


BMJ Open Facilitators and barriers to the implementation of the Primary Care Asthma Paediatric Pathway: a qualitative analysis

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ABSTRACT

Objective The aim of this qualitative study was to use a theory-based approach to understand the facilitators and barriers that impacted the implementation of the Primary Care Asthma Paediatric Pathway.

Design Qualitative semistructured focus groups following a randomised cluster-controlled design.

Setting 22 primary care practices in Alberta, Canada.

Participants 37 healthcare providers participated in four focus groups to discuss the barriers and facilitators of pathway implementation.

Intervention An electronic medical record (EMR) based paediatric asthma pathway, online learning modules, in-person training for allied health teams in asthma education, and a clinical dashboard for patient management.

Main outcome measures Our qualitative findings are organised into three themes using the core constructs of the normalisation process theory: (1) Facilitators of implementation, (2) Barriers to implementation, and (3) Proposed mitigation strategies.

Results Participants were positive about the pathway, and felt it served as a reminder of paediatric guideline-based asthma management, and an EMR-based targeted collection of tools and resources. Barriers included a low priority of paediatric asthma due to few children with asthma in their practices. The pathway was not integrated into clinic flow and there was not a specific process to ensure the pathway was used. Sites without project champions also struggled more with implementation. Despite these barriers, clinicians identified mitigation strategies to improve uptake including developing a reminder system within the EMR and creating a workflow that incorporated the pathway.

Conclusion This study demonstrated the barriers and facilitators shaping the asthma pathway implementation. Our findings highlighted that if team support of *enrolment* (establishing buy-in), *legitimisation* (ensuring teams see their role in the pathway) and *activation* (an ongoing plan for sustainability) there may have been greater uptake of the pathway.

Trial registration number This study was registered at clinicaltrials.gov on 25 June 2015; the registration number is: NCT02481037, <https://clinicaltrials.gov/ct2/show/NCT02481037?term=andrew+cave&cond=Asthma+in+Children&cntry=CA&city=Edmonton&draw=2&rank=1>

Strengths and limitations of this study

- ⇒ The study uses qualitative methodology and the normalisation process theory to increase our understanding of clinicians in the implementation of complex interventions in primary care.
- ⇒ The study identified facilitators and barriers to the implementation of the Primary Care Paediatric Pathway in the electronic medical record, which may have generalisability to other interventions.
- ⇒ Study participants identified key mitigation strategies that could be used to improve uptake of future research-based innovations.
- ⇒ Despite targeting clinics with a minimum paediatric asthma population, the participating clinics care for relatively few patients relevant to the intervention, which may have impacted pathway uptake. It would be important to reassess its effectiveness in practices with larger paediatric asthma populations to better understand the strengths and weaknesses of the pathway itself.
- ⇒ A comparative analysis approach may have allowed for better understanding of the causes of poor uptake of the pathway through within-case analyses and a cross-case comparison.

BACKGROUND

An estimated 11%–15% of Canada's children have asthma;^{1–3} and over half of these children experience poor disease control demonstrated by emergency department visits, hospital admissions, missed school days and low quality of life ratings.^{3–9} Because of the significant burden of paediatric asthma, high quality, evidence-based national and international guidelines have been widely disseminated, including guidelines specific to primary care providers^{10–12} However, the consistency of evidenced-based asthma care is variable, with less than 2% of clinicians able to provide all of the recommended care suggested by the guidelines and less than 5%

of asthma visits including the recommended assessment of asthma control.^{13 14}

Children with asthma take approximately half of the asthma medication they are prescribed,^{15 16} with almost one half of children with asthma prescribed no preventative medication by their primary care providers.^{17 18} Increasingly there is concern regarding the long-term risks for children with poorly controlled asthma, suggesting there is a need to identify children at greatest risk of adverse outcomes, to develop strategies for ongoing monitoring and interventions that target the worsening of asthma in children.¹⁹ Previous research has shown that that electronic medical record (EMR) based interventions in primary care settings may improve asthma control, preventative medication prescriptions and asthma action plan provision.^{20–22} To address the significant challenges associated with paediatric asthma management, specifically the prescription and use of preventative asthma medications, an evidence-based primary care clinical pathway for the EMR was developed.²³

The Primary Care Asthma Paediatric Pathway (PCAPP) implementation included: (1) An asynchronous online learning module for primary care providers addressing how to use the pathway; (2) In-person training and discussion for the healthcare team members to facilitate patient/family asthma education; and (3) An EMR embedded pathway that included asthma algorithms, templates, printable prescription and written asthma action plans and links to online patient education resources.²⁴ To facilitate the identification of paediatric asthma in the practices a clinical dashboard tool was created to quickly assess their patient population, including the medications prescriptions and frequency of asthma care.²⁴ Figure 1 provides an example of the PCAAP pathway use within the EMR. The aim of this qualitative study was to use a theory-based approach to understand the facilitators and barriers that impacted the implementation of the PCAPP in primary care.

METHODS

The research methodology for the 3-year mixed-methods health services study have been previously described.²³ In brief, the randomised cluster-controlled design was implemented in 22 primary care practices in Alberta, Canada, half receiving the PCAPP intervention and the other half receiving usual care. As suggested by the Medical Research Council, complex interventions use two or more information sources or two or more research methods to answer a research question,²⁵ in this instance quantitative and qualitative research approaches. Prior to implementation of the complex intervention a Theoretical Domains Framework study was conducted to facilitate a theory-based approach to the implementation strategy.²⁴

Following implementation, a qualitative descriptive approach was used to contextualise the trial findings. Qualitative description is a qualitative approach that aims for description. A purposeful sample of intervention sites

ALBERTA CHILDHOOD ASTHMA PATHWAY - EXACERBATION

Click to view [Alberta Childhood Asthma Pathway Algorithm](#)

Management of present or impending exacerbation Consider:

- Age
- Severity of previous episodes
- Previous responses
- Side effect potential of systemic corticosteroids

Clinical assessment including visible respiratory distress

Review Exacerbation Symptoms:

Mild/Moderate daytime symptoms 3+times/week

nighttime symptoms some nights

reliever: 3+ times/week

limited physical activity

can go to school/work

Moderate/Severe daytime symptoms continuous & getting worse

nighttime symptoms: continuous & getting worse

reliever: relief for less than 3-4 hours

very limited physical activity

can't go to school/work

Very severe continuous dyspnoea +/- cyanosis

unable to sleep

no relief from reliever inhaler

unable to speak a sentence

scalene/intercostal retraction at rest

Select exacerbation category Mild Moderate or severe Very severe

Immediate office management Systemic corticosteroids

- Prednisone 2mg/kg for 2-5 days OR
- Dexamethasone 0.3 mg/kg for 2-3 days

Salbutamol (Ventolin) 5 puffs OR Terbutaline (Bricanyl) 2 puffs

Patient meets criteria for going home Yes No

Figure 1 Example of the Primary Care Asthma Paediatric Pathway (PCAPP) pathway as it is viewed within the clinician's electronic medical record (EMR). This view shows what would appear if the clinician indicated the child was being seen in primary care for an exacerbation of asthma.

was selected to participate in qualitative focus groups.²⁶ Sites were selected based on the size of the practice (small, medium, large) and the geographical location (rural, urban) to facilitate maximum variation. The semistructured interview guide was framed by the Ottawa Model of Research Use²⁷ to address the facilitators/barriers that impacted uptake of the pathway by the providers, the potential improvements and attributes of the pathway. The interview guide was developed by the authors (SS, HS, MP) who provide expertise in knowledge translation, primary healthcare, paediatrics and asthma management. While participants had already consented to participate in the intervention/study, an additional consent for the focus group was completed. The focus groups were conducted by HS and were limited to no more than 1 hour in length to accommodate the schedule of the clinics.

The normalisation process theory (NPT) was used to inform and guide our interpretations of the study results, as it provides an explanation of how innovations may become embedded into routine clinical practice.²⁸ Using an inductive approach, the research team evaluated the data for congruence with the four constructs (coherence, cognitive participation, collective action and reflexive monitoring), to better understand the success and/or failure of the implementation of the pathway.²⁹ The NPT is an action theory, which means it is concerned with explaining what clinical teams do rather than their

attitudes or beliefs, and how they work, that is, the focus is on what individuals and groups do to normalise a new innovation/process.^{30 31}

The inclusion criteria for the participants included: (1) Being a member of a clinical team that delivered the complex PCAPP intervention at their site (they were randomised to the intervention group of the cluster randomised control trial); (2) Providing direct patient care or providing administrative support for the clinical team to children aged 2–17 years with asthma; (3) Coming from a site with at least 50 children with asthma in the practice. Participants were not required to have successfully implemented the pathway, as the aim was to include all levels of implementation of the pathway.

In qualitative descriptive studies, descriptive validity is demonstrated through detailed description of the data collected.³² Detailed description was facilitated through rich focus group data collection that was augmented through detailed field notes post each focus group and detailed analytical memos. To ensure rigour, we used several methodological approaches including member-checking and triangulation. During focus groups we engaged in informal member-checking, highlighting key themes as they emerged to participants to validate the findings (an ongoing process throughout the data collection)³³ and data triangulation by collecting data through focus groups (including a variety of health professionals), as well as through the dashboard that demonstrated actual pathway use.³⁴

Patient and public involvement

No patients were involved in the design and implementation of this study. However, the intervention targeted primary care health teams. These teams were involved in the ongoing development and refinement of the intervention. This included modifying the intervention to better meet the ‘real-world’ needs of primary care teams, based on their feedback.

Analysis

To facilitate accurate, timely transcription, court reporters were used to conduct live transcription in addition to audio recordings.³⁵ Data collection and analysis were

iterative and concurrent processes to allow for further development of new ideas from focus group data. For each focus group conducted, a memo was created by the interviewer, and incorporated into the analysis. Focus group data were analysed using a three phase approach: coding, categorising and development of themes.³⁶ Data collection concluded when there was agreement within the study team that data addressed the research questions and when no new messages emerged. The team member that completed the interviews and preliminary coding was a PhD trained nurse with expertise in asthma education. Additional team members that assisted with the coding and interpretation of the data included a PhD trained scientist with mixed-methods research experience, and a PhD trained nurse, with significant qualitative methodology expertise. The transcripts provided by the court reporter were initially reviewed and compared with the audio files for accuracy. Data for each focus group were then coded using code words that captured the essence of the data.²³ Codes were defined to ensure consistent application through the data coding phase. As the categories emerged from the data the theoretical properties were further defined. Lastly, comparisons were completed between the categories to identify similarities and differences.²³ NVivo V.10 software³⁷ was used to help manage the data analysis process.

RESULTS

Four focus groups were held across four primary care sites; [table 1](#) provides a summary of the participating sites and the participants. Given that the uptake of the pathway was generally described as low, much of the focus group data identified the barriers, and possible mitigation strategies to address the barriers in the future. Many of the clinicians indicated they liked the components of the pathway, including the evidenced-based approach and access to resources, such as the written asthma action plan. While many said they never or rarely used it, there were no participants that stated that they did not like the pathway or would never use it. Specifically, we employed the theory to enhance our understanding of three key results

Table 1 Participating sites description

Practice	Urban or rural	Practice type	Participant's profession	Number of participants	Self-described use of implementation of the pathway
1	Urban	Academic	Physician Medical Office Administrator	2	High use
2	Rural	Non-academic	Physicians Respiratory herapists (RTs)	12	Used by Respiratory Therapists only
3	Urban	Academic	Physicians Nurses	15	Minimal use
4	Urban	Non-academic	Physicians Medical Office Administrators	8	Minimal use

Table 2 Normalisation process theory (NPT) and pathway implementation

Core construct of NPT	Demonstrated by the focus groups (components of the core construct)
Coherence is the sense-making individuals and teams do to operationalise a new practice	<ul style="list-style-type: none"> ▶ There was a recognised value of the pathway, providing a consistent approach to paediatric asthma care within the EMR (<i>communal understanding</i>). ▶ Participants noted the value and benefit of the pathway: evidence-based, reminder of components of optimal care, encouraged patient education (<i>internalisation</i>).
Cognitive participation: the work that is done to create a community related to the new practice	<ul style="list-style-type: none"> ▶ Successful implementation was linked to a team approach with clear roles for team members (<i>legitimisation</i>). ▶ Project champions may facilitate uptake and awareness (<i>initiation</i>). ▶ Sites with limited cognitive participation lacked uptake and were unable to fully implement the pathway (<i>enrolment and activation</i>).
Collective action: the operational work that is undertaken to implement the new practice	<ul style="list-style-type: none"> ▶ Participants' identified further resources may be required to facilitate implementation, such as a reminder system (<i>contextual integration</i>). ▶ Clinics that created the division of labour for pathway implementation were more likely to use it, and have a champion for implementation (<i>skill set workability</i>).
Reflexive monitoring: team members assess and understand how new practices affect them and others around them	<ul style="list-style-type: none"> ▶ Participants quickly identified the pathway that required reconfiguration to optimise it for use in primary care; it was modified to better meet the clinicians' needs (<i>communal appraisal</i>). ▶ Focus groups identified mitigation strategies (reminder system, prompt to initiate the pathway) that may improve future implementation (<i>reconfiguration</i>).

EMR, electronic medical record.

from the research: (1) Facilitators of pathway uptake; (2) Barriers to implementation and; (3) Mitigation strategies identified by the participants that may improve the implementation of future interventions. Table 2 summarises the NPT and its applicability to the understanding of the PCAPP intervention implementation.

Facilitators of implementation

Three categories emerged from the data related to the facilitators of the pathway. They included: (1) The evidenced-based approach to paediatric asthma management, (2) A willingness to modify the pathway, and (3) Pathway specific education.

Evidence-based approach

All participants were positive about the components of the pathway, and its possible benefits for children with asthma and for the clinical teams. They reported that it served as a reminder of optimal asthma care, and provided access to resources and tools, such as educational materials and the written asthma action plan. 'I think it's been good in terms of ensuring that I'm following all the guidelines and getting all of the important pieces for the education and management of the young asthmatic.' (physician, small urban site). One participant indicated that the pathway led to a practice change in having a more complete or thorough approach to asthma management.

Modifying the pathway to meet clinical needs

Initially there were three separate templates that were developed as components of the pathway. Each template was to be used to address an aspect of asthma management that may be encountered in primary care (suspected asthma, acute exacerbation, ongoing management). However, preliminary feedback suggested it was too complex which impacted its usability. The development team responded, and the three templates were condensed into a single pathway. 'And when it was first introduced, there was three different pathways to consider...so everybody found it a bit confusing with the three different pathways. But then that merged into one pathway on the EMR, which was much more user-friendly.' (allied health team, large, urban site).

Pathway education

Clinicians indicated the education was valuable. However, large practices with high turnover were not able to continue onboarding staff consistently. 'This is primary care. You don't have a whole hour to do it. You're not in the Children's Hospital in the asthma clinic doing everything... you're not expected to do every component every visit, and that's probably unrealistic.' (physician, small urban site). Thus, while the education was valuable, it required an ongoing strategy and perhaps a mechanism for establishing key priorities at each visit.

Barriers to implementation

Despite the positive comments, uptake of the pathway was generally low. Issues of uptake were focused on the implementation of the innovation. The most significant barriers were grouped according to three categories: (1) Relatively low importance of paediatric asthma in primary care related to the low paediatric asthma populations; (2) A lack of awareness of the pathway, contributing to a lack of use; (3) A lack of integration of the pathway into clinic flow. These barriers led to a low uptake at all but one of the sites included in the focus groups.

Clinic population and priority

Small numbers of children with asthma in the clinics was a barrier to use. 'For me, the reason I cannot give you more feedback about how we work is that I really don't have many paediatric asthma patients.' (physician, large urban site). 'I know many people said it would be helpful to use with adults as well.' (allied health team, large urban site). The team at this large urban site estimated they had less than 20% children in the practice. 'I didn't have any paediatric patients with asthma, especially new diagnoses; but when I used it, then I found it was quite straightforward and clear to use.' (physician, moderate urban site). One primary care provider advised that the children identified as having asthma on their panel through the study, may not have confirmed asthma. 'I was going through the files, sure, some of the kids had a bit of wheezing, and they – maybe after a virus infection and – and so on. But if you're looking at moderate to severe asthma patients, I really didn't have any like that in my practice.' (physician, large rural practice). While another team stated 'when they're moderate or severe in asthma, we tend to send them to the specialists,' (allied health team member, large urban practice) as they have access to a large, paediatric asthma service within the city. Given these comments, it would suggest there was low motivation to use the pathway, as it did not address a highly prevalent condition they encounter in their daily practice.

Lack of awareness of the pathway

There were participants that exhibited ambivalence regarding the pathway: 'To be honest, for me, I saw somebody with asthma the other day, and I was, like, are we still doing that asthma pathway? Like, I was, like, Is that still on? I don't know if I was supposed to be still using it?' (physician, moderate urban site). Primary care providers indicated that they forgot about the pathway, or would have already begun using the 'regular' EMR when they realised the patient was visiting for asthma concerns.

One participant stated 'I feel like I definitely underutilised it, though. I think it just wasn't always on my radar. If it was something like a straightforward asthma follow-up, I don't think I always thought to pull it up.' (physician, moderate urban site). Primary care providers needed to actively look for the template within their EMR to use. In one clinic (physician, large, urban site) one of the allied health professionals indicated she had undertaken

activities to build awareness of the pathway (going to each physician to remind them of it) and put the pathway in their 'favourites' folder within the EMR, however integrating with the clinic practices remained challenging.

Lack of integration in the clinic

In order for an innovation to be successful in primary care, it needs to integrate with the existing clinic structure and processes. The EMR did not have a 'flag' or have a reminder system that pulled up the pathway for children with asthma. 'The whole just remembering to click on the pathway (has) been a challenge. But when you get there, so helpful' (physician, moderate urban site). 'Yeah, you maybe could have designated one person in the clinic as a champion to the cause and then given out monthly reminders.' (physician, moderate urban site). As suggested by an allied health team member 'in the future, you have to integrate it somehow into the processes of the clinic.' (large urban site).

Proposed mitigation strategies

While the barriers to implementation were significant, participants were readily able to identify possible mitigation strategies that they felt would impact uptake. Mitigation strategies included: (1) A reminder system; (2) Integration of the pathway within clinic flow; and (3) Expanded scope of the pathway.

A reminder system

The most suggested strategy was to create a reminder system to encourage use. Both an EMR-based reminder, as well as team members identifying children with asthma prospectively (prior to the visit) was suggested as a mitigation for lack of use. 'So I think that the – one of the changes that we can consider isif it's a kid with asthma diagnosis, ask them (staff) to pull up the asthma pathway template from the get-go. So when you go open the visit, you see the asthma pathway, not that you have to pull it up yourself. I think that that would be a process that would make a difference. Because we just forget.' (physician, large urban). One suggestion was having the front desk staff or nursing staff flag patients before appointments that could serve as a reminder to use the pathway.

One clinic identified that they flagged children with asthma, and the intention was to use the pathway for visits; however the children often came in for other reasons (non-asthma), and the pathway was not used for them. Another site was successful at having the office team member identify children with asthma prior to the appointment and made use of the pathway more successful. 'It's easy to access, but the thing is you have to remember to access it.' (physician, small urban site).

Integration of the pathway within clinic flow

Primary care physicians indicated that they have limited time within their appointments with families. The pathway may require more time than available in a typical patient interaction. 'I don't know that a physician would have time to do all of that at an appointment...so I think

overall it's probably a good thing but just needs to be able to fit into the usual pace of a primary care doc(tor) if they're expected to use it.' (physician, large rural site). It was suggested prioritising the components of the pathway to allow clinicians to use it in 'pieces' rather than its entirety, which would feel more manageable given the time constraints. 'That was my main stumbling block in using it. When it was just something that was totally stable, it was, like, yeah, I don't have time for that; I just – will just do a regular thing.' (physician, moderate urban site). This was a significant learning—the pathway may be effective and valuable to improving patient outcomes, but needs to be integrated into the clinic flow to be used.

Expanded scope of the pathway

For some clinics it would be more valuable to have a pathway that managed several conditions/populations, rather than the narrow focus. 'It wasn't meant to be used with adults. I know many people said it would be helpful to use with adults as well.' (allied health team, large, urban site). Expanding the scope of the pathway may increase usability for clinicians, which may include additional populations (adult) or disease states (such as chronic obstructive pulmonary disease).

DISCUSSION

Facilitators we identified included positive perceptions of the pathway such as reminding clinicians of evidenced-based, guideline-informed asthma management and providing helpful tools and resources. Barriers we identified were that clinicians believed they had few children with asthma in their practices, and their primary care teams, as a consequence, did not prioritise care of children with asthma. Additional barriers we identified were that the pathway was not well integrated into clinic flow and most practices did not have identified project champions to facilitate pathway use. Despite these significant barriers, clinicians identified clear mitigation strategies for future efforts to improve uptake including developing a reminder system within the EMR and creating a workflow that better incorporates the pathway. Three important learnings from our results are discussed below.

Although historically primary care adherence to paediatric asthma guidelines has been poor,³⁸ research has demonstrated that decision support tools can improve adherence to guidelines such as increased preventer medication prescription.³⁹ Computer-based decision support tools have also been shown to improve standardised asthma assessments and treatment, and documentation of asthma severity/control for children.^{40–42} Additionally a systematic review of computerised clinical decision support systems for the management of asthma in primary care for adults and children found that computer-based support tools improve patient outcomes.⁴³ Notably many of the computer-based interventions in these studies, such as self-management education, reactive computer

reminders and online interactive asthma monitoring, were not included in our PCAPP intervention.

Limited pathway utilisation

The NPT highlights the importance of *coherence* in which individuals see that a new innovation is valuable and that as a team, they create a shared understanding of its benefits.⁴⁴ Our findings suggest that primary care practices had significant *coherence* with regard to the pathway. Participants understood its use, felt it had value, and thought it provided useful resources for the management of paediatric asthma in primary care. Nonetheless, this high *coherence* did not translate to regular use of the pathway. This is likely because clinicians did not see children with asthma frequently enough so they simply forgot to use the pathway when they did. Our experience is similar to the Asthma APGAR tool implementation study that found that participants stated a barrier to use was that they were unsure of the need of an asthma-specific tool in primary care.⁴⁵ So in our study, despite clinicians' recognition of the value and benefit of the pathway (*coherence*), the infrequent opportunity to use the pathway hindered its utility (*collective action*). Notably, however, practices in our study that identified a project champion (which increased *cognitive participation*) used the pathway significantly more. The NPT suggests that *cognitive participation* creates a community of support that will optimally influence the implementation of an intervention.⁴⁴ Perhaps if we had encouraged identification of a project champion across all practices, it could have led to overall increased use of the pathway.

Lack of integration with clinic flow

The pathway needs to be integrated into the normal workflow of the clinic and the components of the pathway should be prioritised due to the rigid time limitations of primary care. Consistent with reports from study participants, de Bruin and colleagues¹³ found that primary care clinicians were generally not able to complete all of the components of evidence-based care in a regular visit, suggesting clinicians may need to establish core priorities for visits. Similarly, in subspecialty asthma practice workflow concerns were a barrier to computerised decision support tools, including slowing the pace of clinical practice.⁴⁶ The uptake of health information technology in paediatrics has been shown to improve over time, as understanding of the tool increases,¹³ therefore, additional time may have been required for the clinicians to learn the pathway. Participants were able to see the worth in the intervention, and they identified mitigation approaches that reconfigured the process to fit within existing clinic structure; this would lead to *activation* and thus, creating a plan for sustainability of the intervention.³¹

Suggested mitigation-reminder strategies

Participants stated the pathway was useful, however they found it challenging to remember to consistently use

the tool. This experience is common, as clinicians often find it difficult to integrate decision aids into their daily practice.⁴⁷ The focus groups in our study allowed participants the opportunity to undertake *reflexive monitoring* to offer several key strategies to improve the daily use of the pathway. They suggested a flag or reminder in the EMR to indicate that the child had asthma would be helpful. Computer-generated reminders have shown modest gains in improvement of clinical care.⁴⁸ Strategies suggested by participants included working with administrative team members to identify children with asthma prior to their visit. Similar methods, such as having front desk staff provide an asthma management questionnaire to patients was shown to be effective.⁴⁹ Participants also suggested having an electronic reminder within the EMR to identify children with asthma. Halterman and colleagues⁵⁰ found a similar approach using electronic prompts increased the use of asthma action plans, smoking cessation education and reduction in asthma symptoms for children with asthma. Interestingly, study participants did not indicate lack of content knowledge, disagreement with the evidence in the pathway, nor applicability of the pathway to the population to be barriers, which were major themes previously identified in the literature.⁴⁷

LIMITATIONS

One limitation was that our study was restricted to primary care practices from one province in a single country, and further restricted to clinics that were using one of the province's two most commonly used EMRs. A second limitation was that participating clinics care for relatively few patients relevant to the intervention. While during the clinic recruitment process we specified that clinics should care for a minimum of 50 children with asthma, in retrospect it may have been advantageous to identify clinics with larger paediatric populations. Given the low pathway use we found, it would be important to reassess its effectiveness in practices with more patients with paediatric asthma to better understand the strengths and weaknesses of the pathway itself. A third limitation is that we did not employ a comparative analysis approach which may have allowed us to better understand the causes of poor uptake of the pathway through within-case analyses and a cross-case comparison.⁵¹ Future research may consider employment of this methodology.

CONCLUSION

This study demonstrated, through a theory-based approach, that the overall uptake of an evidence-based pathway for the management of paediatric asthma in primary care was low, despite a strong recognition of the potential utility. Key reasons for limited use included small numbers of children with asthma cared for by the practices, and limited awareness of the pathway due to insufficient integration within clinic flow and process. Participants thought the pathway would have been more

useful with an automated reminder system, integrating the pathway with existing clinic flow and process, and expanding the scope of the pathway to include other problems such as adult asthma and COPD. Our findings show that if the clinical team engaged in *enrolment* (establishing buy-in), *legitimisation* (ensuring teams see their role in the pathway) and *activation* (an ongoing plan for sustainability), the pathway may have been more widely used.

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Contributors HS was responsible for data collection, analysis and manuscript preparation and is the guarantor for this research. MP was responsible for data analysis and manuscript preparation. AC and DJ provided guidance on the development of the interview guide, data interpretation and manuscript revision. SS, senior author was the methodological expert for the study design, data collection and analysis. SS oversaw the manuscript preparation.

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Ethics approval This study involves human participants and was approved by both the Health Research Ethics Board at the University of Alberta (Pro00056585) as the primary ethics board, and additionally from the Conjoint Health Research Ethics Board at the University of Calgary. Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available upon reasonable request. Availability of data and materials: the data sets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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