

“What is the actual goal of the pathway?”: Examining emergency department clinicians’ perspectives on the implementation of a pediatric concussion pathway using the Theoretical Domains Framework

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Abstract

Background Multiple evidence-based clinical practice guidelines (CPGs) exist to guide the management of concussion in children, but few have been translated into clinical pathways (CP), which operationalize guidelines into accessible and actionable algorithms that can be more readily implemented by health care providers. This study aimed to identify the clinical behaviours, attitudinal factors, and environmental contexts that potentially influence the implementation of a clinical pathway for pediatric concussion.

Methods Semi-structured interviews were conducted with 42 emergency department clinicians (17 physicians, 25 nurses) at five urban emergency departments in Alberta, Canada. A Theoretical Domains Framework (TDF)-informed interview guide contained open-ended questions intended to gather feedback on the proposed pathway developed for the study, as well as factors that could potentially influence its implementation.

Results The original 14 domains of the TDF were collapsed into 6 clusters based on significant overlap between domains in the clinical behaviours, thematic areas, and other issues raised by clinicians: 1) knowledge, skills, and practice; 2) professional roles and identity; 3) attitudes, beliefs, and motivations; 4) goals and priorities; 5) local context and resources; and 6) engagement and collaboration. The 6 clusters identified in the interviews each reflect 2-4 predominant topics that can be condensed into six overarching themes regarding clinicians' views on the implementation of a concussion CP: 1) standardization in the midst of evolving research; 2) clarifying and communicating goals; 3) knowledge dissemination and alignment of information; 4) a team-oriented approach; 5) site engagement; and 6) streamlining clinical processes.

Conclusion Application of a comprehensive, evidence-based, and theory-driven framework in conjunction with an inductive thematic analysis approach enabled six themes to emerge as to how to best implement a concussion clinical pathway. These overarching themes must be addressed to successfully implement a CP for pediatric concussion.

Contributions To The Literature

- Discuss how the Theoretical Domains Framework can be combined with an inductive thematic analysis approach to explore key strategies and considerations for the implementation of a clinical pathway for pediatric concussion
- Contribute to the literature on intervention planning for pediatric concussion care in emergency departments
- Provide an example of how the Theoretical Domains Framework can be modified (collapsed domains) and applied as a research tool to identify salient themes relevant to clinical practice and change

Background

Pediatric concussion is a significant public health burden, sometimes referred to as a silent epidemic [1]. An estimated 1-2 million children in North America sustain concussions annually, with those seeking medical care rising dramatically [2,3]. Children with concussion often report postconcussive symptoms,

including somatic (e.g., headache, dizziness), cognitive (e.g., inattention, forgetfulness), and affective (e.g., irritability, dysphoria) complaints [4]. Postconcussive symptoms are most severe acutely, but can persist for weeks to months and result in functional disability and declines in quality of life in 15-25% of children [5-8]. Moreover, postconcussive symptoms often disrupt daily activities, with some children experiencing associated difficulties in social and academic settings [9, 10].

Multiple evidence-based clinical practice guidelines (CPGs) have been developed to guide the management of pediatric concussion [1,11-13]. However, their implementation in clinical settings is inconsistent, thus perhaps explaining the observed significant practice variation and knowledge gaps. For instance, in studies of primary care providers and emergency physicians in Ontario, Canada who diagnose and manage concussion, only 47% and 60% recommended an initial period of school absence, 37% and 64% correctly applied return-to-play guidelines, and 26% and 22% reported regular use of standardized rating scales for assessing concussion, respectively [14, 15]. Variation in clinical practice can be associated with increased risk, including premature return to school and sport, which has been reported to occur in 44.7% and 43.5% of cases, respectively, for children with sport-related concussions [16].

Two major factors possibly account for the lack of knowledge translation in the clinical care of pediatric concussion. First, CPGs for pediatric concussion have seldom been translated into clinical pathways (CPs), which operationalize CPGs into accessible and actionable algorithms for provider use [17, 18]. Second, implementation typically relies on passive dissemination, rather than planned interventions. Effective interventions require evidence-based, theory-driven approaches to systematically evaluate and address factors that may affect uptake of CPs [19, 20].

Recently, the Theoretical Domains Framework (TDF) has shown promise as a theory-based approach for intervention planning [21]. The TDF provides a comprehensive framework of 14 theoretical domains [22], based on 33 behaviour change theories, that provide concrete guidance for assessing factors that may influence intervention implementation [23-26]. Hence, it serves as a useful approach to design interventions by anticipating relevant implementation challenges. To date, the TDF has been applied to a wide range of clinical settings and issues, from public health prevention planning to prescribing behaviour among providers [27-37].

Among its advantages, the TDF allows for implementation to be linked to underlying theories of behaviour-change techniques. The framework's comprehensive coverage encompasses a broad scope of influences on behaviour, rather than a limited set represented by any particular theory. Hence, implementation challenges can be addressed directly based on the explicit linkage between *theories* and *techniques* of behaviour change [22-25], thereby promoting change in the clinical setting based on evidence-based principles.

In 2015, the Maternal Newborn Child Youth (MNCY) Strategic Clinical Network (SCN) of Alberta Health Services (AHS) identified pediatric concussion as one of its three top priorities, and convened a work group to develop best-practice, evidence-based CPs to guide the management of pediatric concussion in

both emergency department (ED) and primary care settings. With support from AHS and the Brain Canada Foundation, the authors sought to conduct an expanded evaluation of the implementation and impact of the CP for acute care of pediatric concussion across five sites in Alberta, Canada. The project will involve a stepped-wedge cluster randomized trial to examine the health outcomes associated with a CP for the management of pediatric concussion in emergency departments.

Prior to implementing the CP and conducting the trial, we conducted qualitative interviews with ED clinicians to gather feedback on the proposed CP, as well as factors that could potentially influence its implementation. The interviews were conducted using open-ended questions based on the TDF. The current study sought to analyze the interviews to identify the clinical behaviours, attitudinal factors, and environmental contexts that might potentially influence the CP implementation. The study also intended to assess the utility of the TDF as a qualitative research tool to achieve the project's aims.

Methods

Participants and recruitment

A total of 42 ED clinicians (17 physicians, 25 nurses) participated in semi-structured interviews to share their experiences in providing pediatric concussion care along with their views on the barriers and facilitators of implementing a CP. Clinicians were recruited through convenience and snowball sampling from 5 EDs in urban hospitals in Alberta. A recruitment notice was sent to all physician and nursing staff at participating research sites through key site leads (e.g., section chiefs, physician unit leads, nurse unit managers). Those interested voluntarily contacted the study coordinator to arrange an interview. A purposive sampling strategy was used to ensure that nurse educators from each site were represented in the final sample because they play a key role in EDs for disseminating information about new clinical initiatives to staff.

Procedures

From October 2017 to January 2018, interviews were conducted in person by the study coordinator (AL). Interviews lasted approximately 45-60 minutes each and were audio-recorded, transcribed verbatim, and de-identified prior to analysis. Extensive field notes were taken during the interviews to capture contextual factors and nonverbal aspects of the interview. The notes were systematically summarized after each interview to capture immediate impressions and to record key statements or emerging themes to allow for development of a preliminary coding schema for further analysis. A semi-structured interview guide was developed using the TDF based on feedback from our multidisciplinary research team, which included a clinical neuropsychologist, emergency physicians, a neurologist, a developmental-behavioural pediatrician, a critical care physician, a physiotherapist, community representatives with a history of concussion, and concussion researchers. The interview guide included open-ended questions structured to reflect the 14 domains of the TDF (see Table 2).

The study was approved by the Health Research Ethics Boards of both the University of Calgary and University of Alberta (REB17-1543). Signed consent was obtained from all participants to take part in the interviews.

Analysis

A content analysis was conducted following the analytic approach proposed by Bengtsson [38]. Transcribed interviews were analyzed using NVivo to identify common codes, sub-headings, generic categories, and emergent themes. Interviews with physicians and nurses were analyzed together. The lead author (AL) conducted the primary analysis and independently coded the transcripts. Preliminary categories and emergent themes were then discussed with the principal investigator (KOY), who provided critical feedback. In the second-level analysis, the lead author re-examined the transcripts to collapse some categories, identify patterns in the data, and synthesize findings to determine the final themes that corresponded to each domain of the TDF. The final synthesis and interpretation involved further discussions with the principal investigator, who reviewed a detailed summary analysis containing descriptions of themes, supportive evidence from the interviews, and a discussion of the implications of the findings for the CP implementation. The interview summary was shared with the larger research team to garner feedback and to discuss practical steps for the next phase of the study, which will involve working with clinical sites to develop site-specific implementation strategies. Predominant themes were those that participants mentioned most frequently or discussed extensively in relation to considerations for implementing a CP, and were deemed by the investigators to offer valuable insight into guiding the project's goals.

Results

A total of 17 ED physicians and 25 nurses participated in the interviews. Of the physicians, 8 had additional specialized training in pediatrics and 4 in sports medicine. Nurse participants included 9 general nurses, 4 unit managers, 8 nurse educators, 2 licensed practical nurses, and 2 in specialized administrative roles. Overall, the participants were diverse in terms of personal and practice characteristics, including sex, years of practice, clinical role, experience in pediatric care, and knowledge of concussion (see Table 1).

After secondary level analyses, the original 14 domains of the TDF were collapsed into 6 clusters for study purposes: 1) knowledge, skills, and practice; 2) professional roles and identity; 3) attitudes, beliefs, and motivations; 4) goals and priorities; 5) local context and resources; and 6) engagement and collaboration (see Figure 1). Findings revealed significant overlap between responses found in some of the original TDF domains. Hence, the TDF domains were collapsed to summarize the key findings and identify overarching domains that influence clinical behaviour and CP uptake. Predominant themes emerged in each domain as discussed below (see Table 3).

Domain 1: Knowledge, Skills, and Practice

Participants unanimously indicated that concussion training is limited in the ED. Because physicians are responsible for diagnosis and discharge planning, they were more familiar with concussion guidelines and assessment tools than nursing staff. Nurses, however, felt that they could play a larger role in pre-assessment and discharge teaching. They generally saw the study's CP initiative as an opportunity to learn more about concussion and to clarify the role that nurses can play in concussion care.

Concussion was generally viewed as a controversial topic or one in which research is still evolving. The perceived lack of evidence around concussion, particularly in terms of best practices for concussion management and intervention outcomes, made clinicians sceptical about the effectiveness of a proposed CP. Staff highlighted the need for the CP to be evidence-based and to demonstrate its clinical utility in terms of both enhancing clinical efficiency and improving patient care and health outcomes.

Participants emphasized that ED staff are already inundated with information; hence, any newly generated information about the CP needs to be targeted, timely, concise, and relevant. Clinicians indicated that a multi-disciplinary and multi-modal approach to knowledge dissemination is vital in order to reach all staff. Raising awareness of the CP would require working closely with nurse educators and unit managers to distribute information to staff and to implement a reminder system. Staff also identified other avenues for knowledge dissemination outside of the ED that would ultimately be beneficial for improving the coordination of care for concussion patients, such as sharing information with general practitioners (GPs), to whom patients are often referred for follow-up care.

Clinicians acknowledged significant practice variation for concussion care in the ED, and attributed this to factors such as physician preference, clinical practice experience, clinical flow, and lack of practice guidelines. They generally felt that a CP was needed to reduce practice variation and to align practices between nurses and physicians, ultimately to promote more consistent patient care.

Domain 2: Professional Roles and Identity

Clinicians emphasized that respect for clinical autonomy is of vital importance to the success of a CP implementation. Resistance is more likely to occur if clinicians feel that their clinical experience is not being recognized or if the pathway does not result in optimal decision-making for patient care. Clinicians preferred to view the CP as a tool that aids them in their practice rather than as a prescribed set of instructions. They also emphasized the importance of taking into consideration clinical practicality, which means drawing on physicians' clinical expertise and eliciting their feedback about how best to implement a CP.

Clinicians emphasized that the CP should reflect a multi-disciplinary, team-oriented approach. They recommended that nurses have a defined role within the CP so that the responsibility for implementation does not fall solely on physicians. Clinicians shared several examples of nurse-initiated CPs that have been used successfully in the ED to reduce the burden on physicians. Moreover, nurse involvement in CPs helps to enhance clinical flow and efficiency.

Clinicians described how a lack of clarity regarding professional roles, practice variation, lack of coordination in care, and inconsistencies in information provided to patients can all raise the risks of damaging one's professional reputation and also jeopardizing patient care. These are areas that they hope the CP can help to improve in concussion care.

Domain 3: Attitudes, Beliefs, and Motivations

Clinicians were generally supportive of a CP for concussion because they agreed it could address a gap in care. Those with less experience working with children were especially supportive of the CP. They were motivated to learn more about concussion in children because they wanted to increase their knowledge and skills and, ultimately, feel more confident working with a pediatric population. The CP was seen as a way to standardize practice, improve continuity of care, and enhance overall quality of care; hence, despite time constraints and other barriers, clinicians generally saw the value of implementing a CP for concussion.

Time constraints and the busy nature of the ED was repeatedly identified as one of the biggest obstacles to CP implementation. Clinicians may not necessarily be resistant to a CP, but may express scepticism because they are accustomed to working in an environment characterized by constant change and competing priorities. The concept of 'timely teaching' was noted, meaning that dissemination of information about the CP and preparation for its rollout should be strategically timed so as to optimize people's attention to it. Also, clinicians stressed the need to be aware of other initiatives that may be concurrently underway in and around the time of CP rollout, along with the need to determine a strategy, in collaboration with each site, to keep the initiative on clinicians' radar.

Clinicians stated that research goals are not necessarily aligned with clinical goals. Some participants felt that research can be impractical, stating how results do not always lead to improvements in clinical care or patient outcomes. Overall, clinicians expressed conflicting views regarding the utility of and support for research, as academically-oriented sites have a larger research infrastructure and are self-described as being a more pro-research environment. Lastly, a distinction was often made between the academic sites (e.g., large teaching hospitals) and community-oriented ones (e.g., smaller community health centres).

Domain 4: Goals and Priorities

Patient education on concussion was identified as an important area for improving care. Participants highlighted the need to have one reliable source of information on concussion because patients can easily be overwhelmed with information overload. Practical considerations such as language barriers, educational level, and access to technology were identified at two of the community sites as being particularly relevant for their patient populations. Clinicians felt that the study's web portal would be a valuable resource for patients and help streamline the process of providing discharge instructions in the ED. However, they emphasized that clinicians should vet the information on the portal, that it should be

an improvement compared to other existing resources, and that the information should avoid being vague.

Continuity of care was clearly identified as an area needing improvement, as physicians were frustrated over the lack of adequate follow-up information about their patients. Another concern was not knowing what local resources are available, the criteria for referrals to some specialty clinics, and how long it takes for patients to be seen at a referral clinic. Although ED physicians commonly refer patients to GPs, they are simultaneously concerned with the level of knowledge that GPs have about concussion and how patients will be managed by them. They believe this could ultimately result in unnecessary returns to the ED, increased levels of stress in patients, or inappropriate referrals for diagnostic imaging. Overall, participants viewed the CP as an opportunity to provide clarity on local referral options.

Participants emphasized that the CP needs to be 'value added', meaning that, among other things, it should help to streamline concussion care in the ED. For example, it ought to be evidence-based, clear, concise, efficient, easy to locate, avoid duplication of charting, and easily integrated into current practice. It should offer something novel to improve care, otherwise staff would resist adopting it. Some participants suggested that the CP could be particularly helpful in providing clarity as to how to stratify patient management of concussion based on age and severity of the concussion.

Domain 5: Local Context and Resources

Clinicians highlighted several practical considerations for CP implementation, including the timing of the CP rollout, personnel shortages, use of site champions, data ownership, operational approvals, training requirements, accessibility of forms, documentation and charting, and usage of reminder or alert systems. These practical considerations reflected the concrete and everyday needs, operations, or limitations of the ED for implementing a CP.

Factors that are unique to the ED, and which could affect CP implementation, include clinical flow, the nature of episodic care, structural constraints, and the hectic pace and constant change in the ED. A key point highlighted by clinicians is that the ED offers episodic care rather than focuses on follow-up care. This feature has implications for the uptake of the concussion pathway, as clinicians may feel that the CP is not relevant to the ED context if the CP focuses on patient education and follow-up care.

Domain 6: Engagement and Collaboration

Stakeholder engagement was identified as critical to the success of CP implementation. Key staff, such as unit managers, nurse educators, physicians, and site chiefs, need to be consulted and given the opportunity to provide feedback on the CP and the implementation strategy for them to endorse the initiative. Staff are more likely to support the project and ensure the uptake of the CP if they are well-informed about it. The ideal site champions were felt to be those who have a keen interest in pediatrics and are more involved in clinical rather than administrative work. Clinicians stressed the importance of clearly articulating the goals of the CP to garner more support for its implementation.

Clinicians identified opportunities for other collaborations that could be beneficial for the CP initiative. For example, any concussion handouts developed for patients should align with existing resources provided through provincial health agencies. Additionally, collaboration with referral clinics could increase uptake of the CP by improving coordination of care, which was identified as being problematic in pediatric concussion.

Discussion

The 6 clusters of TDF domains identified in the interviews with clinicians each reflect 2-4 predominant topics that can be condensed into six overarching themes regarding clinicians' views on the implementation of a concussion pathway. Each of these overarching themes likely needs to be addressed to implement a CP for pediatric concussion successfully.

Standardization in the Midst of Evolving Research

A predominant theme, particularly with physicians, is the belief that research-derived evidence about concussion is lacking or still in its infancy. Concussion was deemed to be a controversial topic that does not lend itself well to a CP because the research continues to evolve and clinicians are unsure of which interventions will be most effective. Interestingly, this view has both negative and positive implications for implementing a CP. On one hand, clinicians want to support further research to build evidence for best practices and effective interventions. On the other hand, they are sceptical of supporting efforts to standardize clinical practices when they believe that the research is still evolving or that debates persist over the evidence.

Thus, the CP initiative must delineate highlight how it will address gaps in the evidence. Researchers can also address clinicians' concerns by raising awareness about existing evidence regarding concussion management and the benefits of CPs. Clinicians are more likely to adopt a CP if they see that medical and research experts in the field have carefully reviewed the research evidence and considered its clinical application.

Clarifying and Communicating Goals

A striking finding was the evident lack of clarity around what constitutes a CP, and the attendant implications for CP uptake among clinicians. Several physicians asked for clarification about how the study investigators defined a CP. They also insisted that the goals of a CP versus those of a research study ought to be kept distinct, explicitly defined, and clearly communicated to clinicians at the participating sites. Thus, it is necessary to clearly communicate to clinicians the goals of the CP in terms of patient assessment and management of care, clinical flow and organization, and availability of resources. Study investigators can also emphasize how a CP will offer a tool to clarify clinical roles, align practices, and support staff in providing consistent and quality care.

The interviews also identified a need to better understand the personal and professional goals of clinicians themselves. An understanding of clinicians' goals and motivations provides insight into the levels of engagement and interest that they might bring to adopting the CP. For example, very few nurses interviewed had significant experience working with children, and even those who practiced at a designated pediatric care site were relatively new to the setting. However, nurses expressed a strong desire to gain confidence and skills in working with children. Thus, the CP initiative presents a learning opportunity, and implementation strategies should indicate how the CP will address a gap in care.

Another goal expressed by clinicians was the desire to bridge the research-to-practice gap. Interviews revealed a wide range of existing attitudes among clinicians regarding the purpose and clinical utility of research. The underlying message was that research and practice ought to be integrated. This commonly held view has positive implications for clinical pathway intervention studies: CP implementation is more likely to be successful if a study demonstrates to practitioners how, drawing from evidence-based research, a CP can improve care, patient health outcomes, and clinical efficiency.

Knowledge Dissemination and Aligning Information

Knowledge dissemination and the need to consolidate existing concussion information came up frequently during the interviews. Knowledge dissemination here refers to both patient education and informing practitioners about the clinical pathway. Regarding the former, two key points arose: 1) taking into account the unique characteristics of the patient population at each of the clinical sites in preparing educational resources; and 2) standardizing information so that all patients receive the same reliable information on concussion.

The interviews revealed that the patient population at two of the community health centres are comprised of a large percentage of individuals who are non-English speaking immigrants. This language barrier has implications for discharge teaching for clinicians, and needs to be taken into consideration in preparing informational resources, such as patient leaflets. When asked if this language barrier might hamper patients' and families' use of the web portal that will make up a core component of CP, clinicians indicated that the overall benefits of the web portal would outstrip any language barriers. They stated that while English may be a barrier for some parents, their young patients are usually functional in English and often act as interpreters for their parents. Hence, children will likely be the primary advocates for accessing health information on their own behalf, and they will be able to navigate the concussion information available on the study's web portal on their own accord. Lastly, online concussion information may be more effective for families for whom English is a second language. In the context of a highly stressful ED visit for a concussion diagnosis, parents are often not able to fully grasp the information provided to them upon discharge. This stressful context, in conjunction with language barriers, makes the verbal communication of concussion information during discharge teaching largely ineffectual for immigrant patients and families.

Clinicians commented on the apparent dearth of reliable information on concussion, and their uncertainty about where to send patients for further information. A common suggestion was to ensure that any

information (e.g., printed brochures, online content) developed for patients by the study be aligned with other key provincial health resources. Clinicians welcomed the idea of having a single, reliable, evidence-based source of information to direct patients to in order to reduce their anxiety. Overall, the standardization of concussion information is an aspect of the proposed CP that was especially appealing to clinicians, because they see how it can help streamline discharge teaching.

The dissemination of information about the CP to practitioners is one of the more challenging aspects of the initiative. Uptake of the CP requires, first and foremost, adequate exposure to information about the pathway, an understanding of the logistics and its benefits, and personal motivation to modify clinical behaviour. Successful implementation is also largely contingent on having staff in various roles throughout the department, from physicians to unit clerks, be aware of the initiative and to act as reminders for colleagues. Given the large number of clinical staff in busy EDs, challenges will inevitably arise in coordinating the roll-out of information about the CP prior to implementation.

Clinicians strongly advocated a knowledge dissemination strategy that uses multiple modalities. Practical suggestions included targeting different shifts, using site champions to disseminate information, giving presentations to both physician and nurse groups, sending electronic notices, posting bulletins in newsletters, putting up posters, doing site visits prior to and after the CP launch, attending in-service sessions, and devising other alert systems using existing resources at each site.

A Team-Oriented Approach

Physician and nurses alike emphasized the value of taking a multi-disciplinary, team-oriented approach to ensure a successful CP implementation. Physicians expressed concern that the introduction of a CP will be an additional burden to their workload; they wished to avoid being solely responsible for completing the tasks required of the CP. Other successful CPs were mentioned to illustrate examples of nurse-initiated pathways where responsibilities for carrying out various tasks within the CP were distributed across different clinicians. A challenge in devising a uniform protocol that involves both physician and nurse participation in a CP is that clinic flow varies from site to site and clinician roles may differ in the provision of concussion care.

Nurses emphasized that they wish to play a more active role, not only in concussion care, but also in the implementation of CPs in general. Nurses embrace their role as patient educators and want to ensure that patients and families have adequate health information upon discharge. Hence, they see an opportunity within a CP to assume a more defined role in discharge teaching. Additionally, many nurses expressed interest in taking a more active role in patient pre-assessment and to learn more about concussion. They also remarked on how new initiatives involving the translation of evidence-based research into practice are often oriented primarily to physicians, while affording nurses only cursory information and limited involvement.

Site Engagement

Clinicians discussed how the engagement process is critical to the success of CP implementation because, first and foremost, staff want to have an opportunity to provide critical feedback on the feasibility and clinical utility of the CP. Collaboration ensures that sites will be more motivated to achieve the common goals set out by the CP implementation team. Several clinicians spoke candidly about how staff do not take well to external research studies that they feel have been imposed on them, especially at community health sites, which may be characterized by an intrinsic reluctance to readily adopt initiatives introduced by larger academic hospital sites. This apparent tension between the two types of clinical facilities speaks even more to the need for site engagement, to ensure that each individual site is given the opportunity to share its unique needs, environmental context, and available resources.

A surprising finding related to site engagement was the common view held by nurses that they have not been as actively involved in consultation and planning on previous CP initiatives, despite being critical to their success. As mentioned, nurses play a key role in disseminating information to staff, reminding physicians about the new CP, and facilitating implementation through initial patient screening and discharge teaching. Thus, nurses ought to be sufficiently consulted to ensure adequate site engagement.

Based on the wealth of information about site-specific considerations shared by clinicians, the process of site engagement is clearly critical to CP implementation. Clinicians brought up practical considerations, such as competing priorities in the ED, changes in protocols or use of technology, operational approvals, personnel changes, and local resources. Attitudinal considerations include the perception that a CP for concussion is not relevant for an acute care setting because emergency medicine focuses on episodic care rather than follow-up care, which is a large component of any proposed CP for concussion. Some clinicians also spoke about the reality of “research fatigue” and the difficulty of trying to stay engaged in long-term initiatives when they are immersed in the hectic ED environment.

Streamlining Clinical Processes

Clinicians stated emphatically that a CP would not be well-received if it did not help to streamline clinical processes. Given the hectic ED environment, clinicians look for how new initiatives make a “value added” contribution to routine clinical practice. Physicians are often overloaded in any given shift and are concerned that a CP will be cumbersome or impede clinical efficiency. They wish to avoid, for instance, the duplication of charting, lengthy and unnecessary patient assessment and history taking, and prolonged discharge teaching. Interestingly, physicians implied that any new proposed practices should not deviate too much from current routine practices, but rather should improve on them by streamlining processes to improve clinical efficiency. Hence, “value added” refers both to improving patient care through evidence-based practices and to facilitating clinic flow by reducing the amount of time clinicians need to spend on administrative tasks such as charting or paperwork for referrals. This finding suggests that the case for CP implementation ought to highlight how the CP supports and enhances existing practices, rather than involving significant changes in practices that might be perceived as more daunting or intrusive.

Reflection on Using the TDF

The results of the interviews described here represent the initial steps needed to inform the development and implementation of a CP that aims to improve pediatric concussion care. Feedback from clinicians on the feasibility and practical considerations of CP implementation proved to be highly valuable in guiding the next phase of the larger parent study. Given how time-consuming and complex implementation studies can be [36], this initial research helped to identify clinical behaviors, attitudes, and other environmental factors that must be taken into consideration to ensure the successful uptake of the CP in busy ED settings. The application of the TDF framework allowed us to develop a comprehensive, semi-structured interview guide, and also served as a useful tool to organize and structure the analytical framework to identify broad patterns, emerging themes, and overlapping areas of concern identified by participants. As other studies using the TDF have noted, the TDF allows for a focused and efficient means of data analysis [28], and is particularly useful for readily identifying and grouping general sets of beliefs into comprehensive domains that are based on validated behavior change theories. Most importantly, the TDF serves as an effective link between theory-based investigation and intervention in a clinical setting [22].

While the TDF provided a comprehensive framework for the interview guide, we found significant overlap between some of the domains based on participants' responses, leading to some redundancy in the interviews. Other investigators have remarked on related limitations [39, 40]. When related questions regarding beliefs, intentions, goals, and emotions are spread out across different domains, participants' responses end up being heavily weighted to those areas by sheer virtue of the frequency with which they appear in the TDF. Hence, in our analysis, some TDF domains were clustered to reduce redundancy and to capture the underlying elements encompassed by the new category.

Another limitation is that the TDF is perhaps too prescriptive, and may preclude the analysis of qualitative data in an inductive manner that allows themes to emerge from participants' own concerns and insights rather than through a set of pre-determined domains. A salient finding from the interviews, for example, was the recurring question of what actually constitutes a CP, what are its goals, and why are clinicians asked to change their clinical behaviour when they do not feel that it is necessary to do so. These responses helped the study team re-examine its *a priori* assumption that clinicians have a clear idea of what a CP entails and that the adoption of a CP, with related changes in clinical behaviour, was needed to improve care for concussion. Participants' responses, however, suggested that such an approach could be viewed as threatening or dismissive by experienced clinicians, who suggested that the CP implementation ought to be reframed as the presentation of tools to *support practice* rather than to *change behaviour*.

Ultimately, the TDF provides a useful starting point as a comprehensive, evidence-based, and theory-driven framework for developing a sound guide to structure open-ended qualitative interviews regarding the potential implementation of new clinical practices. Then, used flexibly as an analytical tool to guide data analysis, the TDF can be employed in conjunction with a more inductive thematic analysis approach to qualitative research that allows for themes to emerge from participants' responses themselves, rather than forcing them to map onto predetermined domains. Using this flexible approach, novel findings may

arise, as was the case in our study, that provide great insight into clinicians' views on the goals and challenges of implementing a CP.

CONCLUSION

Application of a comprehensive, evidence-based, and theory-driven framework in conjunction with an inductive thematic analysis approach enabled six themes to emerge as to how to best implement a concussion clinical pathway. These overarching themes must be addressed to successfully implement a CP for pediatric concussion.

List Of Abbreviations

AHS – Alberta Health Services

CP – clinical pathway

CPG – clinical practice guidelines

ED – emergency department

GP – general practitioner

MNCY – Maternal Newborn Child and Youth

SCN – Strategic Clinical Network

TDF – Theoretical Domains Framework

Declarations

Ethics Approval and Consent: The study was approved by the Health Research Ethics Boards of both the University of Calgary and University of Alberta (REB17-1543). Signed consent was obtained from all participants to take part in the interviews.

Availability of Data and Material: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Authors' Contributions:

1. AL collected and analyzed the data and prepared the manuscript.
2. RZ, BW, JZ, and KS assisted in the development of the interview guide, interpreted the data, and edited the manuscript.
3. AM, AC, DJ, BC, and KB assisted in the development of the interview guide, provided guidance in the research design and stakeholder consultations, and interpreted the data.
4. JB and AK assisted in the literature review and manuscript preparation.
5. KY is the Principal Investigator of the study and provided guidance throughout the research process. KY also analyzed the data and edited the manuscript.

Consent for Publication: Not applicable.

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Tables

[Table 1 could not be inserted due to technical limitations. It can be found in the supplemental files]

Table 2. Semi-structured topic guide for clinician interviews

Domain	Sample Questions
1. Knowledge	To your knowledge, what are the existing guidelines for the diagnosis and management of concussion in children? Are there aspects of pediatric concussion that you would like to learn more about? What is the best way for you to learn about the clinical pathway?
2. Skills	How would you describe the training you've received in pediatric concussion care?
3. Social/professional role and identity	Given your role, which aspect of pediatric concussion care do you feel you are most responsible for? Would the introduction of a clinical pathway affect your role? How?
4. Beliefs about capabilities	How would you describe your level of confidence around being asked to implement a clinical pathway for concussion?
5. Optimism	Do you think that the implementation of a clinical pathway will make any difference? Do you anticipate that there will be any barriers to implementing the clinical pathway?
6. Beliefs about consequences	In your opinion, what do you think are the possible negative aspects of implementing a clinical pathway?
7. Reinforcement	What are the best ways to ensure that clinical staff will use the clinical pathway as expected?
8. Intentions	Currently, how motivated would you say you are to learn about and implement a new clinical pathway in your practice? Do you anticipate this level of motivation could change over time? If so, why?
9. Goals	Given your clinical responsibilities, how would you prioritize the clinical pathway implementation relative to other activities?
10. Memory, attention, and decision	What are some ways we can support you, other clinicians, and the clinic in general in implementing a clinical pathway?
11. Environmental context	What resources are available to support you or the clinic in general in the implementation of a clinical pathway? Can you think of any organizational limitations that you feel would hinder your ability to implement the clinical pathway effectively?
12. Social influences	Are there factors such as interpersonal relations among colleagues or professional roles and boundaries that could impact the implementation of a clinical pathway?
13. Emotion	Do you foresee any potential for the clinical pathway implementation to elicit negative emotions among clinicians or hospital administrators?
14. Behavioral regulation	In terms of your personal practice, what are the mechanisms that will help you ensure that you regularly and effectively implement the clinical pathway?

Table 3. Clinician perspectives influencing behaviours related to the implementation of a clinical pathway

Domain	Theme	Sample Quote
1. Knowledge, Skills, and Practice	Lack of training on concussion	"I received no formal training ... Nobody's ever talked to me about pediatric concussion. I have received most of it through advanced certification courses ... Most knowledge about pediatric concussions is self-directed." (04RN)
	Ambiguity around concussion and need for evidence-based info	"The most difficult thing I find with concussion care at the moment is I don't necessarily know what the right answer is. Like the research is pretty nebulous as to what we should actually be telling people ... there's a lot of unanswered questions." (24MD)
	Multiple modalities for knowledge dissemination	"Just [use] multiple modalities to reach people. It's a big team." (07RN)
	Practice variation	"There's just not a lot of consistency in practice right now, so I think having a little more consistency ... to guide their orders or their interventions ... is always a benefit." (22RN)
2. Professional Roles and Identity	Respecting clinical autonomy	"Some people might, with pathways, [feel that you are] taking away autonomy from nurses." (21RN)
	Distribution and delineation of roles	"Clinical pathways with defined nursing roles can be very successful." (19RN)
	Managing professional identity and mitigating risks	"If I'm telling a family that I'm sending a referral to X, Y and Z clinic, they will be contacted within 2-3 days for an assessment in 1-2 weeks, that better happen, because [if it doesn't], then that destroys your credibility." (11MD)
3. Attitudes, Beliefs, and Motivations	Supportive attitudes and motivations	"I think especially at this site, if you say 'pediatric', people will jump because it's not necessarily everybody's comfort zone here ... so a lot of people really jump at the opportunity to get any more pediatric education just to increase their comforts." (10RN)
	Skepticism, indifference, and potential resistance	"We have so many other commitments in terms of clinical work and things like that that sometimes it's a barrier. It's just one more thing to do in our days ... [we wear] many hats as physicians and many of us are involved in teaching and meetings and committee work and all sorts of things." (29MD)
	Attitudes towards	"I mean it's still a research project. It's not mandatory ... so that might just be something that takes the back seat when it's really stressful and busy." (09RN)

	research vs. clinical goals	
4. Goals and Priorities	Enhance patient education and manage expectations	“The thing that parents need most when their kids have concussions is reassurance and some guidelines.” (19RN)
	Improve coordination of care	“If this pathway tightens up follow-up care after emergency, that would help me immensely. I’ll feel much more confident in making those referrals. So I wish that there was a neater process for that because there’s not many different places I can send them ... and the most frustrating is to have a rejection for a referral.” (11MD)
	Streamlining processes	“It has to offer [clinicians] something that they’re not getting right now. Like it’s either easier for them or it’s making the decision pathway clearer, or it’s helping them access resources for people ... there has to be some benefit to it, or I think it’s going to be a challenge to sell it.” (24MD)
5. Local Context and Resources	Practical considerations	“From my experience as a manager, you know, the uptake on things isn’t immediate. You have to continue to nurture it and remind and keep going and that’s probably true in most sites if they’re honest about it.” (32RN)
	Site-specific considerations	“That’s the nature of emergency medicine. We see episodic care. We never find out follow-up ... All emergency departments all do the same thing, they only see people once, and they’re more interested in the diagnosis than the follow-up per se.” (15MD)
	Uniqueness of acute care setting	
6. Engagement and Collaboration	Stakeholder engagement	“[It is important to] make sure that it’s not being dictated down from the Children’s Hospital, that this is our protocol. Really kind of incorporating and bringing it to the department, rather than just being implemented or forced.” (04RN)
	Other collaborations	“I feel like the most successful pathway is asthma and that’s definitely multi-disciplinary ... the strength of the asthma pathway was it not only empowered nursing, but RTs [as well]. So [there were] two groups for keeping this pathway alive and well ... [and] multiple champions in different disciplines that provided for its successful outcome, rather than having one or two.” (07RN)

Figures

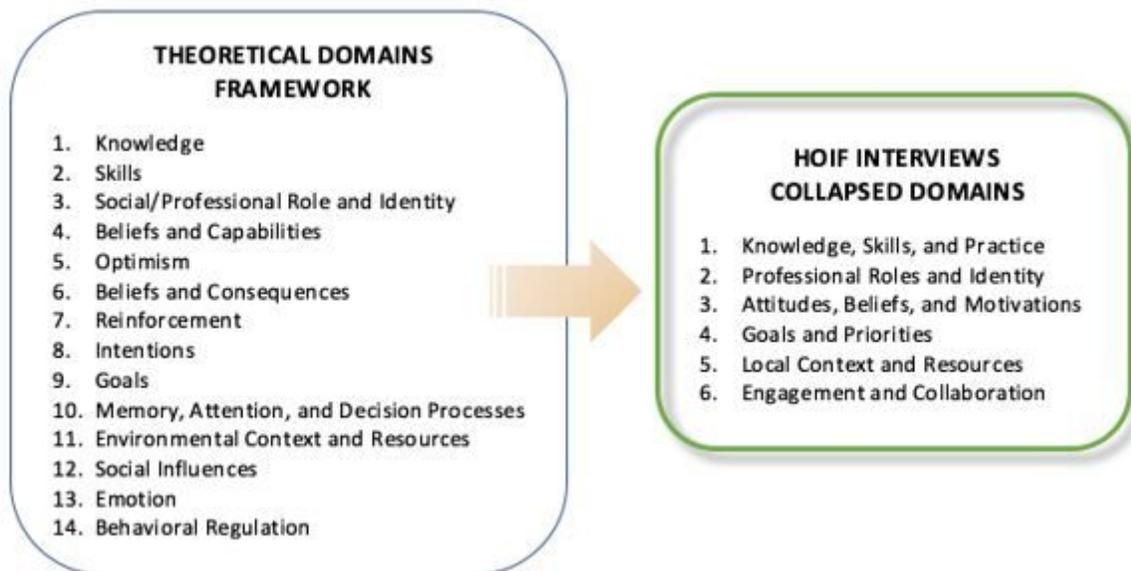


Figure 1

Theoretical domains framework collapsed for HOIF project interviews

Supplementary Files

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