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Care transition interventions for children with asthma in the emergency department

Molly A Martin, MD, MAPP,
University of Illinois at Chicago; Chicago, IL

Valerie G Press, MD, MPH,
University of Chicago; Chicago, IL

Sharmilee M Nyenhuis, MD,
University of Illinois at Chicago; Chicago, IL

Jerry A Krishnan, MD, PhD,
University of Illinois at Chicago; Chicago, IL

Kim Erwin, MDes,
Illinois Institute of Technology Institute of Design; Chicago, IL

Giselle Mosnaim, MD,
Rush University Health Center; Chicago, IL

Helen Margellos-Anast, MPH,
Sinai Health System; Chicago, IL

S Margaret Paik, MD,
University of Chicago; Chicago, IL

Stacy Ignoffo, MSW, and
Chicago Asthma Consortium; Chicago, IL

Michael McDermott, MD
Illinois Emergency Department Asthma Surveillance Project

For the CHICAGO Plan Consortium

Abstract

The Emergency Department (ED) is a critical point of identification and treatment for some of the most high risk children with asthma. This review summarizes the evidence regarding care transition interventions originating in the ED for children with uncontrolled asthma, with a focus on care coordination and self-management education. While many interventions on care transition for pediatric asthma have been tested, only a few were actually conducted in the ED setting. Most of these targeted both care coordination and self-management education but ultimately did not improve attendance at follow up appointments with primary care providers, improve asthma control, or reduce healthcare utilization. Conducting any ED-based intervention in the current

Corresponding Author: Molly A Martin, MD, MAPP, University of Illinois at Chicago, Department of Pediatrics, 840 South Wood Street, M/C 856, Chicago, IL 60612, mollyma@uic.edu, Landline: 312-996-2363.

environment is challenging due to the many demands on ED providers and staff, poor communication within and outside of the medical sector, and caregiver/patient burden. The evidence to date suggests ED care transition interventions should consider expanding beyond the ED to bridge the multiple sectors children with asthma navigate, including health care settings, homes, schools, and community spaces. Patient-centered approaches may also be important to ensure adequate intervention design, enrollment, retention, and evaluation of outcomes important to children and their families.

Keywords

Asthma; Patient-centered; Pediatric; Emergency department; Care transitions; Disparities; Care coordination; Education

Introduction

Asthma is one of the most common chronic diseases among children in the United States (US), affecting over 7 million children and costing more than 50 billion in direct health care costs annually.[1–3] Not all children with asthma are affected equally. The health burden from asthma is disproportionately high among non-Hispanic black and Puerto Rican children, which have substantially higher prevalence of asthma (13.4% and 23.5%, respectively, versus 7.6% for non-Hispanic white).[3] The risk of hospitalizations is also higher for non-Hispanic black (12.9%) versus non-Hispanic white (3.4%) children.[4] These disparities exist despite decades of research to develop and implement strategies that target health disparities in asthma.[5–7]

The emergency department (ED) is where many patients with asthma seek and receive care.[8] Respiratory disorders are the most common reason for ED visits in children after injuries and poisonings.[9] In 2010, children with asthma in the US experienced over 900,000 asthma-related ED visits.[9] Asthma disparities are obvious in the ED;[10–12] non-Hispanic black children have been shown to have an ED visit rate more than four times higher than the rate for non-Hispanic white children.[13] Medicaid recipients also have a greater number of asthma-related ED visits when compared to non-Medicaid insured recipients.[10,14] Because the majority of patients receiving ED care experience symptoms of uncontrolled asthma in the weeks and months prior to their ED visit, ED utilization rates for asthma can be attributed to patient-level issues such as under-recognition of symptoms or challenges implementing treatment plans.[15] On a system level, these rates serve as a barometer for inaccessible, and perhaps lower quality, ambulatory care options for asthma care.

Caring for asthma in EDs is costly both for families and the healthcare system.[16] Some children that present to the ED for asthma care have severe asthma that is difficult to control under the best of circumstances, while other children have uncontrolled asthma due to improper management at home or in the ambulatory setting.[8,10] In all situations, families require education and support while in the ED to safely and effectively transition their care to the ambulatory setting and home.[14] With the shift from volume to value-based payment models for healthcare in the US, there is increasing interest among health systems to identify and adopt strategies that improve the quality and outcomes of care transitions following ED

discharge for asthma. The objective of this review was therefore to summarize the evidence regarding care transition interventions originating in the ED for children with uncontrolled asthma.

Care Transitions from the ED to Home and Ambulatory Settings

Care transitions are defined as the movement of patients between health care practitioners, settings, and home as their need for healthcare evolves over time.[17] The primary barriers to effective care transitions are inadequate communication, patient education, and accountability.[17–19] ED providers frequently do not have access to ambulatory health records and cannot effectively coordinate management or arrange follow-up care. Patients and their caregivers often receive incomplete, confusing or conflicting recommendations regarding care plans during health care transitions. This becomes even more challenging when patients lack a sufficient understanding of the disease or how to care for it. Accountability for the disease management falls either on the ambulatory provider or the patient/caregiver, both of whom often have incomplete information, limited resources to coordinate care, and may not communicate effectively with each other.

While chronic diseases like asthma are influenced by many factors within the health care system and the communities where patients live,[20] approaches to care transitions from the ED can be grouped into two domains: care coordination and self-management education. Care coordination is defined as “the deliberate organization of patient care activities between two or more participants (including the patient) to facilitate the appropriate delivery of health care services.[21] Care coordination can be achieved through a range of modalities including designated care coordination staff, written materials, emails, phone calls, text messages, and open access scheduling. The goal is to address access and resource gaps through communication processes. Self-management education targets the skills that patients and caregivers require to monitor, treat and control asthma.[22] This education can happen in many different environments and can be delivered using a variety of modalities.

Care Transition Interventions in the ED for Pediatric Asthma

Care coordination is usually not a typical part of ED services, yet many patients in the ED are there primarily because of failures in coordinating quality care in the ambulatory setting.[8,10] Incomplete access to patients’ full health information in the ED coupled with limited skills training and general capacity for care coordination has motivated the development of interventions to transition patients out of the ED and link them back into primary care. In 2012, Katz et al. published a review of care coordination interventions in the ED.[23] Of the 14 randomized controlled trials identified, four targeted pediatric asthma interventions that were delivered in the ED.[24–27] (Table 1) Another review of ED-based care transition interventions for pediatric patients published by Abraham et al.[28] in 2016 identified nine care coordination interventions for children with asthma, but only five of these were actually conducted in the ED.[24,26–27,29–30]

Three of the six interventions identified in these reviews demonstrated improvements in follow-up with primary care providers, mainly using strategies that focused on patient

reminders and appointment scheduling.[24–25,30] One study achieved improvements in care coordination by providing families with allergen skin testing in the ED as a way to generate tailored asthma management plans and encourage families to seek follow-up care.[30] Care coordination can also be achieved through decision support tools. A randomized controlled trial in Canada provides an example of a provider-level intervention that achieved improvements in care coordination by aiming to reduce practice variation.[31] The study tested the effects of a structured paper template to promote guideline-consistent ED discharge practices versus usual care. The treating ED physicians completed the paper template at ED discharge and made all decisions about the dosage and duration of medications prescribed, verbal instructions, and recommendations for medical follow-up. Results indicated that the intervention significantly increased ED physician adherence to guideline recommendations for arranging follow-up visits with medical providers and that caregivers were also more likely to attend a follow-up visit with a medical provider.[31]

Self-management education for asthma has been shown to improve patient outcomes and be a cost-effective component of asthma care in a variety of settings.[22,32–33] However studies of asthma self-management education interventions in the ED are limited. In an Agency for Healthcare Research and Quality (AHRQ) review of self-management interventions for pediatric asthma through 2006, none of the 75 interventions identified in the review that directly targeted self-management and patient education were conducted in the ED.[34] A Cochrane review of educational interventions for pediatric asthma in the ED included 38 studies but only four of these interventions actually occurred in the ED.[26,29,35–37] (Table 1) While the Cochrane review reported that educational intervention was strongly associated with a reduced risk for subsequent ED visits,[35] only one of the four studies that delivered the educational intervention in the ED setting reported some improvements in healthcare utilization.[37]

Several of these studies incorporated both self-management education and care coordination into their interventions. One example, Emergency Department Allies, combined education with care coordination in two academic EDs. The study utilized a randomized 3-arm clinical trial design.[26] Usual care consisted of an educational video, peak flow and inhaler instruction, instructions on how to make a follow-up appointment and a written asthma action plan. Group 2 received usual care plus enhanced care coordination that included specific outreach and communication to the primary care provider. Group 3 received all that Group 2 did, plus six home visits from a case manager that performed asthma and environmental needs assessments, education, personalized care plans, and social service referrals. Neither intervention arm was associated with decreases in the frequency of subsequent ED visits or improvements in asthma quality of life or controller medication use. The reasons for the lack of effect of either intervention were unclear although the usual care condition was more robust than what is often seen in busy EDs. Also, the training of the case managers and their oversight for quality and consistency was not described; perhaps it was not as strong or specific as needed to improve the outcomes.

Zorc et al. also tested a combined care coordination and education intervention for children with asthma.[27] The control group received standard discharge instructions to follow-up in 3–5 days with their primary care provider (PCP). Intervention group participants received an

educational video in the ED and if they screened positive for persistent asthma, they also received a letter to bring to their PCP stating their screening result. After discharge, they were sent a postcard reminding them to follow-up with their PCP. PCP follow-up rates at 4 weeks were similar between groups. Secondary outcomes of symptoms, asthma quality of life, and subsequent ED visits were also similar between study groups. While this intervention demonstrated adequate feasibility, perhaps a one-time general-audience video was not robust enough to change behavior. Other educational video interventions that tailored their videos demonstrated slightly better outcomes.[37]

A Patient-Centered Approach to ED Pediatric Asthma Interventions

The Coordinated Healthcare Interventions for Childhood Asthma Gaps in Outcomes (CHICAGO) Plan is a multi-centered randomized controlled trial funded by the Patient-Centered Outcomes Research Institute (PCORI) to test evidence-based strategies to improve the care and outcomes of African-American and Latino children with uncontrolled asthma presenting to EDs in Chicago.[38] The CHICAGO Plan builds on the strengths and lessons learned from these previous studies, and also incorporates a new element—patient-centeredness. The Institute of Medicine defines patient-centered care as: “Providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions.”[18] To ensure the study is patient-centered, the CHICAGO Plan is guided by a team of stakeholders and a community advisory board. Formative work conducted in preparation for the trial defined the outcomes and interventions, while ongoing input from stakeholders supports study implementation and results interpretation. CHICAGO Plan recruits children ages 5–11 years old presenting to an ED with uncontrolled asthma. Children are randomized to receive a patient-centered ED discharge tool, a patient-centered ED discharge tool plus community-health worker (CHW) home visitation, or usual care. CHWs are defined as frontline public health workers who are trusted members of and/or have an unusually close understanding of the community served.[39]

Care coordination is achieved in two ways in the CHICAGO Plan. The first is through the CHICAGO Action Plan after Emergency department discharge (CAPE), adapted from Ducharme et al.[31] The CAPE is a personalized paper asthma management plan. The CAPE was designed using a process of contextual inquiry that engaged ED providers and administrators, ambulatory care providers, caregivers of children with asthma, and CHWs.[40] This formative work also concluded that the completion of the CAPE by existing ED staff and providers would not be feasible. The CAPE is therefore generated by ED coordinators hired specifically by the trial to serve as discharge coordinators, in consultation with both the ED providers and the patients’ caregivers. Care coordination is also achieved through the integration of CHWs in one arm of the study. CHWs work with participants to develop tailored strategies for more effective navigation of the health care system.

The CHICAGO Plan delivers self-management education in three ways. First, all study participants receive ED inhaler education using Teach-To-Goal.[41–42] Second, the CAPE provides families with information on their specific medications, triggers, and follow-up care in a format they can refer back to when they leave the ED. The written information in

the CAPE is also orally presented to the patient by the ED coordinator, along with inhaler technique education. This process allows for discussion and questions regarding the content and accommodates multiple learning styles. Third, in the home, CHWs support families to learn asthma symptoms, how medications work, when medications should be used, proper inhaler technique, and how to reduce triggers.

Another domain targeted by the CHICAGO Plan in the CHW arm is home environmental remediation. Home-based environmental trigger interventions have been shown to reduce indoor allergens, asthma symptoms and improve quality of life,[43–45] but home environmental remediation is typically not a primary focus in the ED. To test the potential importance of triggers in the home, the CHW home visitation arm of the CHICAGO Plan takes a proactive approach toward identification of environmental issues and remediation. The environmental triggers targeted in the CHICAGO Plan included cockroach and mouse allergen as children with asthma are commonly sensitized to these allergens and high levels of exposure are found in inner city homes.[46–51] In the CHICAGO Plan, CHWs teach and support families to implement integrated pest management and green cleaning strategies to reduce environmental trigger exposures in the home. CHWs also work with the city housing authority and an independent non-profit housing advocacy organization to assist families in obtaining structural repairs or to change housing when repairs are not adequate.

The CHICAGO Plan is ongoing and is expected to report results in the winter of 2017. Outcomes include measures of asthma control, caregiver quality of life, and several process measures (e.g., prescription of guideline-recommended medications in the ED and arrangement of follow-up appointments prior to ED discharge).

Gaps, Challenges and Opportunities Moving Forward

In studies examining strategies to improve care transitions among children presenting to the ED with asthma exacerbations, the focus to date has been to provide self-management education and care coordination support both during and after the ED visit to improve ambulatory follow-up and asthma control. This should be an effective strategy, as the ED setting represents a point of enhanced receptivity to information and support for behavior change[52] and ED-based care transition interventions that include all pediatric diseases have been shown to improve the probability of follow-up visits with primary care.[28] However when we look at pediatric asthma interventions alone, we see the limited evidence suggests poor effectiveness of asthma-specific care transition interventions for children in the ED.[23,28] These asthma interventions include elements that have been shown to be effective in other settings. What they do not include are robust multi-sector interventions that address the needs of children where they live, play, learn, and receive health care.

Care transitions from the ED to the ambulatory setting and the home rely on effective care coordination but this care coordination cannot occur only in the ED. Ideally, it should link within the medical sector (hospital, ED, ambulatory setting, and pharmacy) as well as connect with the community, home, and family in such a way that the burden of accountability does not fall solely on the patient or caregiver as demonstrated in the Figure. Many care coordination tasks currently exist because the sectors do not have functioning

systems of communication. Electronic health records from hospitals and EDs frequently do not connect with each other and with ambulatory settings. This limits the ability of clinicians to provide optimal health care and also imposes challenges on the scheduling of follow-up outpatient care.[53] Outside of the medical sector, almost no infrastructure exists to support communication of health information between schools, families, and housing agencies.

The ultimate solutions to these problems reside in large-scale system and policy changes which will not happen quickly. Therefore we must define how and by whom care transitions in our current system can be most effectively achieved. As the studies presented demonstrate, care coordination in the ED can be conducted by a variety of staff. Care coordination staff supported by written tools and technology-driven materials hold potential for connecting care plans across sectors. Yet we are far from the implementation of such tools. In the Abraham et al. review of ED-based care coordination interventions, none were integrated into the electronic health record or utilized health information technology.[28] As these technology tools grow in feasibility and implementation, we need to consider the interaction of the human element with written/electronic materials. Are both necessary? Qualitative work and a needs assessment conducted for the CHICAGO Plan suggest that urban, low income, minority populations appreciate written/electronic resources as sources of reference and tools to communicate across sectors, but rely on the human connection for initial delivery of the information, assistance with navigating the healthcare system, and long-term support of asthma management.

Self-management education for the caregiver/patient may be an important component of effective care transitions from the ED but the evidence remain limited. Traditionally self-management education was provided through written materials or delivered by the providers, but newer evidence supports delivery of this education by CHWs and technology platforms for high-risk populations.[54–56] Education can be delivered in any setting and it remains unclear which settings optimize behavior change. The ED presents a unique opportunity to identify patients at high risk for poor asthma outcomes and to use the experience of the ED visit as a teachable moment. Families might be primed for education and behavior change by the ED experience, but the evidence to date also suggest that the opposite might be true. Families might be too overwhelmed by the ED experience to effectively respond to education and support. It also remains unclear how much or how frequent self-management education needs to occur. Likely there is no one-size-fits-all recommendation; some patients will require more time and resources to implement change, while others will require less.

Home environmental remediation remains a difficult to address component of care transitions and recent evidence call into question the overall efficacy of this intervention.[57] Environmental remediation frequently requires actions and partnerships with agencies outside of the healthcare system and one way to achieve that in the current environment is CHWs. CHWs move between the healthcare system and patients' homes and are therefore uniquely positioned to facilitate home remediation efforts. Larger policy efforts may also be needed such as enforcement of existing building codes, smoke-free housing, idling laws and enforcement, industry zoning modifications, and financial assistance for low income landlords and home-owners.[58]

A final area for consideration in the success of ED care transitions is the possible need for patient-centered interventions. In a 2009 review of asthma interventions, Clark et al. reported successful interventions recognized the multifaceted nature of asthma management for patients, assessed needs and risk for each patient, and tailored program elements to those needs and risks.[33] Engaging patients and other stakeholders in the design process is one way to achieve this. Due to strong interest from funders, payers, and the public for patient-centered interventions, evidence regarding the efficacy of patient-centered interventions on clinical outcomes and healthcare utilization has been growing. However, evidence on the role of patient-centered interventions in the ED does not exist and presents an opportunity for future studies.

Conclusions

The ED remains a critical point of identification and treatment for some of the most high risk children with asthma. Providing these children and their families with the education and care coordination services they need to effectively manage their asthma at home with the support of an ambulatory provider is no easy task. Conducting any ED-based intervention in the current environment is challenging due to existing ED staff and provider responsibilities, poor communication within and outside of the medical sector, and caregiver/patient burden. The existing evidence on care transition models from the ED suggests that multi-sector studies for children with uncontrolled asthma can be initiated in the ED but then need to consider all the sectors children with asthma navigate which include not just the hospitals, EDs, and clinics, but also their homes and schools and community spaces. Once we develop care models that connect across all these sectors, we can perhaps finally reduce the burden of asthma borne by our most disadvantaged children and vulnerable sectors of our society.

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Abbreviations

CAPE	CHICAGO Action Plan after Emergency department discharge
CHICAGO	Coordinated Healthcare Interventions for Childhood Asthma Gaps in Outcomes
CHW	Community Health Worker
ED	Emergency Department
PCORI	Patient-Centered Outcomes Research Institute
PCP	Primary Care Provider
US	United States

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What is Still Unknown

- How to effectively transition care of children with asthma from the emergency department to the ambulatory setting.
- The role of patient-centered interventions for asthma care transitions in pediatric asthma.
- How interventions that link the health care system, family, home environment, and community can improve asthma outcomes for children.

Figure.
Sectors of Care for Children with Asthma

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Table 1

Care Transition Intervention Studies in the Emergency Department for Pediatric Asthma

Lead Author	Population	Intervention	Comparison	Outcomes	Time	Setting
Baren 2006 [25]	N=384. Ages 2–54 years old, current asthma exacerbation in the ED, plan to discharge, receiving prednisone, English only.	Group B) Free prednisone, transportation vouchers for PCP, and reminder call. Group C) Same as Group B but with follow-up appointment scheduled.	Three arm RCT. Comparison (Group A) was usual discharge care.	Follow up with PCP. **Results**: Group C more likely to have a follow-up PCP visit (OR, 2.8; 95% CI, 1.5 to 5.1).	30 days. Secondary outcomes at 1 year.	9 EDs chosen for geographic and patient diversity.
Ducharme 2011 [31]	N=219. Ages 1–17 years old, clinical diagnosis of asthma, treated with albuterol in ED, discharged with albuterol and fluticasone, French or English only.	Treating ED physician recorded asthma management instructions using a structured paper template.	Two arm RCT. Comparison was usual discharge care. All participants received albuterol and fluticasone inhalers.	Fluticasone adherence. **Results:** Improved adherence to fluticasone in intervention group. No change in PCP follow up at 28 days. Slight improvement in PCP follow up at 90 days for intervention group. [RR1.37 (1.01, 1.85)]	28 days. Secondary outcomes at 90 days.	Montreal, Canada
Farber 2004 [36]	N=56. Ages 2–18 years old, history of asthma, receiving ED care for acute asthma, Medicaid insurance.	Education consisted of inhaler device instruction and action plans in the ED, followed by 3 phone calls to reinforce asthma management skills.	Two arm RCT. Comparison was brief education routinely used in ED.	Asthma severity and hospital/ED visits. **Results**: No changes.	1 month and 6 months.	New Orleans, LA
Gorelick 2006 [26]	N=352. Ages 2–18 years old, acute asthma, English only.	Group 2: Group 1 plus ED records faxed to PCP, PCP office called, patient called to remind about appointment, appointment scheduled for patient if needed. Group 3: Same as Group 2 with addition of care manager that made up to 6 home visits for education and social service referrals.	Three arm RCT. Usual care (Group 1) included asthma videotape, instruction on peak flow meter and inhaler use, proper medications use, instructions for follow-up with PCP, written asthma care plan.	ED utilization, health-related quality of life, and controller medication use. **Results:** No differences between groups.	6 months.	Milwaukee, WI
Scarfi 2009 [30]	N=77. Ages 2–12 years old, physician diagnosed asthma or at least 2 prior treated wheezing episodes.	Skin testing during ED visit for food and aeroallergens, parents given results and a written report.	Two arm controlled trial. Group determined by day in ED. Comparison was usual care.	Asthma clinic follow up rates. **Results:** Intervention group 2.6 (1.02–6.65) more likely to keep appointment.	1 week.	Urban public hospital
Smith 2006 [29]	N=92. Ages 2–12 years old, Medicaid or no insurance, presenting to ED with asthma exacerbation.	Asthma coach for follow up, monetary incentive. Discharge instructions using “Asthma 1-2-3 Plan”.	Two arm RCT. Comparison group received “Asthma 1-2-3 Plan”.	Asthma planning visit with PCP in 2 weeks. **Results:** No differences between groups.	2001	St. Louis, MO
Sockrider 2006 [37]	N=464 Age of 1 to 18 years, previous physician diagnosis of asthma, English or Spanish,	Tailored computer-based program on asthma self-management delivered by educator in ED, with follow-up telephone call	RCT. Comparison was usual care.	ED utilization. **Results**: Caregivers in intervention group reported more well-asthma visits [OR	9 months.	4 sites in Texas

Lead Author	Population	Intervention	Comparison	Outcomes	Time	Setting
	presentation to a participating ED with asthma symptoms.			1.85, (1.05,3.39)]. No difference in ED visits.		
Zorc 2003 [24]	N=278. Ages 2–18 years old, history of asthma, symptoms requiring ED treatment, plan to discharge.	Study staff attempted to schedule follow up PCP appointment with caregiver in ED or after discharge.	Two arm RCT. Comparison was usual care which included faxing ED records to PCP.	PCP follow up. **Results**: Improved PCP follow up in intervention group [1.4 (1.1,1.7)].	4 weeks.	Philadelphia, PA
Zorc 2009 [27]	N=439. Age 1–18 years old, presented to ED with asthma exacerbation.	Intervention group watched educational video in ED and subgroup who screened positive for persistent asthma received a letter regarding the results to give to their PCP. All mailed reminder to schedule a follow up with PCP.	RCT. Comparison was usual care.	Follow-up rates with a PCP after an ED visit. **Results:** No differences between groups.	4 weeks.	Philadelphia, PA