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Development of an International School Nurse Asthma Care Coordination Model

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Abstract

Aim—To identify and compare how school nurses in Reykjavik, Iceland and St. Paul, Minnesota coordinated care for youth with asthma (ages 10–18) and to develop an asthma school nurse care coordination model.

Background—Little is known about how school nurses coordinate care for youth with asthma in different countries.

Design—A qualitative descriptive study design using focus group data.

Methods—Six focus groups with 32 school nurses were conducted in Reykjavik (n=17) and St. Paul (n=15) using the same protocol between September 2008 – January 2009. Descriptive content analytic and constant comparison strategies were used to categorize and compare how school nurses coordinated care, which resulted in the development of an International School Nurse Asthma Care Coordination Model.

Findings—Participants in both countries spontaneously described a similar asthma care coordination process that involved information gathering, assessing risk for asthma episodes, prioritizing health care needs and anticipating and planning for student needs at the individual and school levels. This process informed how they individualized symptom management, case

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Conflict of interest statement

No conflict of interest has been declared by the authors.

Author Contributions:

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE *):

1. substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content.

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management and/or asthma education. School nurses played a pivotal part in collaborating with families, school and health care professionals to ensure quality care for youth with asthma.

Conclusions—Results indicate a high level of complexity in school nurses' approaches to asthma care coordination that were responsive to the diverse and changing needs of students in school settings. The conceptual model derived provides a framework for investigators to use in examining the asthma care coordination process of school nurses in other geographic locations.

Keywords

adolescent; asthma; care coordination; focus groups; international perspectives; model development; qualitative; school nursing

INTRODUCTION

Asthma rates in children and youth are increasing worldwide (Centers for Disease Control and Prevention [CDC], 2011, Hansen *et al.* 2013, World Allergy Organization [WAO] 2011). CDC data show an increase in pediatric asthma and a continued rise in emergency department visits and hospitalizations in children (2011). The CDC estimates that 9.3% of children in the U.S. have asthma (Bloom *et al.* 2013). Worldwide, the prevalence of allergic disease and asthma in children has been increasing (WAO, 2011). Asthma is the most common non-communicable disease in children, affecting about 14% of children globally (Zar & Ferkol 2014). The ISAAC Study, which examined the prevalence of asthma symptoms globally, found that asthma symptoms have increased substantially over the last 15 years, especially in younger children (Mallol *et al.* 2013, Pearce *et al.* 2007).

Over the last 40 years there has been a sharp increase in the morbidity, mortality and economic burden associated with asthma in children affecting their quality of life and functioning (Braman, 2006, CDC, 2011). Worldwide, children with asthma are more likely to have: (a) their sleep impaired; (b) their activities restricted; (c) a lower health related quality of life; (d) missed on average 1.5 more days of school; (e) their parents miss more days of work (Li *et al.* 2013; Shohat *et al.* 2005; WAO, 2011; Wildhaber *et al.* 2012) and (f) their academic performance affected (Crump *et al.* 2013, Moonie *et al.* 2008). In a study of almost 1000 children from six different countries, almost half reported their asthma affected their ability to engage in physical activity. Ten percent reported they had suffered bullying related to their asthma (Wildhaber *et al.* 2012).

BACKGROUND

In Europe and Australia, a World Health Organization (WHO) initiative has emphasized the concept of the 'health promoting school,' where health promotion includes consideration of the social and physical environment of the school, links with the community and school health services (Stewart-Brown, 2006). Despite this emphasis, there is limited evidence regarding what school nurses are doing to promote health through the management of chronic conditions such as asthma.

Since children with asthma spend a substantial amount of time in school, coordinating their care across settings is important. School nurses are the primary health care professionals in

the educational setting who provide care for students with asthma. School personnel and parents report relying on school nurses for meeting the healthcare needs of their children with asthma (Anderson, 2009, Botcheva *et al.* 2004). The role of the school nurse is critical to the implementation of quality school health services for children with asthma. For many children, contact with a school nurse may be the only consistent access to a healthcare professional.

School-based asthma management interventions show promise for improving asthma control in children (Clark, 2012, Noyes *et al.* 2013). Several studies of school-based asthma management programs have described roles and responsibilities of school nurses including case finding (Borowsky *et al.* 2013, Bruzzese *et al.* 2009, Splett *et al.* 2006, Wheeler *et al.* 2009), provision of direct asthma care (Bruzzese *et al.* 2009, Noyes *et al.* 2013, Splett *et al.* 2006), education of children with asthma, their parents and teachers (Bruzzese *et al.* 2009, Kintner *et al.* 2012, Levy *et al.* 2006, Nabors *et al.* 2012, Splett *et al.* 2006, Taras *et al.* 2004), communication with parents, school personnel and health care providers (Bruzzese *et al.* 2009, Levy *et al.* 2006, Milnes *et al.* 2013, Splett *et al.* 2006, Taras *et al.* 2004, Sigurdardottir *et al.* 2013) and prevention activities related to the school environment (Jones *et al.* 2009, Levy *et al.* 2006, YoussefAgha *et al.* 2012). Although specific roles have been identified, little is known about the care coordination process and strategies that school nurses use to provide quality asthma care in the school system. Research is needed to better understand how school nurses in different types of school systems and health care systems coordinate care for students with asthma.

THE STUDY

Aims

The purpose of this phase of the International School Nurse Asthma Project (I-SNAP) project was to describe the process that school nurses used in coordinating asthma care for youth (ages 10–18) in St. Paul, Minnesota and Reykjavik, Iceland. The aims of this exploratory, descriptive qualitative study were to: (1) identify and compare how school nurses in Reykjavik Iceland and St. Paul, MN coordinated care for youth with asthma (ages 10–18); and (2) to develop a model representing school nurse asthma care coordination.

Design

A qualitative descriptive study design (Neuendorf, 2002) was used to compare and contrast focus group findings from companion studies conducted with licensed school nurses during the same time frame in Reykjavik, Iceland and St. Paul, Minnesota. I-SNAP research team members jointly developed the focus group protocol. Bilingual investigators in Iceland ensured the comparability of meaning between the English and Icelandic versions of the protocol. All team members had expertise in childhood asthma and a common interest in understanding how school nurses in both countries coordinate care for youth with asthma. Each country had a core research team that included two university nursing faculty and one school nurse administrative leader. The lead school nurse administrators in Reykjavik and St. Paul consulted on the design and implementation of this project to ensure the relevance and comparable meaning of the study questions to school nurses in their respective settings.

Participants

A purposive, homogeneous sampling strategy (Patton, 2002) was used to identify school nurses employed in schools serving pre-adolescent and adolescent youth in the Reykjavik, Iceland and St. Paul, Minnesota school systems. The inclusion criteria were licensed school nurses who had experience working with youth with asthma between 10–18 years of age. Only one school nurse per school was allowed to participate. Information about the study was distributed to school nurses by the lead school nurse administrator in each city via fliers and e-mail notifications about the project. Interested participants contacted the site principal investigator who determined the eligibility of each participant and scheduled their focus group session. School nurses in each city represented a broad range of schools serving adolescents.

Data collection

Pilot focus group—An expert panel of school nurses and school nurse administrators, with expertise in working with youth with asthma was convened at the University of Minnesota to evaluate and field test the protocol and provide further training for focus group facilitators to ensure comparable data collection across sites. This pilot group was conducted via videoconferencing so Icelandic and U.S. research team members could concurrently participate in the review of the focus group process and critique of the protocol. At the end of this session, the facilitator debriefed with the school nurse experts on the panel about the relevance of the interview questions and items on the demographic questionnaire. Next, the research team debriefed about the focus group process and clarified items on the interview guide as needed. Data from the pilot focus group were not included in this study.

Focus groups—Three audiotaped focus groups with school nurses were held in school settings in Reykjavik and three in St. Paul. Once informed consent was obtained, each participant completed a brief background survey and then participated in a focus group discussion with other school nurses in their city. Each focus group of 5–6 participants was co-facilitated by two members of the research team using the same semi-structured interview guide. The interview guide included guidelines for the facilitator and a list of nine core interview questions with suggested probe questions to use as needed. Focus group sessions lasted between 60–90 minutes. Data were collected between September 2008 – January 2009. At the conclusion of each focus group session, the two facilitators debriefed about the session process and outcomes.

Focus group interview sessions were audiotaped and later transcribed verbatim. One investigator, who is fluent in both Icelandic and English, translated all of the Icelandic transcripts into English. The accuracy of the translation was checked by a bilingual co-facilitator.

This paper focuses on the analysis of school nurses' responses to focus group interview questions about their role responsibilities in working with youth with asthma in schools and their descriptions of how they coordinated asthma care in their school settings with youth, their parents, school staff and health care providers. The following four core interview questions elicited rich data about asthma care coordination roles and responsibilities that, in

turn, informed the development of the International School Nurse Asthma Care Coordination Model:

- What are your role responsibilities in working with children with asthma in your school?
- How do you coordinate care with parents of children with asthma?
- How do you coordinate care with the child's health care providers?
- How do you engage school personnel in preventing asthma episodes?

Ethical considerations

This study was approved by the Institutional Review Boards at the University of Iceland and the University of Minnesota. Administrators in the Reykjavik and St. Paul school systems reviewed and accepted their respective University ethics committee approvals.

Data analysis

Descriptive content analytic techniques (Neuendorf, 2002) were used to categorize and compare asthma care coordination roles and responsibilities described by school nurses during focus group discussions in Reykjavik and St. Paul, MN. Table 1 illustrates this coding process and the sequential steps in the inductive content analysis process (Elo & Kyngas 2007) that led to the development of a conceptual model reflecting how school nurses 'masterminded care' to 'individualize interventions' for youth with asthma. Research team members from both countries were regularly engaged in interpreting the data and verifying findings at each step of the analytic process.

Rigour

A variety of strategies were used to establish trustworthiness based on criteria developed by Lincoln & Guba (1985). Dependability was established by verifying the accuracy and meaning of the Icelandic to English translations of the protocol and checking the accuracy of the transcriptions against the audiotapes. Strategies to ensure confirmability and consistency in the implementation and analysis across sites included concurrent training, maintaining an audit trail and active involvement and regular communication among research team members in Iceland and the U.S. throughout the study. Credibility of the findings was established through prolonged engagement with school nurse administrators and focus group facilitators from both sites who reviewed the protocols and verified interpretations of the data. Also, member checking was done with participants who were invited to presentations where they reviewed the findings and confirmed the relevance of the care coordination model to their practice. Rich focus group interviews provided thick descriptions of how school nurses coordinated care for youth asthma, which supported the applicability and transferability of findings.

FINDINGS

Characteristics of the Sample

A total of 32 school nurses participated in the study (n=17 in Reykjavik and n=15 in St. Paul). All study participants held at minimum a baccalaureate degree. The mean number of students served by school nurses in Reykjavik was 559 and the mean in St. Paul was 883. The majority of school nurses in both cities were responsible for students in one school (12 nurses in Reykjavik and 11 nurses in St. Paul). The rest of the nurses in each location were responsible for more than one school. All school nurses were female, except for one male participant in St. Paul. The age range of school nurses in Reykjavik was 27–47 (mean =38.2 years) and 32–66 years (mean =53.7 years) in St. Paul (Table 2).

School Nurse Asthma Care Coordination Process

Participants in both countries spontaneously described similar components of the asthma care coordination process that they used in working with individual students and at the school level: Information gathering; Assessing risk for asthma episodes; Prioritizing health care needs; and Anticipating and planning for student needs. All of these components were evident in each of the focus group discussions, although at times school nurses from Reykjavik and St. Paul emphasized needing to focus their time on different aspects of these components depending on student needs.

The essence of this school nurse care coordination process involved *masterminding care*. Masterminding care refers to the integrated way school nurses creatively managed the complex process of anticipating and responding to student needs and situations. School nurses described concurrently identifying and prioritizing individual student and school population level needs while preparing for potential crises. The integrated care coordination process used by the school nurses informed how they individualized interventions through core asthma coordination activities related to: Symptom management; Case management; and Asthma education for youth with asthma in their caseloads in both countries.

The findings will be reported according to the elements of the International School Nurse Asthma Care Coordination Model (Figure 1) with representative exemplars from the focus group transcripts provided to illustrate the concepts. Note: ‘Reyk’ refers to Reykjavik and ‘St. P’ to St. Paul focus quotes.

Core Elements of the Asthma Care Coordination Process (Masterminding Care)

Information Gathering—During focus group discussions, nurses in both countries illustrated how they coordinated asthma care for youth in school settings. This process initially involved gathering key information by screening the school population for asthma cases as well as assessing the health status of individual students with asthma diagnoses to determine care coordination needs:

The first step in the coordination of care ...I would say is the identification of the asthmatic student....Do they take medications? Have they been diagnosed with asthma? (St. P)

I find it my role to checkis the asthma being treated? And how does the child feel? Take the status. (Reyk)

Case finding-- I'm always aware of students that I don't know about that suddenly present with a cough...and I start thinking...Is this a kid that I don't know about yet? And then start working from that angle. (St. P)

Assessing risk for asthma episodes—School nurses described assessing risk for asthma episodes in the school environment as well as for individual students. Nurses in both Reykjavik and St. Paul recognized that some students were more at risk than others. Assessments of higher levels of risk were used to identify which students with asthma needed follow up and further intervention:

Our training has really encouraged us to look at the kids with things beyond mild intermittent. (St. P)

If there is someone with severe asthma, then you do something about it.... There is so much you have to evaluate at the school. (Reyk)

School nurses were also involved in assessing the school environment for asthma triggers and informing school personnel how to reduce asthma triggers:

We may have to make the environment in the school more suitable for the children. We may have to think about not having carpets on the floors if this is an allergy or asthma I think that is our role. (Reyk)

Prioritizing health care needs—School nurses in both countries indicated that they were responsible for promoting the health of the student populations they served as well as dealing with acute and chronic illnesses, such as asthma. Prioritizing the chronic care needs of youth with asthma amidst other health care needs of the student population was identified as a critical component of the care coordination process. The number of children in a school with poorly controlled asthma, the size of the school population and the number of schools the school nurse was responsible for were factors identified by participants that influenced how individual school nurses set school level priorities.

St. Paul school nurses described having so many students with asthma that they needed to prioritize which students with asthma to focus on. For example:

We have a gigantic list of all the kids that we know about that have asthma. And at the beginning of the year try to prioritize which of those we're going to try to touch base with and try to call those down [to the office] and see how they're doing. (St. P)

I've got probably 420 in my program and probably 220 have had asthma. And maybe they will always have asthma. But is it going to interfere with their schooling? No. On another 40 it does. But that's 40. It's better than trying to figure out 220. (St P)

In contrast, Reykjavik school nurses often prioritized students with other chronic illnesses, such as Type I diabetes, as needing more care coordination at school than students with asthma that was typically well controlled:

I don't have a written action plan, not like you do with the diabetes children, because they have not been out of breath, the asthma has not been severe. (Reyk)

Anticipating and planning for student needs—School nurses in both countries emphasized the importance of anticipating what students' asthma needs would be and preparing for potential circumstances (e.g., informing school staff about students at risk and what to do in case of an asthma episode). The process of anticipating student needs was used to individualize plans of care for youth with asthma in collaboration with their health care providers. The asthma action plans were used, in turn, to inform school health and school personnel how to manage asthma symptoms and episodes in the school setting and when and who to call in case of emergency. Nurses from both Reykjavik and St. Paul developed and used individualized plans of care for students with asthma episodes or poorly controlled asthma:

Of course if the asthma is severe ...[or the student] gets a severe asthma attack and maybe ends up in a hospital, it is our [responsibility] to plan an action plan for the staff. (Reyk)

It's making sure that we're following through on the asthma action plan if they have an acute exacerbation. (St. P)

Core Asthma Care Coordination Activities (Individualizing Interventions)

Symptom management—During focus group discussions, school nurses in Reykjavik typically reported that asthma was well-controlled and that relatively few students in their respective schools required direct school nurse intervention for asthma symptoms. Participants in Reykjavik focused on what they would do in case of an acute attack or episode and how they would reduce asthma triggers to prevent asthma flare-ups:

You would of course find out what is the asthma trigger with this child and go into this... Is it fragrance? ... (Reyk)

Call for help of course, 112 [=911] if this is severe you see. You would take that responsibility, to make sure they would call for help, be with the child meanwhile. (Reyk)

In contrast, school nurses in St. Paul typically described working with more symptomatic students in their caseload and encountered more emergent asthma episodes that required intervention in their assigned schools than school nurses in Reykjavik. When working with a symptomatic student, school nurses in St. Paul indicated that they referred to the student's asthma action plan for management guidelines and administered medications and treatments accordingly. School nurses also described making frequent reassessments of youth with acute episodes and weighing the risks of whether or not to allow the student to remain in school:

When we're there we can check them hourly. We can check and we can give them medications and check them in a half an hour to an hour....We listen to their lungs and we can see...are they improving enough to the point where they can function in class but aren't exactly in their red zone? Are they on the border? Are they going to go bad? (St. P)

Case management—School nurses' case management role responsibilities involved working with individual students with asthma as well as their family caregivers, school staff and health care providers. Participants in both countries focused their case management activities on newly diagnosed and symptomatic youth with asthma. Effective coordination, communication and collaboration were key interrelated aspects of case management emphasized by participants in both countries.

Coordination: In addition to coordinating care with individual students with asthma, school nurses also alerted school personnel about students at risk for asthma episodes and taught them how to prevent and manage asthma episodes in school and during sports activities and on field trips. School nurses who staffed more than one school emphasized the importance of informing designated school staff about how to recognize asthma symptoms and what to do in case of an emergency:

With the coordination there are of course school meetings, physicians, school psychologists or someone who is working in the school and with parents. There are meetings where they try to coordinate... how is it with giving medication, what is the role of the school nurse.... You call, you try to get e-mail with physicians and nurses and you try to establish contacts, organize meetings and get education. (Reyk)

Communication: Effectively communicating and working in partnership with parents, staff and providers was emphasized by both Reykjavik and St. Paul nurses. School nurses indicated that they used a variety of strategies for communicating and coordinating asthma care with parents and health care providers, including in-person meetings, telephone, written notes, e-mail and faxes.

School nurses' communications regarding a student's asthma care were primarily with parents, unless the student needed more intensive asthma management or needed a referral. Communication with parents focused on seeking information about the child's symptoms and asthma management, keeping parents informed about the child's condition as needed and coordinating care with parents.

School nurses in both countries used a variety of types of oral and written communication tools to inform school staff about youth at risk for asthma episodes and how to prevent and manage asthma episodes. Examples included:

Communicating to the staff about the care of a student with asthma and communicating to those staff who would be most likely to [observe] these symptoms via a confidential list. (St. P)

I made this folder that I distributed all over the school, the gym and the office: there are these children with chronic illness, what to do step by step. (Reyk)

Collaboration: Participants emphasized their roles in collaborating and coordinating asthma care with parents and health care providers when a symptomatic student needed further evaluation and/or treatment. For example, both Reykjavik and St. Paul school nurses made referrals as needed to primary care providers for youth with asthma, based on their assessments of symptomatic students:

If I would see that a child is having asthma attacks frequently or had severe asthma, it would be our responsibility to contact the parents and tell them to go to some doctor(s) to treat the asthma better, if it is not treated well enough. (Reyk)

It's almost like a third of the time that I'm asking for a medication to come to school, I'm also trying to get a referral to Portico....where health insurance might be available. (St. P)

Asthma education—Providing asthma education was a core activity for school nurses in Reykjavik and St. Paul. School nurses in both countries described providing asthma education to students and school personnel. School nurses tailored their asthma education to the needs of a variety of learners in the school setting. For example, in St. Paul the school populations were more culturally diverse which required adaptation of educational messages and materials:

Our populations are so diverse, we have all these barriers. We have cultural barriers, we have language barriers... [and many] people with a second language. (St. P)

School nurses were engaged in teaching individual students with asthma as well as groups of students about asthma (e.g., in health classes). Similarly, school nurses described meeting with individual student's teachers and coaches and informing groups of school personnel (e.g., janitors, teacher's aids) about asthma prevention and management:

I do some student education in just routine health classes.... And so in September I always start with a lesson on asthma, just because it's kind of a big month for asthma. (St. P)

It is often even a parent or we, or even just the teacher, who educates the class about the situation so it does not become a taboo or a secret or people hide it. So if an individual has to use his/her inhaler it is not a problem. (Reyk)

You do have to educate the staff, training them on how to use a neb and inhalers when they're on a field trip. So there's parent education, there's student education, there's staff education. (St. P)

School nurses in St. Paul also described educating parents on topics such as asthma management protocols, characteristics of asthma and the correct use of asthma equipment:

There's that piece of working really closely with families, trying to get them to understand what our protocol is in the school setting. And also, that health teaching

piece of understanding where the illness is coming from and what the steps or the pathway of the illness is and what you can do to prevent it and why they should be able to do anything that anybody else can do. (St. P)

DISCUSSION

Overall, the findings illustrate the complex, dynamic and multi-faceted nature of asthma care coordination provided by school nurses in both countries. This coordination involved collaborating with students and their parents, teachers and health care providers. These school nurses were able to address asthma prevention as well as management in their respective school settings amidst their other responsibilities. The types of asthma care coordination activities described by school nurses in this study are similar to those found in the literature, such as direct asthma care (Bruzzeze *et al.* 2009), asthma education (Kintner *et al.* 2012) and communication with parents, school personnel and health care providers (Milnes *et al.* 2013).

A unique contribution of this study is the articulation of the asthma care coordination process that school nurses used to mastermind care. Masterminding care involved an iterative versus a linear step-by-step process that enabled school nurses to prioritize and nimbly respond to the changing needs of students in their school settings. During focus group discussions, participants also shared how they coordinated asthma care not only with students but also partnered with parents, school staff and health care professionals to ensure access to care and continuity of asthma care at home and in the community. The types of asthma education and support strategies that school nurses in the I-SNAP study used to coordinate asthma care with parents were similar to those described by Sigurdardottir *et al.* (2013) in their two-session family therapeutic intervention. Sigurdardottir *et al.* (2013) found that psychosocial and educational intervention components (e.g., providing caregiver support, offering easy to read literature as well as information and professional opinion about the asthma situation) significantly benefited mothers in the intervention groups compared with the mothers in the treatment as usual group.

The commonalities in the elements of the care coordination process identified by school nurses in Reykjavik, Iceland and in St. Paul, MN in the U.S. could be attributed in part to the similar professional level of education of the participants who held a minimum of a baccalaureate degree and preparation in pediatrics and public health nursing. The primary differences in findings were related to how school nurses were able to focus their priorities and time related to factors such as the size of their caseload, the number of schools served and the proportion of students with poorly controlled asthma and other chronic conditions. Findings from our earlier paper on barriers to asthma care (Svavarsdottir, 2013) indicated that school nurses in St. Paul, MN encountered more socioeconomic and health access barriers than school nurses in Reykjavik, Iceland where the population is more homogenous and there is ready access to universal health care in the community. School nurses in St. Paul, MN worked with a more ethnically and culturally diverse student body and immigrant families where language and literacy issues added challenges in communicating with families and connecting them with resources. School nurses in St. Paul also encountered more youth with poorly controlled asthma who had difficulty accessing health care services

and resources. Thus, school nurses in St. Paul needed to focus proportionately more of their time on symptom management and case management with youth with asthma than school nurses in Reykjavik.

Limitations

The term ‘international’ in this study refers to the cross-country study of school nurse asthma care coordination conducted in Iceland and the U.S. The educational preparation of the school nurses and the context of the school systems and countries where data were collected need to be considered in determining the transferability of the findings to school nurses in other geographic settings. The sample sizes were relatively small as our focus was on learning in depth from school nurses with similar educational preparation who had experience working with pre-adolescents and adolescents with asthma between the ages of 10 and 18. The findings may not be applicable to school systems settings that do not have a similar standard of nursing practice for school nurses, which requires a minimum of a baccalaureate degree.

CONCLUSION

The primary contribution of this descriptive qualitative study is the development of an International School Nurse Asthma Care Coordination Model that is grounded in the experiences of school nurses who work with youth with asthma (ages 10–18) in Reykjavik, Iceland and St. Paul, Minnesota. Further development and testing of this model is needed in other geographic locations to determine the applicability and fit of the components of this model to school nurses in other cities and countries. Further study is also needed to examine the degree to which a school nurse’s experience and educational preparation contributes to the effectiveness of care coordination for youth with asthma in schools. Meanwhile, the components of the model can be used to inform school nurses and nursing students about the care coordination process and strategies needed to coordinate asthma care in school systems. School nurses are in a unique position to coordinate asthma care with youth with asthma not only in the school system but in collaboration with their families and health care providers to help ensure continuity of care across systems.

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Summary Statement

Why is this research needed?

- Globally, over the last two decades, the prevalence of asthma symptoms has increased.
- Children with asthma are more likely to have their activities restricted, miss days of school and have their performance affected.
- School nurses are the primary health care professionals in the educational setting, yet little is known about their role in coordinating care for youth with asthma.

What are the key findings?

- The major contribution of the study is the development of the *International School Nurse Asthma Care Coordination Model* that depicts the process of school nurse care coordination for youth with asthma.
- School nurses in Reykjavik, Iceland and in St. Paul, Minnesota described enacting similar components of a dynamic and iterative asthma care coordination process in their school settings.
- School nurses individualized their interventions to address the changing needs of individual youth with asthma as well as the school populations they served.

How should the findings be used to influence practice and education?

- Findings inform how school nurses can proactively ensure a 'health promoting school' environment as they coordinate care for youth with asthma in collaboration with family caregivers and health care providers.
- The International School Nurse Asthma Care Coordination Model provides a useful framework for practicing school nurses and nursing students that delineates core elements of school-based care coordination for youth with asthma.

Figure 1.
International School Nurse Asthma Care Coordination Model

Table 1

Inductive descriptive content analysis process

Core elements of the process	Data analysis steps
Inductive, descriptive content analysis of verbatim transcripts of focus groups with school nurses	<p>*Research team members in both countries first independently read and reread the entire set of focus group transcripts from St. Paul, Minnesota and then from Reykjavik, Iceland to identify similarities and differences in the core concepts, patterns and themes related to asthma care coordination conducted by the school nurses by site.</p> <p>*Regular videoconference calls with focus group facilitators and investigators were set up to discuss preliminary findings and address questions related to interpretation of the data.</p>
Development and validation of the coding scheme	<p>*Building on the preliminary team work, a member of the team who has descriptive content analysis coding experience reviewed each of the verbatim focus group transcripts line by line and used open coding to identify and categorize the types of asthma care coordination roles and activities carried out by school nurses in each city.</p> <p>*Based on this analysis, she constructed a list of coding categories.</p> <p>*Next, a second team member with qualitative expertise independently reviewed the categorization of the care coordination data in the focus group transcripts to validate the coding scheme.</p> <p>*Minor differences in coding categories were addressed through a consensus process.</p>
Open coding of verbatim sets of transcripts by country for school nurses' roles and responsibilities related to care coordination	<p>*Next the coding scheme was used to systematically review each of the transcripts on a line-by-line basis and to categorize core characteristics of the care coordination process and the types of activities or interventions that school nurses designed for students with asthma.</p> <p>*Constant comparisons were made to determine the relationship between coding categories and to identify similarities and differences in findings by country.</p>
Concept and pattern identification & validation	<p>*Concepts and patterns related to the process of school nurse care coordination were identified by first comparing focus group data by country and then across countries.</p> <p>*Next, the naming and categorization of overarching concepts and subconcepts was reviewed and discussed by researchers from both sites to validate how concepts were clustered in the overarching categories (masterminding care and individualizing interventions).</p>
Development of a conceptual model to depict the relationship between how school nurses 'masterminded care' at the individual student and school population level through components of the asthma care coordination process which, in turn, informed how they 'individualized interventions.'	<p>* A conceptual model was developed to depict the relationships noted between core components of the asthma care coordination process and core coordination activities described by school nurses in both countries.</p> <p>*Elements of the model were identified by clustering care coordination processes and activities into core, non-overlapping categories.</p> <p>*Masterminding' and 'Individualizing interventions' were the two overarching concepts that framed the interrelationships between the care coordination processes and activities in this model.</p>

Table 2

School nurse characteristics in Reykjavik, Iceland and Saint Paul, Minnesota (N=32)

Background Characteristics	Reykjavik (N=17)		St Paul (N=15)	
	N	%	N	%
Educational level				
Bachelors in nursing	16	94.1	7	46.7
Masters in nursing	1	5.9	8	53.0
Worked in more than one school	5	26.3	4	27.0
	Mean		Mean	
School nurse age in years	38.2		53.7	
Years employed in current school setting	4.3		7.7	
Mean number of students served by school nurses	1 nurse to 559 students		1 nurse to 883 students	