

Development of a Tool to Evaluate Asthma Preparedness and Management in Child-Care Centers

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Introduction: Asthma is a common condition affecting many children in child-care centers. The National Asthma Education and Prevention Program offers recommendations about creating an asthma-friendly child-care setting. However, no studies have investigated the extent to which child-care centers adhere to these recommendations. This study describes the development of a novel instrument to determine the ability of child-care centers to meet national recommendations for asthma.

Methods: The Preparing for Asthma in Child Care (PACC) Instrument was developed using information from existing recommendations and standards, the peer-reviewed literature, site visits, and expert interviews. The survey questions were pilot-tested at 36 child-care centers throughout San Francisco.

Results: The instrument is composed of 43 items across seven domains: smoking exposure, presence of a medical consultant and policies, management of ventilation and triggers, access to medication, presence of asthma action plans, staff training, and encouragement of physical activity.

Discussion: The PACC Instrument is an evidence-based and comprehensive tool designed to identify areas to target to improve asthma care for children in child-care centers.

Introduction

NATIONALLY, APPROXIMATELY 7% of children younger than 5 years of age have been diagnosed with asthma.¹ Rates of emergency department visits and asthma hospitalizations are highest among young children.² Appropriate and timely management can decrease asthma morbidity.³ Child-care centers represent an important and underutilized setting for approaching asthma. In 2007, the majority of preschool-aged children in the United States were enrolled in center-based care.^{4,5} Previous research has suggested that child-care centers are unprepared to care for children with asthma due to exposure to environmental asthma triggers⁶⁻⁸ and lack of asthma training and asthma policies.^{6,9-12}

Recognizing that the quality of asthma care provided to such children at child-care centers monitored by the San Francisco Department of Public Health (SFDPH) had never been fully evaluated, the SFDPH initiated a partnership with the University of California, San Francisco (UCSF), with the goal of developing an instrument for use by public health workers to quantify and compare child-care center asthma preparedness. This paper describes the development of a

comprehensive and evidence-based instrument to measure the preparedness of child-care centers to prevent and manage asthma exacerbations (Figure 1). The Preparing for Asthma in Child Care (PACC) Instrument operationalizes the concept of asthma preparedness across seven domains identified as important by the National Asthma Education and Prevention Program (NAEPP).¹³ These domains are smoking exposure, presence of an asthma consultant and policies, management of ventilation and triggers, access to medications, presence of asthma action plans, staff training, and encouragement of physical activity.

Methods

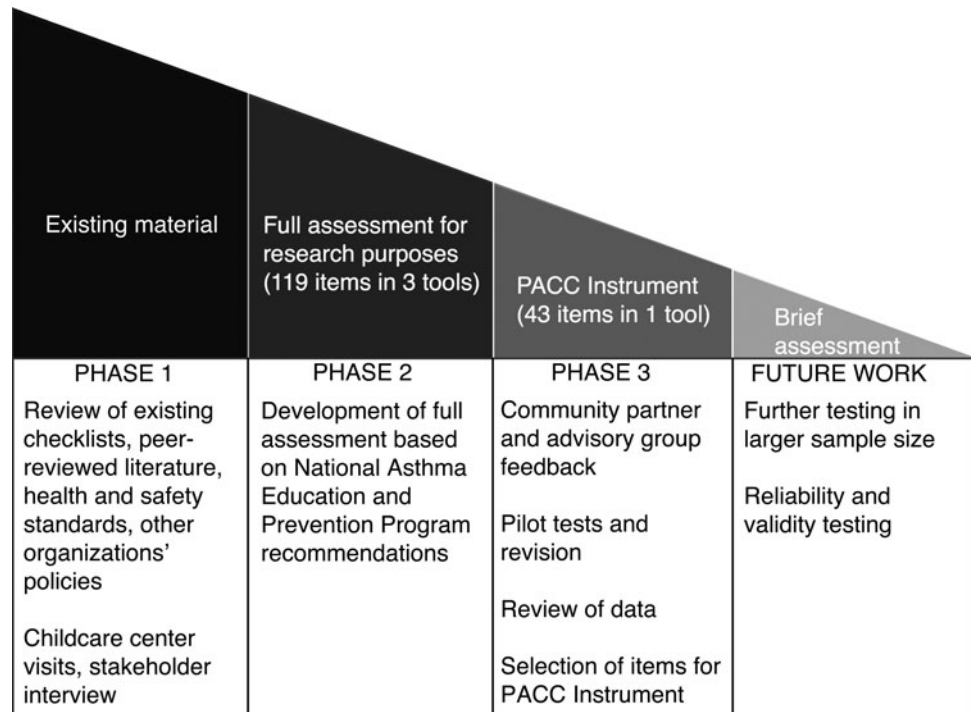
Phase I: formative research and activities

All actions described took place between April 2013 and May 2014. The study was approved by the UCSF Committee for Human Research and an SFDPH staff member. First, existing materials related to asthma preparedness in child-care centers were identified. To this end, a search of the peer-reviewed literature and publicly available resources online was conducted. Several checklists exist. However,

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FIG. 1. A schematic depicting development of the Preparing for Asthma in Child Care (PACC) Instrument.



none was found that was both comprehensive and based on published recommendations from the NAEPP.^{14,15} The NAEPP recommendations, while holistic and originating from national experts, provide general suggestions rather than specific items that operationalize the concept of preparedness.¹³

National and local standards were reviewed. In California, providers are required to attend a 15 h health and safety course upon hiring and a first aid and CPR training course every other year.¹⁶ These curricula typically include a short section about inhaled medications. Additional asthma training is optional. The widely used American Academy of Pediatrics' Guidelines for Out-of-Home Child Care¹⁷ do not include policies relating specifically to asthma (Table 1). In the Early Childhood Environment Rating Scale—Revised¹⁸ (ECERS-R) and the Infant Toddler Rating Scale-Revised (ITERS-R),¹⁹ certain recommendations conflict with asthma recommendations. For example, the ECERS-R awards points to child-care centers for providing aquariums and stuffed animals, which could serve as allergen reservoirs. Finally, when this project was initiated, the SFDPH lacked policies specific to asthma in child-care settings.

Asthma policies at other child-care organizations were reviewed, including the relevant sections of the Head Start Performance Standards.²⁰ To inform development of the instrument, a health manager serving all Head Start centers in San Francisco was interviewed, and five visits were conducted to child-care centers in San Francisco and a neighboring county. Key lessons that emerged were the lack of asthma-related policies and requirements for child-care and the importance of developing a comprehensive instrument. Because child-care providers are occupied with direct child-care activities during the workday, limiting the demands placed on the providers was a primary concern. For these reasons, the NAEPP guidelines¹³ were selected as the framework, and an investigator-implemented instrument

(i.e., one conducted by an outside observer) was selected as the format.

Phase 2: development of the instrument

The PACC Instrument focuses on the seven domains specified by the NAEPP recommendations (Table 2).¹³ The instrument incorporates data from semi-structured interviews with the child-care manager, environmental assessments, and file and medication reviews. Cutoffs for adherence within each of the seven domains were set at either 100% or 66%, depending on the number of items included within the domain. For domains in which fewer than two items made up the score, 100% was used as the cutoff. For domains in which more than two items made up the score, 66% was used as the cutoff so as not to give too much weight to any individual factor (Table 3).

Phase 3: review and revision

Meetings with key informants and community stakeholders. The San Francisco Asthma Task Force, a local organization that has been investigating and influencing asthma policies since 2001, provided additional comments. A group of children's health and environmental health professionals, including pediatricians, nurses, health workers, environmental specialists, and an epidemiologist, provided regular feedback that shaped the instrument's overall direction and approach. Two child-care center managers provided feedback on the content and wording of the surveys.

Data collection. The assessment was conducted at child-care centers or in classrooms where children were primarily older than 2 years of age. Child-care centers or classrooms serving exclusively infants were excluded. Each site visit included three components: a semi-structured interview, an environmental assessment, and a file and medication review.

TABLE 1. STRENGTHS AND LIMITATIONS OF RESOURCES REVIEWED

<i>Type</i>	<i>Source</i>	<i>Strengths</i>	<i>Limitations</i>
Checklist	National Asthma Education and Prevention Program recommendations ¹³ Asthma and Allergy Foundation of America, New England Chapter checklist ¹⁴ Respiratory Health Association checklist ¹⁵	Comprehensive (including physical activity); issued by national asthma authority Very detailed with respect to environmental triggers; also includes some general preparedness items Based on document from Environmental Protection Agency designed for use in homes	Not specific; does not allow quantification of preparedness Does not allow quantification of preparedness; not based on national recommendations Does not allow quantification of preparedness; information pertains to environmental triggers only
Peer-reviewed literature	Alley, 2002 ¹² Goveia, 2005 ⁶ Huss, 2002 ⁹ Juhn, 2002 ¹¹ Perry, 2008 ⁷ Walders, 2004 ¹⁰	Assessment of asthma-related practices and correlation with attitudes; completed by 489 staff Includes questions about asthma training, medication use, triggers and policies; completed by 284 Head Start site directors and 666 staff Assessed asthma care practices and training; completed by 12 Head Start directors and 268 staff Assessment of asthma knowledge completed by 100 child-care center directors Detailed assessment of aeroallergen exposure in 33 Head Start centers Assessment of asthma knowledge and practices completed by 61 Head Start teachers and administrators	Not based on national recommendations; self-report only Not based on national recommendations; self-report only Not based on national recommendations; self-report only Not based on national recommendations; self-report only Not based on national recommendations; self-report only Not based on national recommendations; self-report only
Other	Caring for Our Children: National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care, American Academy of Pediatrics ¹⁷ Indoor Air Quality Tools for Schools by the Environmental Protection Agency ²⁶	Reviewed by a panel of children's health and school health experts Endorsed by national government; comprehensive coverage of school-related environmental issues	Not asthma-specific; does not allow quantification of preparedness Extremely detailed; pertains to environmental triggers only

TABLE 2. "HOW ASTHMA FRIENDLY IS YOUR CHILD-CARE SETTING?" FROM THE NATIONAL ASTHMA EDUCATION AND PREVENTION PROGRAM (NAEPP)

<i>Recommendation</i>	<i>Verbatim text</i>	<i>Sources for additional PACC Instrument questions</i>
Smoking exposure	Is the child-care setting free of tobacco smoke at all times?	Asthma and Allergy Foundation of America ¹⁴ ; California Health and Safety Code ²⁷ ; Respiratory Health Association ¹⁵
Management of ventilation and triggers	Is there good ventilation in the child-care setting? Are allergens and irritants that can make asthma worse reduced or eliminated? Check if any of the following are present: cockroaches, dust mites (commonly found in humid climates in pillows, carpets, upholstery, and stuffed toys), mold, furry pets, strong odors or fumes from art and craft supplies, pesticides, paint, perfumes, air fresheners, and cleaning chemicals.	American Academy of Pediatrics ¹⁷ ; Asthma and Allergy Foundation of America ¹⁴ ; Environmental Protection Agency ²⁶ ; literature review ^{6-8,28} ; Respiratory Health Association ¹⁵
Presence of a medical consultant and policies	Is there a medical or nursing consultant available to help child-care staff write policy and guidelines for managing medications in the child-care setting, reducing allergens and irritants, promoting safe physical activities, and planning field trips for students with asthma?	American Academy of Pediatrics ¹⁷ ; verbatim from NAEPP recommendations ¹³
Access to medication	Are child-care staff prepared to give medication as prescribed by each child's physician and authorized by each child's parent? May school-aged children carry their own asthma medicines when appropriate? ^a Is there someone available to supervise children while taking asthma medicines and monitor correct inhaler use?	American Academy of Pediatrics ¹⁷ ; Asthma and Allergy Foundation of America ¹⁴ ; California Health and Safety Code ²⁹ ; NAEPP Expert Panel Report ³
Presence of asthma action plans	Is there a written, asthma action plan for each child in case of a severe asthma episode (attack)? Does the plan make clear what action to take? Who to call? When to call?	American Academy of Pediatrics ¹⁷ ; NAEPP Expert Panel Report ³
Staff training	Does a nurse, respiratory therapist, or other knowledgeable person teach child-care staff about asthma, asthma management plans, reducing allergens and irritants, and asthma medicines? Does someone teach all the older children about asthma and how to help a classmate who has it?	American Academy of Pediatrics ¹⁷ ; Asthma and Allergy Foundation of America ¹⁴ ; verbatim from NAEPP recommendations ¹³
Encouragement of physical activity	Does the child-care provider help children with asthma participate safely in physical activities? For example, are children encouraged to be active? Can children take or be given their medicine before exercise? Are modified or alternative activities available when medically necessary?	Asthma and Allergy Foundation of America ¹⁴ ; verbatim from NAEPP recommendations ¹³

For the interview, the manager (e.g., the person present at the center who is primarily responsible for the daily decisions at the center) was invited to participate. The child-care manager was interviewed rather than a staff member responsible for direct child care because the majority of the interview questions related to center-level policies or practices with which the manager would be most familiar. The majority (75%) of managers interviewed reported direct involvement in child care for some portion of the workday. A minority (25%) reported performing exclusively administrative duties. All interviews were conducted in English.

The environmental assessment was conducted by an investigator in one classroom and other areas where children spent significant time, such as play areas. If there was more than one eligible classroom, then the manager was asked to select a classroom for the assessment. The majority of centers had only one eligible classroom. The file and medication review was completed by a trained SFDPH nurse, who reviewed all files at the center to identify children with asthma based on physician report. For each child with asthma, the nurse looked for an up-to-date asthma action plan, asthma medications, a spacer and mask or nebulizer,

TABLE 3. PREPARING FOR ASTHMA IN CHILD CARE INSTRUMENT QUESTIONS: POSSIBLE RESPONSES AND POINT VALUES

Type	Question	Possible responses	Value
<i>Domain: smoking exposure^a</i>			
A	Do you (investigator) smell smoke at any time during your visit to the center?	No Yes	30 0
I	How many times per month do you smell smoke at your center?	< 1 ×/month ≥ 1 ×/month	30 0
Adherence: 100%		Points possible: 60	
<i>Domain: management of ventilation and allergens^b</i>			
A	Does the classroom smell fresh (e.g., no strong scents or stuffy air)?	Yes No	10 0
A	Does the classroom have overhead ventilation and/or operable windows?	Yes No	10 0
A	How many times in the last 2 weeks has the center felt stuffy, smelly, or poorly ventilated?	0 times >0 times	10 0
A	Have you noticed cockroaches at your center within the last year?	No Yes	6 0
A	What is the primary floor type in the center?	Noncarpet (wood, tiles, or linoleum) Carpet	1 0
A	Are curtains or drapes present in child-care areas?	No Yes	1 0
A	Besides window coverings, are fabric wall hangings or other “dust catchers” present in child-care areas?	No Yes	1 0
A	Are nonwashable stuffed animals present in child-care areas?	No Yes	1 0
A	Are there any upholstered furnishings in the room?	No Yes	1 0
A	Are piles of paper and/or other clutter present on the floor in the classroom?	No Yes	1 0
A	Is water damage visible on the floors, walls, or ceilings?	No Yes	2 0
A	Are there potted plants present?	No Yes	2 0
I	Have you noticed mold at your center within the last year?	No Yes	2 0
A	Are there any furry pets present? (e.g., cats, dogs, gerbils, birds, hamsters, etc.)?	No Yes	3 0
I	Have you noticed furry pets such as cats, dogs, gerbils, or birds at your center within the last year?	No Yes	3 0
A	Do you (investigator) smell air freshener or other fragrance in the classroom, kitchen, closets, or bathrooms?	No Yes	2 0
I	Within the last year, have you noticed strong odors/fumes from arts and crafts supplies, pesticides, paint, perfumes, air fresheners, and cleaning chemicals or disinfectants at your center?	No to all Yes to any	2 0
I	Do you use pesticide sprays or bombs to help manage pests at the center? <i>If yes: When are pesticides usually applied?</i>	No Yes AND before school, after school, or on weekends Yes AND during school	2 0
Adherence: 66%		Points possible: 60	
<i>Domain: presence of a medical consultant and policies^c</i>			
I	Is there a medical or nursing consultant available to help with asthma-related issues?	Yes No OR Unsure	32 0
I	Does your site have policies and guidelines for managing asthma medications at the site?	Yes No OR Unsure	7 0
I	Does your site have policies and guidelines for reducing asthma allergens and irritants at the childcare center?	Yes No OR Unsure	7 0
I	Does your site have policies and guidelines for promoting safe physical activities for children with asthma?	Yes No OR Unsure	7 0
I	Does your site have policies and guidelines for planning field trips for children with asthma?	Yes No	7 0

(continued)

TABLE 3. (CONTINUED)

Type	Question	Possible responses	Value
Adherence: 66%		Points possible: 60	
<i>Domain: access to medication</i>			
I	How prepared are you to personally administer asthma medication to children if necessary? Please answer on a scale of 1 to 5, where 1 = “not at all prepared” and 5 = “extremely prepared.”	5 1, 2, 3, OR 4	5 0
I	How prepared are staff to administer asthma medications to children if necessary? Please answer on a scale of 1 to 5, where 1 = “not at all prepared” and 5 = “extremely prepared.”	5 1, 2, 3, OR 4	5 0
I	Does your center require parents of children with asthma to talk to staff about their child’s medication?	Yes No OR Unsure	5 0
FMR	Do all children with asthma have a nebulizer consent form or other form authorizing child-care providers to give asthma medications at the site?	Yes No	5 0
FMR	Do all children with asthma have unexpired albuterol or other quick-relief medication at the site?	Yes No	20 0
FMR	Do all children with asthma have a spacer and mask at the site? ^d	Yes No	10 0
FMR	Is there an administration log where staff record medications given to children with asthma?	Yes No	10 0
Adherence: 66%		Points possible: 60	
<i>Domain: presence of asthma action plans</i>			
A	Do you require an asthma action plan to be on file for each child with asthma? <i>If yes:</i> How often does your center require that the asthma action plans are updated?	Yes AND At least annually Yes AND If plan changes No Unsure Yes AND Less than annually OR Unsure	30 0
FMR	Do all children with asthma have an updated (within 1 year) asthma action plan on site?	Yes No	30 0
Adherence: 100%		Points possible: 60	
<i>Domain: staff training</i>			
I	Do you or your staff receive any training about asthma?	Yes No	12 0
I	<i>If yes:</i> Is this for manager, staff, or both?	Both Manager Staff N/A	12 0
I	<i>If yes:</i> How long ago was the most recent training?	≤ 12 months > 12 months	12 0
I	<i>If yes:</i> Are the following topics covered: asthma basics (causes of asthma, signs of asthma flare-ups)?	Yes No OR Unsure	6 0
I	<i>If yes:</i> Are the following topics covered: asthma management plans?	Yes No OR Unsure	6 0
I	<i>If yes:</i> Are the following topics covered: reducing allergens and irritants?	Yes No OR Unsure	6 0
I	<i>If yes:</i> Are the following topics covered: asthma medications? For example, using them and different types of medications.	Yes No OR Unsure	6 0
Adherence: 66%		Points possible: 60	
<i>Recommendation: encouragement of physical activity</i>			
I	How much do you agree with the following statement: at this site, children with asthma are able to participate in physical activities the same way as children without asthma? This is on a 1 to 5 scale, where 1 = “strongly disagree” and 5 = “strongly agree.”	5 1, 2, 3, OR 4	30 0
I	Are children with asthma encouraged to participate in physical activities?	Yes No OR Unsure	30 0
Adherence: 100%		Points possible: 60	

^aThere is no safe level of tobacco smoke exposure for children.³⁰ The monthly cutoff was selected to distinguish between centers where smoke exposure as a rare versus regular occurrence.

^bInvestigator observation of mold was not included in the final score because mold was not observed during visits.

^cTo be adherent, a manager must report having at least two out of four of the NAEPP-recommended asthma policies in writing at the center.

^dUse of a spacer is recommended for all children, and facemasks are recommended for children younger than 4 years of age.³

I, item assessed through in-person interview with childcare center manager; A, item assessed through environmental assessment; FMR, item assessed through file and medication review.

paperwork allowing child-care providers to administer inhaled medications,¹⁶ and a medication administration log.¹⁷ Site-level data were used for analysis.

Results

Preliminary pilot testing and revision

The observation and interview items were first piloted at five child-care centers not served by the SFDPH, including three Head Start sites serving a low-income population similar to the target population. Minor changes to wording and formatting were made based on these results. Experts in survey development and community-based participatory research reviewed the instrument.

Secondary pilot testing and revision

Forty centers were eligible for the second round of pilot testing. A full assessment was completed at 36 centers. Initially, 119 data points were collected. Items with the best face validity and variability between centers were used to create the final 43-item instrument through consensus with the research team. On average, completion of the interview and environmental observation required 26 min and 30 min, respectively. Completion of the file and medication review required <1 h per center. Full results were presented elsewhere.²¹

Discussion

The PACC Instrument is a comprehensive and evidence-based tool to address asthma preparedness at child-care centers based on national asthma recommendations specific to child care. The instrument was developed for use by a health worker or nurse and identifies specific domains in need of improvement. Although based on pilot data from a small sample of child-care centers, this tool is an improvement over the most commonly cited asthma preparedness checklists, which offer a list of allergen-related items with some general preparedness items¹⁴ or focus solely on allergens.¹⁵ Moreover, because child-care providers and community partners provided input throughout the development process, the instrument is relevant for individuals who will benefit from its use.

While specific to child care, the NAEPP's own recommendations¹³ for asthma in child-care settings offer general advice rather than specific items for quantifying and comparing performance. For example, the statement that the center should be "free of tobacco smoke at all times" could be interpreted differently by different users. Does this statement include secondhand smoke? If the manager has ever smelled smoke at the center during his or her career, would the center be considered nonadherent? Such questions make interpreting the NAEPP recommendations difficult. The PACC Instrument minimizes these potential ambiguities.

This instrument has several limitations. First, in condensing the instrument from 119 to 43 items, formal analyses were not performed but rather expert consensus was relied on to select items with the greatest face validity and variability between centers. Additionally, formal reliability or validity testing was not conducted. A sample size of 36 is small. However, it was selected for feasibility and to meet the needs of the SFDPH. In terms of feasibility, not all child-care centers have access to public health nurses who can review files and medication. However, it was felt that with support

from a public health department or other health worker, this instrument could be implemented in a practical fashion.

Future work will focus on pilot testing the instrument in its condensed form and conducting formal reliability and validity testing with a larger sample size. Posting the instrument on the SFDPH Web site and circulating it to other public health departments and child-care organizations could increase its uptake. Additionally, converting the instrument to a self-assessment tool for use by child-care providers should be explored. An instructional video may be necessary if this approach is taken. Other successful interventions designed for child care²² offer comprehensive web-based training to support providers with implementation.

Asthma is a significant problem for young children and their caretakers. With more children spending increasing time in child-care settings, a method to assess a center's ability to care for children with asthma is crucial for public health practitioners, child-care administrators, and parents. To the authors' knowledge, there have been only a small number of rigorous interventions targeting child-care providers and the child-care environment for asthma preparedness and management.^{23–25} The PACC Instrument could help facilitate additional research on this important topic.

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Author Disclosure Statement

No competing financial interests exist.

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