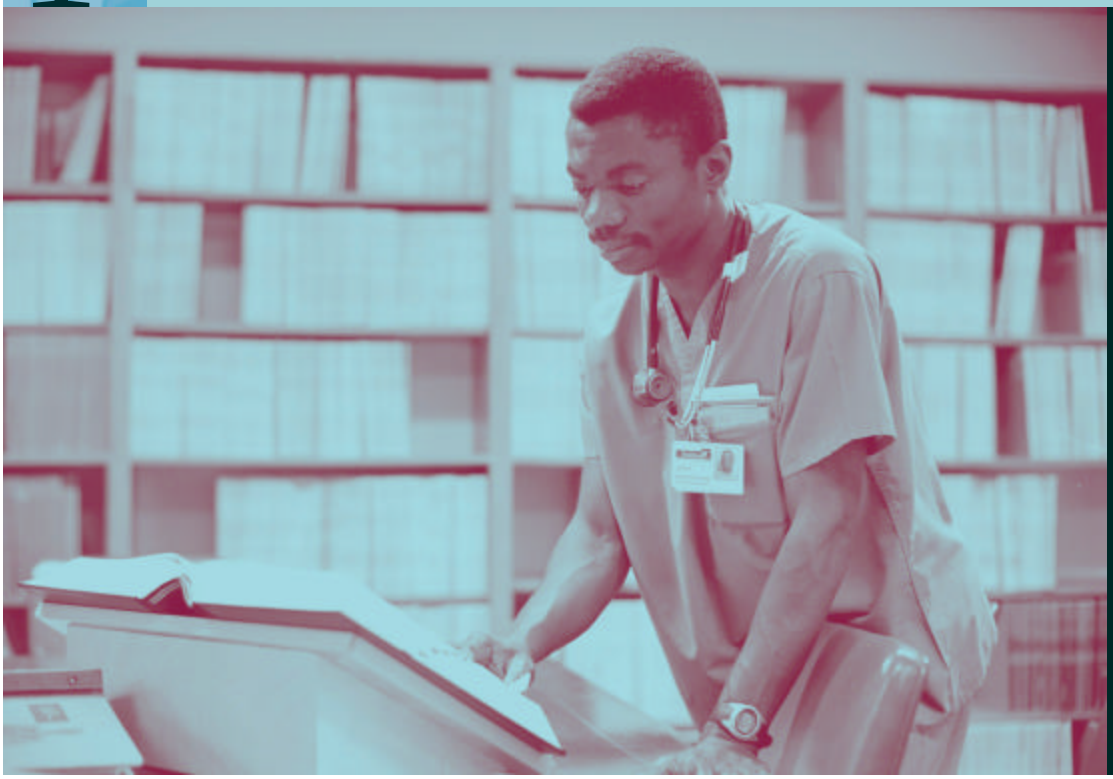
Table of Contents

1 Development of the Inhaler Device Assessment Tool (IDAT)



Chapter highlights

- Why evaluation tools for Best Practice Guidelines are necessary
- Process used for developing the Inhaler Device Assessment Tool (IDAT)

The Nursing Best Practice Research Unit (NBPRU) was formed in January 2005 as a partnership between the University of Ottawa, School of Nursing and the Registered Nurses' Association of Ontario (RNAO). One of the research unit's objectives is to develop and pilot test tools useful in the evaluation of the implementation of clinical nursing BPGs.

BACKGROUND

Clinical or best practice guidelines (BPGs) summarize the most up-to-date research on various clinical topics. They contain recommendations that are useful in helping healthcare providers practice evidence-informed care and improve patients' health outcomes. The Registered Nurses' Association of Ontario (RNAO), with funding from the Ontario Ministry of Health and Long-Term Care has developed 30 BPGs to date. Each BPG includes evidence-based practice, education, and organization/policy recommendations. Details about the RNAO Best Practice Guideline Program may be obtained on the RNAO website: www.rnao.org

When BPG recommendations are implemented in a healthcare organization, the evaluation of its impact needs to be linked with changes in nursing practice and improvements in patient outcomes. The measures used to evaluate the BPG implementation need to be valid and reliable so that conclusions about the relationships between the implementation and the outcomes can be established. These measures also need to be feasible, acceptable, and meaningful to healthcare providers and patients. Sound measures are crucial for effective decision-making on the implementation and evaluation of evidence-informed care.

The Nursing Best Practice Research Unit (NBPRU) was formed in January 2005 as a partnership between the University of Ottawa, School of Nursing and the Registered Nurses' Association of Ontario (RNAO). One of the research unit's objectives is to develop and pilot test tools useful in the evaluation of the implementation of clinical nursing BPGs. At a symposium held in the spring of 2005, a team of leading researchers, administrators, government funders, and policy researchers identified a gap in the availability of tools for measuring the outcomes of guideline implementation. Hence, the NBPRU has developed evaluation tools to accompany various BPGs. The psychometric properties of these evaluation tools were examined in several studies.

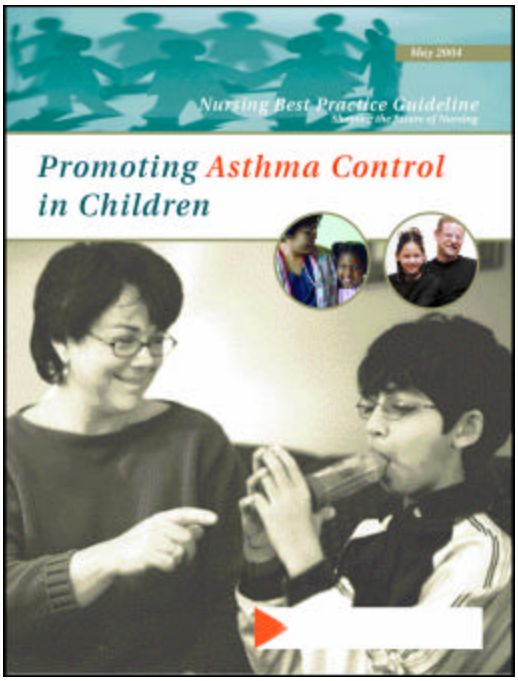
This user guide provides an overview of the development and psychometric properties of an evaluation tool considered as an indicator of patient outcomes targeted by the RNAO Best Practice Guideline: Promoting Asthma Control in Children (RNAO, 2004). The Inhaler Device Assessment Tool (IDAT) is a checklist that nurses can use to ensure that the essential steps of inhaler device techniques are performed accurately and the delivery of medication is optimized.

The IDAT user guide can be a resource for healthcare teams interested in quality improvement programs and/or their own evaluation of the RNAO's BPG on Promoting Asthma Control in Children (RNAO, 2004). This user guide will also serve as a valuable resource to graduate students, nurses, residents, physicians, and research scientists who may wish to adapt the IDAT for their own research on pediatric asthma control. Although the tool itself does not require research experience or graduate level education to administer or use as a teaching tool, the user guide is intended for users who have experience and/or graduate training in basic research and evaluation.

A brief description of the development of the IDAT is presented in this user guide, as well as how to administer, score, and interpret the tool. Its psychometric properties are also summarized. Further technical information on the study examining its psychometric properties is reported by Davies, Danseco, Edwards, Higuchi, McConnell, Clarke & MacPherson (2006).

THE RNAO BEST PRACTICE GUIDELINES ON PROMOTING ASTHMA CONTROL IN CHILDREN

Suboptimal and inaccurate inhaler technique is a common problem among pediatric asthma patients (Hughes, McLeod, Garner & Goldbloom, 1991; Kamps, van Ewijk, Roorda & Branch, 2000; Kofman, Berlinksi, Zaragoza & Teper, 2004). Similarly, studies suggest that health care providers often have poor inhaler techniques that can be improved and optimized after receiving educational sessions (Baddar et



al., 2001; Guidry, Brown, Stogner & George, 1992; Hanania, Wittman, Kesten & Chapman, 1994; Interiano & Guntupalli, 1993). With proper instruction, inhaler techniques of children with asthma and their parents can be improved although the technique may remain suboptimal (Boulet et al. 1999; Becker et al. 200; Kamps et al. 2000). One of the recommendations of the RNAO BPG on Promoting Asthma Control in Children emphasizes the crucial role of nurses, regardless of healthcare settings, to assess and educate parents and children on the proper use of asthma medications to achieve asthma control.

The guideline also outlines techniques for education on the use of asthma medications to maintain optimal control, and advocate for the development of individualized written action plans. Included within the BPG are recommendations in the areas of assessment of asthma control, medications, asthma education, and action plans, as well as referral and follow-up expectations. The BPG serves as a valuable resource for nurses who do not have expertise in childhood asthma, but provide care to children with asthma and their families in their healthcare setting.

APPROACH TO SCALE DEVELOPMENT

Development of the IDAT followed a collaborative process involving representatives from the guideline development panel, RNAO BPG implementation sites, and the guideline evaluation team. This collaborative team identified priority recommendations of the BPG, selected an area for developing an evaluation measure, and reviewed relevant tools identified during a literature review. We called this team the Pediatric Asthma "DREAM" Team (**D**eveloping, **R**eviewing, **E**valuating and **A**nalyzing **M**easures).

We reviewed the existing literature for measures relevant to evaluating a key recommendation of the BPG, namely, nurses' assessment of proper inhaler technique. A review of the literature revealed 20 different checklists. Most were developed for use with adults based on manufacturers or asthma management guidelines (Boulet, et al., 1999; Hughes, et al., 1991; Kamps et al., 2000). Reports on the psychometric properties of these checklists were limited, making judgments on reliability and validity difficult. Bocutti, Celano, Geller and Phillips (1996) developed the only checklist for pediatric patients with information on reliability and validity. We also identified a generic tool developed by Dr. Lisa Cicutto, a leading pediatric asthma expert and nurse practitioner in Canada.

After extensive discussions and review, our team chose to adapt the tool developed by Cicutto. This tool had the advantage of listing five basic steps that are pertinent to the correct use of all inhalation devices. In contrast, the tool developed by Bocutti et al. (1996) had varied steps and different items depending on the inhalation device, making teaching by nurses less practical and feasible.

Modifications on Cicutto's generic tool were made through iterative discussions and feedback from asthma experts at participating sites. To further assess content validity, the tool was reviewed by a broader team of five experts recommended by various members of the evaluation team. These experts reviewed the tool on its content, clarity of wording and scoring procedures, and comprehensiveness of items. Feedback from the reviewers was then integrated into the pilot version.

The inhaler device assessment tool was pilot-tested in two Ontario hospitals: a 170 bed community hospital and a 365 bed tertiary care hospital. Seventy nurses from the emergency departments and pediatric wards participated in the study. Thirty pediatric patients from one of the sites participated in the feasibility testing of the IDAT. More detailed description of the study is provided in Davies et al. (2006).

2 Administration, Scoring and Interpretation of the IDAT

Chapter highlights

In this section, we describe:

- the items of the Inhaler Device Assessment Tool;
- how to use it as a training tool for nurses and other healthcare providers;
- how to use it to teach children and their families about proper inhaler techniques; and
- how to score and interpret the tool.

Various forms were developed for several inhaler devices, but the same five steps are maintained. The procedures for administering, scoring and interpreting are similar across inhaler devices, which are described below.

DESCRIPTION OF THE INHALER DEVICE ASSESSMENT TOOL (IDAT)

The IDAT lists five critical steps applicable to several inhaler devices used by children. These steps involve preparing and priming the device (for example, removing the cap and shaking the inhaler) and the actions required from the patient (exhaling, inhaling and breath holding). The IDAT has specific scoring criteria for each of the five critical steps. These five steps are critical for both the assessment of the patient's technique and for teaching optimal inhaler technique.

The IDAT can be used for the following devices: a metered dose inhaler (MDI), MDI with spacer, MDI with spacer plus mask, Diskus® and Turbuhaler®. The following forms of the IDAT were developed for testing:

- Form A1 - For all MDIs
- Form A2 - For MDIs plus spacers
- Form A3 - For MDIs plus spacers with mask
- Form B - For dry powder breath activated inhalers such as the Diskus® and Turbuhaler®.

Form A1 can be used for MDI use alone or with a spacer. To make the IDAT more user-friendly, Form A2 and Form A3 were created for MDI use with a spacer. Form A3 is specific to using a MDI plus a spacer with mask, which is used with younger children. Therefore users have several options to meet their needs and those of their patients.

All forms include the same five critical steps, but differ in the scoring criteria within each step, depending on the common errors associated with each device. All forms can be found in Appendix A. The current user guide presents the Chart Audit Tool on Nursing Assessment and Device Selection for Vascular Access and Patient Outcomes. A retrospective chart audit tool was perceived as the most efficacious manner in which to assess nursing care and patient/client outcomes on the assessment and

selection of appropriate vascular access devices as well as potential complications related to intravenous therapy.

ADMINISTRATION

Training Nurses and other healthcare providers

The IDAT can be used to train nurses, respiratory therapists and other healthcare providers about proper inhalation techniques, which in turn can be used by health care providers to accurately teach children and their families. The IDAT can also be used for teaching students and clinicians unfamiliar with the proper use and techniques of inhaler devices.

Training takes about 15 to 20 minutes to review the optimal inhaler techniques of the five devices: MDI alone, MDI plus spacer, MDI plus spacer with mask, Turbuhaler and Diskus. In our study, nurses from busy emergency departments and inpatient pediatric units participated in training sessions. It is important to have in-house experts or consultants to perform the training and that they are available for any questions or concerns. When teaching staff about the proper use and techniques of inhalers, it is highly recommended that placebo devices are used to enhance teaching. Placebos are available through their respective pharmaceutical company. Teaching and coaching for the correct use of inhaler devices should continue until a score of 95% to 100% is obtained for each device. Upon completion of staff training, the tool may be used by nurses and other providers to assist with teaching of patients or family members.

Training Children and their Families

The IDAT is to be used by nurses and healthcare providers to assess inhaler technique, teach correct inhaler technique and to provide feedback on inhaler technique to children and their families. Manufacturers' instructions should be checked to make sure that the IDAT is consistent and accurate for the device. Inhaler technique should be assessed at frequent intervals to ensure that correct technique is maintained. It is important that placebo devices are used when teaching children and their families how to use inhaler devices. Patients who are prescribed to use a new device, nurses should review the steps to use the device, demonstrate the technique, and request a return demonstration of the use of the inhaler.

The IDAT should be used to score or identify correct and incorrect steps of inhaler technique. Correct steps should be acknowledged as such. Incorrect steps need to be identified with the correct technique explained and the patient should repeat a demonstration of the device technique until an accurate technique is achieved. All patients regardless of how long they have had asthma or used a specific device should have their inhaler technique assessed at regular intervals. When errors are identified in the inhaler technique, the patient needs to receive instruction and coaching to achieve accurate technique. The IDAT can assist nurses with this process. Parents or guardians can also be provided a copy of the IDAT to use as a guide for monitoring and reviewing correct inhaler technique.

SCORING AND INTERPRETATION

Each of the five steps for all forms of the IDAT is scored as 1 or 0. A step is scored as '1' if no errors are made for that step. A step is scored as '0' if there is at least one error in performing that step. The scores for the five steps are then added, for a total possible maximum score of 5, and a minimum score of 0. The specific criteria for whether to score the step as 1 or 0 will be different depending on the device, and depending on the age of the child, as indicated in the forms.

When training nurses or other healthcare providers on proper techniques for several devices, a score of 95% to 100% should be obtained. For example, when training for the use of 3 devices, a score of 14/15 or 95% should be obtained (3 devices X 5 maximum score = 15; 95% of 15 = 14.25).

3 Overview of Psychometric Properties of the IDAT

Chapter highlights

In this chapter, we briefly report on the psychometric properties of the Inhaler Device Assessment Tool. The properties described include:

- Content validity
- Feasibility
- Acceptability, and
- Reliability.

Content Validity *(whether a measure's scales or dimensions captures constructs in a comprehensive manner)* was evaluated through clinician expert reviews, including five experts recommended by members of the evaluation team. We obtained comments on how comprehensive the items and scoring criteria were, whether the tool was applicable to the selected devices, and how appropriate the items and scoring criteria were for various age groups among children and youth.

Feasibility *(whether a measure can actually be used in a particular setting given the resources, demands of testing and complexity of administration)* was evaluated by examining the reasons for exclusion from the study, documenting the time to collect the questionnaires, and noting the resources required to collect the data. The feasibility of using the IDAT was very good, in both emergency departments and pediatric inpatient units. The use of standard procedures for in-house training of staff at each site enhanced nurse participation in the study. Asthma educators and experts in the sites' greatly assisted the research teams by providing support, feedback, and expert advice on the devices and the training.

Acceptability *(whether a measure and its items are acceptable to end-users)* was evaluated by examining refusal rates, attrition rates, and missing data for individual items. Based on refusal rates, acceptability was excellent at both sites. At one site, 160 nurses had signed up to participate, but time and resources allowed for only 41 nurse participants. Based on attrition rates, acceptability was very good as there were no participants lost to follow-up. Based on missing data for the tools, acceptability was also good. There was missing data for only one device for one participant.

Inter-rater reliability *(whether a measure will produce similar responses when two or more assessors use the tool at the same time)* was

assessed by obtaining the agreement in ratings (or inter-rater reliability) between scoring done by nurse participants and scoring done by the on-site research staff, using the kappa statistic. That is, a research member acted as a patient improperly using a device, and a nurse participant and another research member both scored the "patient's" inhalation technique. The reliability indices range from .55 to .94, with the mean as .82 for all five devices. Where the kappa statistic could not be mathematically calculated, the percent of agreement was reported. There was 100% agreement in all cases. Results in general show that the tool has excellent reliability based on inter-rater agreement.

A second index of reliability was calculated for another phase of the study. A nurse used the tool with a pediatric patient, and a member of the research staff also scored the patients' inhalation techniques. The kappa statistic was used to obtain reliability indices for both analyses. A t-test was run to test for differences in the total score across the two raters. Results in general showed that there is good inter-rater agreement when the tool is used by nurses with pediatric patients.

4 Summary

The RNAO Best Practice Guideline on Promoting Asthma Control in Children (RNAO, 2004) emphasizes the crucial role of nurses in assessing and teaching children and their families about proper inhaler techniques. Nurses need to be knowledgeable about assessing and educating children, parents, family members and caregivers about using asthma medications appropriately to achieve and maintain optimal asthma control. The Inhaler Device Assessment Tool (IDAT) and the accompanying user guide provides a resource to those interested in supporting best practice initiatives for asthma care among pediatric patients in various healthcare settings.

This user guide gives an overview of the development of the IDAT, including its administration, scoring and interpretation, and a brief description of its psychometric properties. The IDAT identifies five critical steps that are common across five inhalation devices used by pediatric patients. There is preliminary evidence that the IDAT is a valid and reliable tool. The IDAT is considered a highly feasible and acceptable instrument, available for teaching nurses and other healthcare providers with pediatric patients in emergency departments and inpatient pediatric units in hospital settings. The identification of five critical steps common to these devices, and the listing of common errors support nurses in learning how to use and teach the use of these devices correctly.

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Appendix

LIST OF APPENDICES

APPENDIX A: INHALER DEVICE ASSESSMENT TOOL

Forms	Device
A1	MDI, MDI plus spacer, MDI plus spacer with mask
A2	MDI plus spacer with mask
A3	MDI plus spacer
B	Diskus®, Turbuhaler®

Inhaler Device Assessment Tool - Form A1: MDI

Type of inhalation device (**Check one**): ☐ MDI ☐ MDI plus spacer ☐ MDI plus spacer with mask

Instructions. Give one point for each step performed correctly (1=Yes, correct technique). Provide a reason for why a step was not done correctly for steps with a Score of 0.
When using this checklist as a teaching guide: For boxes with a score of 0, provide more teaching or coaching in these areas until a total score of 5 is obtained. Record the number of attempts until a satisfactory technique is obtained in the column "Coaching."

Sequence of Critical Steps & Criteria		**Score** Circle 1 or 0		**Coaching**
1 Removes cap. *Score 1 if:* ✓ MDI: Removes cap from the mouthpiece. ✓ MDI plus spacer: Removes cap(s), AND inserts canister into spacer correctly. ✓ MDI plus spacer with mask: Removes cap(s), inserts canister mouthpiece into spacer.	*Score 0 if*: ☐ Forget to remove cap(s). ☐ Metal canister of MDI not in plastic mouthpiece correctly ☐ Other:	1	0	
2 Correctly primes device. *Score 1 if:* ✓ MDI: Shakes the inhaler AND inhaler is upright ✓ MDI plus spacer with mask: Shakes and delivers only 1 spray in the chamber, after on face with a good seal.	*Score 0 if*: ☐ Forget to shake. ☐ Device held incorrectly (e.g., upside down). ☐ Other:	1	0	
3 Exhales. *Score 1 if:* ✓ Exhales completely or breathes out to the end of a normal breath before putting apparatus to mouth. ✓ MDI plus spacer: Hear a hissing sound. ✓ MDI plus spacer with mask: Good fit of mask (nose and mouth covered).	*Score 0 if*: ☐ Does not exhale fully. ☐ Other:	1	0	
4 Inhales appropriately for device. *Score 1 if:* ✓ MDI: Positioned 2-3 finger widths away from widely opened mouth. At the same time starts to breathe in slowly and depresses the inhaler to release 1 puff of medication. Continues breathing in slowly for about 5 seconds. Position with chin up. ✓ MDI plus spacer: Puts the mouthpiece of spacer in the mouth, lips closed tightly around it, presses the inhaler. Breathes in slowly and deeply through the mouth for about 5 seconds. ✓ MDI plus spacer with mask: Good seal over nose and mouth, press the inhaler, slow tidal breathing (that is, regular breathing in and out).	*Score 0 if*: ☐ Head not correctly positioned. ☐ Block spray with teeth or tongue. ☐ Blue or yellow Aerochamber: Hear a musical sound or whistling; breathing in too quickly. ☐ Does not synchronize breathing in with puff (MDI alone). ☐ Inhales through nose. ☐ Delivering 2 sprays at once in the chamber for 1 inhalation. ☐ Cough provoked by inhalation. ☐ Other:	1	0	
5 Holds breath. *Score 1 if:* ✓ Person holds breath to count of 10 seconds. ✓ Lips kept closed while holding breath. ✓ MDI plus spacer with mask: No breath hold (see tidal breathing above) ✓ Person waits 30-60 seconds before repeating process	*Score 0 if*: ☐ Holds breath for less than 10 seconds. ☐ MDI plus spacer with mask: Holds breath in and out less than 6 times per dose of medication. (child <6 years) ☐ Other:	1	0	
Date: _____ dd/mm/yyyy	**TOTAL SCORE**			

Inhaler Device Assessment Tool - Form A2

Type of inhalation device: MDI plus spacer

Instructions. Give one point for each step performed correctly (1=Yes, correct technique). Provide a reason for why a step was not done correctly for steps with a Score of 0.

When using this checklist as a teaching guide: For boxes with a score of 0, provide more teaching or coaching in these areas until a total score of 5 is obtained. Record the number of attempts until a satisfactory technique is obtained in the column "Coaching."

Sequence of Critical Steps & Criteria		**Score** Circle 1 or 0		**Coaching**
1 Removes cap. *Score 1 if:* ✓ Removes cap, AND inserts canister into spacer correctly.	*Score 0 if*: ☐ Forgets to remove cap. ☐ Metal canister of MDI not inserted correctly into plastic holder. ☐ Forgets to monitor medication doses and MDI is empty. ☐ Other:	1	0	
2 Correctly primes device. *Score 1 if:* ✓ Shakes the MDI upright with the spacer/mask.	*Score 0 if*: ☐ Forgets to shake. ☐ Device held incorrectly (e.g., upside down). ☐ Other:	1	0	
3 Exhales. *Score 1 if:* ✓ Exhales completely or breathes out to the end of a normal breath before putting the spacer to mouth ✓ <u>For younger child (4-6 years)</u>: With correct seal on mouthpiece may exhale into spacer.	*Score 0 if*: ☐ Forgets to exhale. ☐ Does not exhale completely. ☐ Other:	1	0	
4 Inhales appropriately for device. *Score 1 if:* ✓ Puts the mouthpiece of spacer in the mouth, lips closed tightly around it, depress MDI. ✓ Breathes in slowly and deeply through the mouth for about 5 seconds. ✓ <u>For younger child (4-6 years)</u>: during exhalation depress the MDI and breathe in slowly and deeply through the mouth as able.	*Score 0 if*: ☐ Head not correctly positioned or with slouching posture. ☐ Blocks spray with teeth or tongue. ☐ Inhales through the nose. ☐ Breathes in too quickly (hear a whistling or musical sound from spacer). ☐ Delivers 2 sprays at once for 1 inhalation. ☐ Other:	1	0	
5 Holds breath. *Score 1 if:* ✓ Holds breath to count of 10 seconds. ✓ Lips are kept closed while holding breath. ✓ Waits 30-60 seconds before repeating process	*Score 0 if*: ☐ Holds breath less than 10 seconds. ☐ Does not wait 30-60 seconds between doses. ☐ Other:	1	0	
Date: _____ dd/mm/yyyy		**TOTAL SCORE**		

Inhaler Device Assessment Tool - Form A3

Type of inhalation device: MDI plus spacer with mask

Instructions. Give one point for each step performed correctly (1=Yes, correct technique). Provide a reason for why a step was not done correctly for steps with a Score of 0.

When using this checklist as a teaching guide: For boxes with a score of 0, provide more teaching or coaching in these areas until a total score of 5 is obtained. Record the number of attempts until a satisfactory technique is obtained in the column "Coaching."

Sequence of Critical Steps & Criteria		**Score** Circle 1 or 0		**Coaching**
1 Removes cap. *Score 1 if:* ✓ Removes cap, AND inserts canister into spacer correctly. ✓ Ensure infant or toddler is positioned correctly and securely.	*Score 0 if*: ☐ Forgets to remove cap. ☐ Infant/toddler not positioned correctly. ☐ Forgets to monitor medication doses and MDI is empty. ☐ Other:	1	0	
2 Correctly primes device. *Score 1 if:* ✓ Shakes the MDI upright with the spacer/mask. ✓ Delivers only 1 spray in the chamber, after mask on face with a good seal.	*Score 0 if*: ☐ Forgets to shake. ☐ Device held incorrectly (e.g., upside down). ☐ Other:	1	0	
3 Exhales. *Score 1 if:* ✓ Good fit of mask (nose and mouth covered). Hold the device by the mask securely to the face. ✓ Exhalation valve must be present and move with inhalation and exhalation.	*Score 0 if*: ☐ Exhalation valve missing or not functioning. ☐ Inadequate seal of mask over nose and mouth. ☐ Other:	1	0	
4 Inhales appropriately for device. *Score 1 if:* ✓ Good seal over nose and mouth, press the inhaler, slow tidal breathing (that is, regular breathing in and out). ✓ Count 6 to 8 breaths.	*Score 0 if*: ☐ Mask not securely held to infant/ toddler's face. ☐ Delivers 2 sprays at once for 1 inhalation. ☐ Tidal breathing for less than 6-8 breaths. ☐ Other:	1	0	
5 Holds breath. *Score 1 if:* ✓ As above for tidal breathing. ✓ Waits 30-60 seconds before repeating process	*Score 0 if*: ☐ As above for tidal breathing. ☐ Does not wait 30-60 seconds between doses. ☐ Other:	1	0	
Date: _____ dd/mm/yyyy		**TOTAL SCORE**		

Inhaler Device Assessment Tool - Form B

Type of inhalation device (**Check one**): ☐ Diskus® ☐ Turbuhaler®

Instructions. Give one point for each step performed correctly (1=Yes, correct technique). Provide a reason for why a step was not done correctly for steps with a Score of 0.

***When using this checklist as a teaching guide:** For boxes with a score of 0, provide more teaching or coaching in these areas until a total score of 5 is obtained. Record the number of attempts until a satisfactory technique is obtained in the column "Coaching."

Sequence of Critical Steps & Criteria		**Score** Circle 1 or 0		**Coaching**
1 Removes cap. *Score 1 if:* ✓ Diskus: Opens the Diskus apparatus using the thumb grip (a click heard when it is open all the way). ✓ Turbuhaler: Removes the outside cover.	*Score 0 if*: ☐ Forget to open Diskus or remove outside cover of Turbuhaler. ☐ Forget to remove cap (Turbuhaler). ☐ Other:	1	0	
2 Correctly primes device. *Score 1 if:* ✓ Diskus: Slides the lever as far as it will go until a click is heard. ✓ Turbuhaler: Turns the colored grip or base ring all the way in one direction until it stops, then back again until a click is heard.	*Score 0 if*: ☐ Device held incorrectly (e.g., upside down). ☐ If click not heard for Turbuhaler or Diskus. ☐ Other:	1	0	
3 Exhales. *Score 1 if:* ✓ Exhales normally before putting the apparatus to the mouth.	*Score 0 if*: ☐ Turbuhaler/Diskus: Exhaling into device. ☐ Does not exhale fully. ☐ Other:	1	0	
4 Inhales appropriately for device *Score 1 if:* ✓ Diskus: With mouthpiece to the lips and position chin up, inhales quickly and deeply. ✓ Turbuhaler: Puts the mouthpiece between the lips, position chin up, and breathes in quickly and forcefully through the mouth.	*Score 0 if*: ☐ Not a good seal between the mouth and mouthpiece of any device. ☐ Head not correctly positioned. ☐ Block spray with teeth or tongue. ☐ Cannot synchronize breathing in with puff. ☐ Inhales through nose. ☐ Cough provoked by inhalation. ☐ Turbuhaler or Diskus breathing in slowly. ☐ Other:	1	0	
5 Holds breath. *Score 1 if:* ✓ Person holds breath to count of 10 seconds. ✓ Lips kept closed while holding breath.	*Score 0 if*: ☐ Holds breath for less than 10 seconds. ☐ Other:	1	0	
Date: _____ Time: dd/mm/yyy	**TOTAL SCORE**			

APPENDIX B: HOW TO COLLECT DATA IN HEALTHCARE SETTINGS

This document is intended to generally outline for the novice researcher (nurses, allied health care workers, managers of quality improvement programs, and others) the specific steps on how to obtain research information or data within a healthcare setting. A sample flow chart of the research process is provided. This document focuses on conducting research in the context of a hospital setting. The clinical context of a particular research setting needs to be considered when determining whether these procedures need to be adapted.

Before conducting any research, you will need to seek approval for your study from the appropriate research ethics board(s) (REB), such as at the healthcare facilities where you plan to conduct the research and/or your educational institution (if you are a student or instructor). Data collected for quality improvement purposes within a facility may not need ethical approval; however, this should be checked with your facility's research ethics board, particularly when pediatric patients are involved. Research ethics board approval is not needed if the IDAT is incorporated into your usual clinical practice as a tool to assess patients' and families' inhaler technique and to provide feedback and coaching to achieve accurate technique. The following steps address the most common ethical issues. Your research ethics board may have additional ethical concerns.

Step 1: **Communication of the Study Approach to the Research Assistant**

When conducting research at a healthcare centre, you will likely have to rely on a Research Assistant (RA) who can be based at the site, hired part-time, or a student with placement at the site. The RA can help with the particular facility REB application and process requirements, recruitment of participants and data collection. The RA must be properly informed and trained on the study protocol to ensure he/she follows approved ethics procedures that protect participants' rights, privacy and confidentiality. The RA will be your key contact at the healthcare setting and will alert staff about the research study to assist with the recruitment of participants and collection of data.

The healthcare organization that has agreed to participate in your research usually selects the RA who will be working with you based on direction from you on the skills and credentials required to conduct the research. Participating research personnel should be regular employees of the healthcare centre with access to potential participants on a daily basis, but not providing direct patient care.

It is recommended that the research personnel do not have direct supervision or influence over potential participants (either patients or staff). This provision is a requirement for conducting ethical research. The ethical concern is that if patients are approached by their attending care personnel, or if staff are approached by a direct supervisor, they may feel that they have to participate in the research out of fear that not participating might affect their care or employment. This is referred to as coercion. The potential for coercion is minimized and/or eliminated if research staff are not directly involved in the patient's care and/or are not in a direct supervisory role or position of influence over potential staff participants.

The following should be provided to the RA to ensure that the study's purpose, procedures, and his/her role are understood:

- Research study information (e.g., what is being studied; how participants are to be recruited; the RA role during the recruitment and data collection phases; how participant informed consent will be obtained; how and what data will be collected; the estimated time it will take for recruitment, data collection and study completion).
- Patient eligibility criteria (see Step 2).
- How the RA is to communicate study information to all nursing staff on participating units and/or to appropriate staff throughout the organization.
- Study materials to be distributed to patients and/or staff (flyers, information and consent form). Ensure the RA leaves extra copies at the nursing station.

Step 2: **Recruitment and Assessing for Participant Eligibility**

Eligibility criteria will depend on the research questions you are undertaking. For example, if you are doing a study on the effectiveness of teaching children and youth proper inhalation techniques, then the following may be your patient eligibility criteria:

- ages 0 to 17 years old
- admitted to the emergency departments or inpatient units
- with symptoms of asthma
- have been prescribed with inhalers, and
- able to understand and speak English.

Unit staff should be informed of the study and eligibility criteria so they can provide study information to potential participants and notify the RA of eligible, interested participants. You will need to check with your research ethics board or quality improvement officer about proper procedures in recruiting participants for your study, considering current privacy legislation. You will also need to make sure you follow the proper procedures when obtaining the consent of parents or guardians, for the participation of children and youth.

One alternative that has been used by the evaluation team of the University of Ottawa is to approach potential participants to explain the study in more detail after unit staff has obtained "permission to call/contact" from an interested participant (see Step 3 below). Depending on study procedures, the RA may collaborate with the Unit/Ward Clerk to secure a list of potential patient participants.

Unit/Ward clerks typically have access to patient information on the unit because they are responsible for the logistics of the unit (patient admission to the unit, room placement, movement of patients from unit to appointment and vice versa, etc.). A recruitment approach involving the Unit/Ward Clark may be more appropriate and/or useful when trying to do a "sweep" across a unit or organization involving the recruitment of all (or large numbers of) patients over a short period of time.

If a participant is eligible and if you need to use a permission to call/ contact, go to Step 3. Otherwise, proceed to Step 4.

Step 3: Providing Eligible Potential Participants with Study Information (Flyer, Information Sheet & Consent Form) and Obtaining Permission to Call/Contact– Unit Staff and RA

Prior to the RA discussing the study in more detail with an eligible participant, potential participants are approached by unit staff first, who will briefly describe the study and/or hand out flyers and ascertain whether an eligible participant is interested in learning more about the study. If eligible potential participants indicate an interest, then the unit staff will obtain "permission to call/contact" for the RA to further explain the study. The participant signs the ***Request for Permission to Call/Contact*** form.

When permission to call is obtained, unit staff will notify the RA and leave the completed **Permission to Call/Contact** form at the nursing station or in the appropriate, designated place. In a home care setting, this may involve faxing the completed "permission to call/contact" form to the RA.

Step 4: RA Meeting with Potential Participant to Provide Detailed Explanation of Study and Seek Informed Consent

When you have identified a potential participant for your study, the RA will need to meet with him or her to discuss and ascertain the following:

- Verify that the potential participant meets eligibility criteria.
- If the potential participant is identified as <u>not</u> eligible, explain this to him/her, thank him/her for his/her time and interest, and end the meeting. Ensure reasons why the potential participant was ineligible get recorded on the Master Sheet (Step 5). This is important information for the study investigators and should be tracked.
- If the potential participant is eligible, explain the study and review materials. Ensure the potential participant has had time to read through the materials.
- Ask potential participant if he/she has any questions and answer them.
- Request signed consent for all parts of the study. Ideally, you would like consent for all study tasks. However, ethically the potential participant does not have to consent to all tasks within a research protocol.
- Have both the participant and the RA sign both copies of the Information Sheet & Consent Form. Leave one copy with the participant.

If the potential participant is not eligible or refuses consent, no further contact should be made with the potential participant. Refusal to participate is also important information to track for study investigators. Ensure this gets recorded on a Master Sheet (see Step 5).

Step 5: Recording Participant Information on the Master Sheet

A Master Sheet allows the RA to track recruitment and data collection. Add pertinent participant information to the Master Sheet for all participants approached (whether identified as eligible or not, and whether consented or not). The following should also be recorded on the Master Sheet:

- Assigned ID Code to participant. ***This assigned ID code will be recorded on all data collection forms.*** None of the data collected should have the participant's name on it.

For tracking purposes, only the Master Sheet should link the assigned ID code to the participant. The Master Sheet may include the patient's hospital chart number or patient ID number (assigned by the hospital at intake), depending on whether the data collection will involve a chart audit/review and retrieval of the patient's health record at a later date from medical records. All data collection forms should be tracked using the assigned ID code.

- An example of a unique assigned ID code (that you have created for the study and assigned to the participant) can be made up in the following manner:

XXX	X-XX	X to XXX
Organization	Unit	Patient recruitment number

- The assigned ID code can consist of letters or numbers, and fewer than three digits can be used. For example,
  - The Organization code could be 100
  - The Unit code could be A
  - The participant recruitment number can start at one and increase incrementally by one in consecutive order e.g. (1 would be assigned to the first participant recruited, and 129 to the 129th participant recruited). The unique assigned ID code would look like this: **100A129**
- Some research projects need to have several sessions with the same participant. Despite the fact that they may participate in more than one session, only ONE unique ID code is assigned to the participant.

- Store the signed participant consent in a locked cabinet in designated area.
- Always store the Master Sheet in a separate locked cabinet. The Master Sheet should never be stored with the data collection forms.
- Once all data collection is completed, the RA will forward the completed data collection forms to the researcher. The Master Sheet should be stored for one year after study completion, after which point it should be destroyed by the RA following established procedures at the healthcare organization.
- The researcher will require the RA to summarize recruitment and data collection information from the Master Sheet (e.g. number of interested participants approached by the RA who were eligible versus not eligible; number who consented versus did not consent; number for whom data collection was not completed and possible reasons why; etc).

Step 6: Collecting Data

Once all required consent forms have been signed, data collection for the study can begin. The procedures used in developing and assessing the psychometric properties of the IDAT are shown in Figures 1 and 2. The technical report by Davies et al. (2005) provides more details and the rationale for these procedures.

When using the IDAT for training nurses or other healthcare providers, the procedures outlined in Figure 1 can be used as a guide, while Figure 2 shows the procedures for pediatric patients.

- Determine who and how many research assistants will be providing the training. If there will be more than one research assistant, the project coordinator needs to make sure that the all research assistants are knowledgeable about the proper inhalation techniques and how to coach others. An inter-rater reliability may need to be established to show that all trainers (either patients or other providers) have similar levels of expertise in the proper inhalation techniques. Performing practice sessions among the research assistants can also help ensure proper skills are obtained.
- Prepare all materials for the individual training sessions. These materials include the inhalation device that is being used by the patient, a placebo device if one is necessary, and the corresponding form of the IDAT.
- Ensure that the physical environment is not too distracting for the patient and/or nurse participant. Training can take only 15 to 20 minutes for five devices, for nurse participants, and can be done in a convenient place within the nurses' work unit. For pediatric patients, training can be completed in 5 to 10 minutes. Discussions with the families are encouraged, and families can take home a copy of the IDAT as a resource when administering the inhalation devices to their children.
- Complete the IDAT forms and other study protocol materials as necessary.
- It may also be important to track the time to conduct the training session, and any problems encountered on the Master Sheet. Comments about the tool can also be documented either on the Master Sheet or in a separate data collector log, including questions, difficulties encountered, why a session was not completed, why a patient was "missed" or not included in the study, and any missing information. This information is important for researchers to have when conducting an evaluation of the tool.
- Store the completed forms, and data collection log if used, in a locked cabinet in a designated area.

Figure 1. Flow Chart of Research Procedures for Nurse Participants

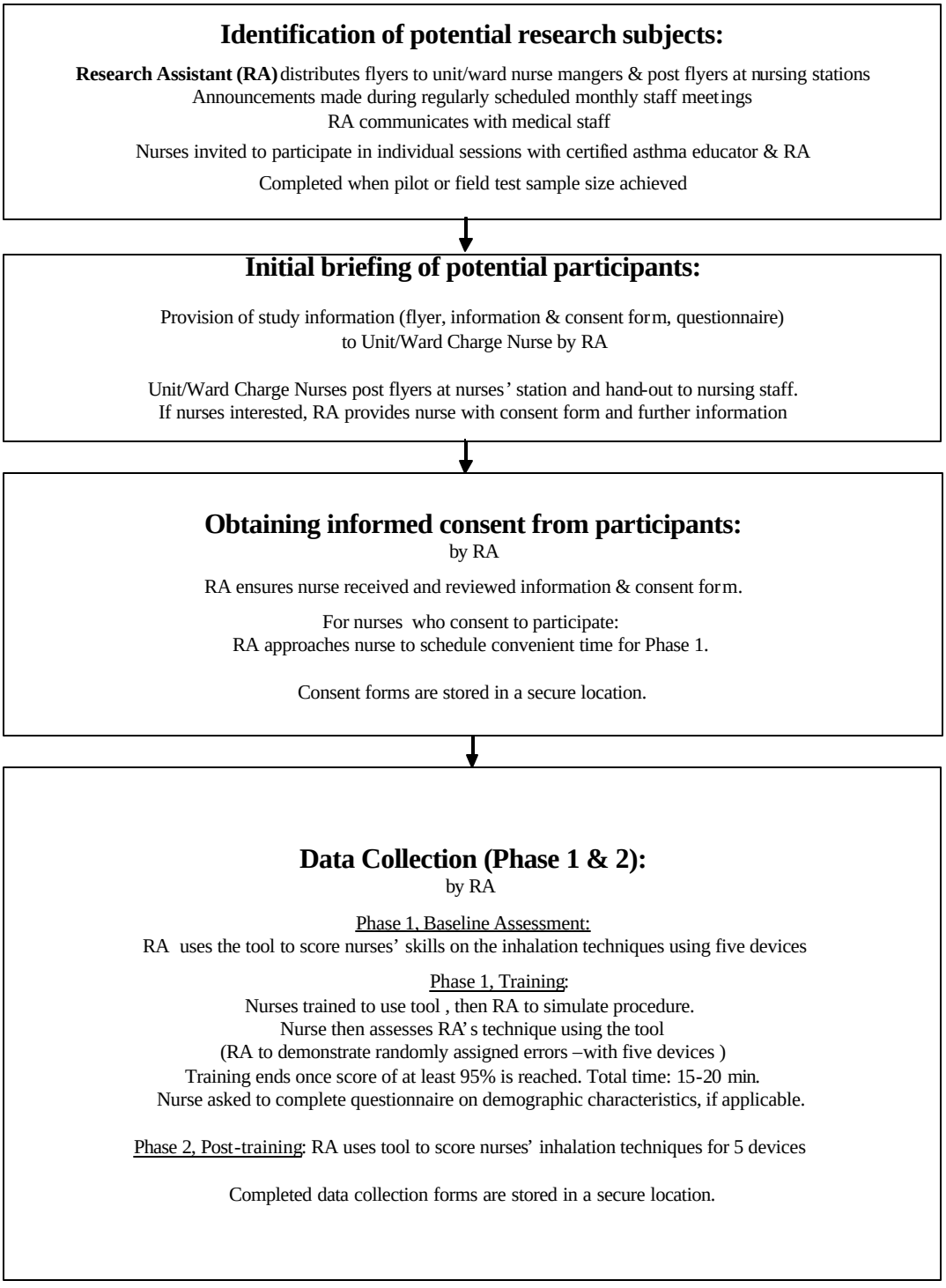
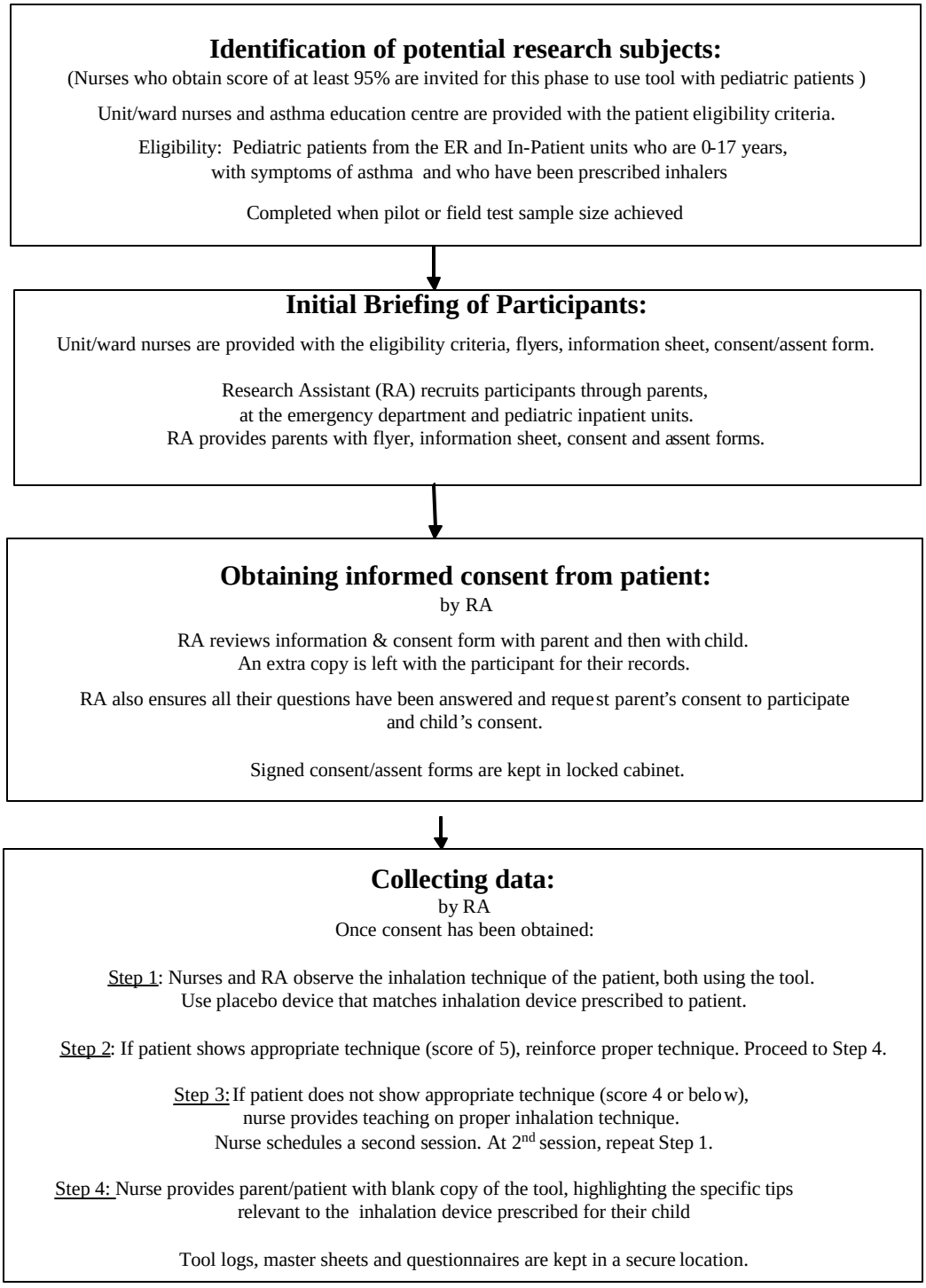


Figure 2. Flow Chart of Research Procedures for Pediatric Patients



APPENDIX C: SPSS DATA ENTRY GUIDELINES

This document provides a general guideline for data entry. The recommendations are made assuming SPSS as data entry spreadsheet/software. The methodology explained below considers various types of variables;

1. **Defining variables:**

a. Keep the question number as variable name (e.g., 1 as q1, 1.1 as q1.1, 1.1a as q1.1a etc.
b. Clarify details of the name under "label" for ex. q1 labeled as "marital status".

2. **Universal/Generic Code:** missing=999 for all the variables.

3. **Scale/Continuous data:**

a. SPSS by default keep 2 decimal places for the values of numeric variable viz. 1 as 1.00. Keep the default while entering data. Thus, 1="very dissatisfied" will appear as 1.00, 2="dissatisfied" as 2.00, 3="satisfied" as 3.00, and 4="very satisfied" as 4.00, etc.
b. Missing=999.

4. **Categorical/Nominal data:**

a. The example might be gender, education, yes/no etc.
b. Follow the same code sequence as given in the questionnaire.
c. Guideline for open ended question:
    i) Gender: male=1, female=2, missing=999
    ii) Yes/No: yes=1, no=2, missing-999
    iii) Education: grade 1=1, grade 2=2, grade 3=3, missing=999.

5. **String and other (date/time etc.) variables:**

a. Specify the length as 250 not the SPSS default as 8.
b. Date: keep the very first date type provided by the system which is dd-mmm-yyyy for ex. May 31 2004 as 31-MAY-2004. You don't need to key exactly the same letters to get this format for ex. if "31 5 4" is keyed it will be displayed by the system as "31-MAY-2004".
c. Time: keep the type as hh:mm:ss for ex. 5 hrs 10 minute 1 sec as 05:10:01. Again it's enough to key "5 10 1" to get the format of "05:10:01".

6. **Multiple response questions:**

Key only Yes (= 1) or No (= 2) for the following type of questions unless specified otherwise.
Example:

Who provides training on inhalation devices? (Check all that apply)

- ☐ Asthma educator
- ☐ Representative of pharmaceutical company
- ☐ Physician
- ☐ Respiratory therapist
- ☐ Other: _____

APPENDIX D: SAMPLE SPSS PROGRAM

1. Sample SPSS Variables, Variable Labels, and Value Labels for Categorical Variables

Variable	Variable Label	Value Labels
D1_test	MDI - Time of testing	1= Baseline 2= Post-training
D1_1	MDI - Removes cap	0 = No 1= Yes
D1_2	MDI - Correctly primes device	0 = No 1= Yes
D1_3	MDI - Exhales	0 = No 1= Yes
D1_4	MDI - Inhales appropriately	0 = No 1= Yes
D1_5	MDI - Holds breath	0 = No 1= Yes
D1_date	MDI - Date of test	
D1_time	MDI - Time of test	
D1_total	MDI - Total Score	
D2_test	MDI plus spacer - Time of testing	1= Baseline 2= Post-training
D2_1	MDI plus spacer - Removes cap	0 = No 1= Yes
D2_2	MDI plus spacer - Correctly primes device	0 = No 1= Yes
D2_3	MDI plus spacer - Exhales	0 = No 1= Yes
D2_4	MDI plus spacer - Inhales appropriately	0 = No 1= Yes
D2_5	MDI plus spacer - Holds breath	0 = No 1= Yes
D2_date	MDI plus spacer - Date of test	
D2_time	MDI plus spacer - Time of test	
D2_total	MDI plus spacer - Total Score	
D3_test	MDI +spacer & mask - Time of testing	1= Baseline 2= Post-training
D3_1	MDI +spacer & mask - Removes cap	0 = No 1= Yes
D3_2	MDI +spacer & mask - Correctly primes device	0 = No 1= Yes
D3_3	MDI +spacer & mask - Exhales	0 = No 1= Yes
D3_4	MDI +spacer & mask - Inhales appropriately	0 = No 1= Yes
D3_5	MDI +spacer & mask - Holds breath	0 = No 1= Yes
D3_date	MDI +spacer & mask - Date of test	
D3_time	MDI +spacer & mask - Time of test	
D3_total	MDI +spacer & mask - Total Score	
D4_test	Diskus - Time of testing	1= Baseline 2= Post-training
D4_1	Diskus - Removes cap	0 = No 1= Yes

Variable	Variable Label	Value Labels
D4_2	Diskus - Correctly primes device	0 = No 1= Yes
D4_3	Diskus - Exhales	0 = No 1= Yes
D4_4	Diskus - Inhales appropriately	0 = No 1= Yes
D4_5	Diskus - Holds breath	0 = No 1= Yes
D4_date	Diskus - Date of test	
D4_time	Diskus - Time of test	
D4_total	Diskus - Total Score	
D5_test	Turbuhaler - Time of testing	1= Baseline 2= Post-training
D5_1	Turbuhaler - Removes cap	0 = No 1= Yes
D5_2	Turbuhaler - Correctly primes device	0 = No 1= Yes
D5_3	Turbuhaler - Exhales	0 = No 1= Yes
D5_4	Turbuhaler - Inhales appropriately	0 = No 1= Yes
D5_5	Turbuhaler - Holds breath	0 = No 1= Yes
D5_date	Turbuhaler - Date of test	
D5_time	Turbuhaler - Time of test	
D5_total	Turbuhaler - Total Score	

2. Sample SPSS Program for Baseline Scores.

Similar programs are run to obtain the mean scores, or frequencies for all steps, for all devices.

```
*************************************************************************************************************.
* Objective: To obtain frequencies for Baseline scores on MDI.
USE ALL.
COMPUTE filter_$=(D1_test=1).
VARIABLE LABEL filter_$ 'D1_test=1 (FILTER)'.
VALUE LABELS filter_$  0 'Not Selected' 1 'Selected'.
FORMAT filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE .

FREQUENCIES
  VARIABLES=D1_1 D1_2 D1_3 D1_4 D1_5 D1_total

DESCRIPTIVES
  VARIABLES=D1_total
  /STATISTICS=MEAN STDDEV MIN MAX .

USE ALL.
EXECUTE .
*************************************************************************************************************.
```

APPENDIX E: RESOURCES

For information on the Registered Nurses' Association of Ontario (RNAO) Best Practice Guidelines Project, consult the website of the RNAO. The nursing BPGs can be downloaded for free. Hard copies are available for purchase.
http://www.rnao.org/bestpractices

For further information on developing, implementing and evaluating nursing practice guidelines, consult the RNAO *"**Toolkit: Implementation of clinical practice guidelines.**"* The RNAO Toolkit can also be downloaded for free and hard copies are available for purchase through the RNAO website.

For further information on evaluation of nursing best practice guidelines and other evaluation tools, contact the Nursing Best Practice Research Unit. Other monographs include measures on organizational innovation characteristics, organizational stability, organizational culture for change, organizational support for BPG implementation, education and supportive processes, and perceived worth of the BPG, and interviewing nurses and administrators.

http://www.nbpru.ca

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Ottawa, ON K1H 8M5

APPENDIX F: QUICK REFERENCE GUIDE

Name	**Inhaler Device Assessment Tool (IDAT)**
Purpose	To assess proper techniques for the following inhaler devices: MDI, MDI plus spacer, MDI plus spacer with mask, Diskus®, Turbuhaler®. To teach nurses and healthcare providers, and children and their families about proper inhalation techniques for various inhaler devices.
Description	The IDAT assesses how well 5 critical steps are demonstrated when using an inhaler device, which include proper preparation of the devices, exhalation, inhalation and breath holding. Form A1 is for all types of MDIs. Form A2 is for MDIs plus spacer with mask. Form A3 is for MDIs plus spacer. Form B is for Diskus® and Turbuhaler®.
Type of data	Checklist; Observation
Estimated time to collect data	2 to 5 minutes per device, depending on number of errors. 15 to 20 minutes for training nurses and healthcare providers on 5 devices.
Training requirements	Appropriate for nurses and other healthcare providers who have patients with asthma. This measure can be used to implement and evaluate the RNAO BPG on Promoting Asthma Control in Children; hence, some training on the BPG is recommended.
Cost	Free electronic copies. Hard copies of the user guide can be purchased.
Summary of Procedures	1. Prepare all materials: the appropriate inhalation device (or placebo) and the corresponding form for the device. 2. Score each step as 1 (Correct) or 0 (incorrect). 3. Provide coaching on steps with errors. 4. Repeat the entire process, from Steps 1 to 5, until a score of 5 is obtained.
Scoring & Interpretation	Each step has a score of '1' (yes, correct technique). A score of '0' means there is an error in doing that step. The total maximum score is 5, indicating correct inhaler technique.
Citation	Davies B, Danseco E, Cicutto L, Higuchi KS, McConnell H, Edwards N, MacPherson A & Clarke D. (2006). Nursing Best Practice Guidelines Evaluation User Guide: Inhaler Device Assessment Tool for Promoting Asthma Control in Children. Nursing Best Practice Research Unit, University of Ottawa, Canada. pp. 1-30.
Contact Information	**If you plan to use this tool, please contact:** Dr. Barbara Davies Co-Director, Nursing Best Practice Research Unit University of Ottawa, School of Nursing 451 Smyth Road, Ottawa, ON K1H 8M5 Tel. 613-562-5800 ext. 8436, Barbara.Davies@uottawa.ca

We would like to hear from you about this user guide or the Inhaler Device Assessment Tool.

1. We plan to use the Inhaler Device Assessment Tool in our organization:
   - ☐ Yes
   - ☐ No
2. The approximate number of patients/ nurses where we will use this tool: _____
3. Health sector/ type of organization:
   - ☐ Long-term care
   - ☐ Complex continuing care
   - ☐ Rehabilitation
   - ☐ Acute care hospital
   - ☐ Community services
   - ☐ Home care
   - ☐ Public health
   - ☐ Hospice/ palliative care
   - ☐ Mental health/ substance abuse/ addictions
   - ☐ Other: (please specify): _____

Please take a few moments to write and tell us about your experiences, suggestions, questions or ideas:

Name (optional) _____

Where can we contact you? (email or telephone) _____

Fax this form to: Nursing Best Practice Research Unit
ATTN: Dr. Evangeline Danseco
(613) 562-5892

Or email to: edanseco@mail.health.uottawa.ca or Barbara.Davies@uottawa.ca

Nursing Best Practice Guidelines Evaluation User Guide

Inhaler Device Assessment Tool (IDAT) for Promoting Asthma Control in Children

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L'Association des infirmières et infirmiers autorisés de l'Ontario

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