



Constraints to implementing guidelines for the identification, assessment, and management of childhood obesity in the clinical care setting: Prevention and treatment framework

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ARTICLE INFO

Keywords:

Child obesity
Health care providers
Prevention and control
Risk assessment

ABSTRACT

The “Pathway for the Identification, Assessment and Management of Overweight and Obese Children & Youth” was developed to support healthcare providers in identifying and treating childhood obesity in British Columbia (Canada).

Purpose: The study aimed to determine the feasibility and effectiveness of using the Pathway in clinical settings. **Methods:** 13 healthcare providers (7 family physicians, 2 pediatricians, 2 registered dietitians, and 2 nurse practitioners) assessed the Pathway and participated in semi-structured interviews in 2015. A direct constant comparative analysis guided the coding of the interviews in the NVivo 9 software.

Results: The interviews uncovered the complexity of factors that influenced practices of healthcare providers. Three broad issues were identified as required if the “Pathway” were to be used and fully implemented in practices. First, the “Pathway” needs to be modified in terms of how it is presented and explained and be supplemented with appropriate documentation and resources for its implementation. Second, the constraints that limit implementation need to be addressed and should include a focus on both individual (i.e., the healthcare providers themselves) and environmental (i.e., factors within and outside of providers' organizations) factors. Lastly, there is a need to establish processes and/or infrastructure for adapting the “Pathway” to the local context as resources and supports vary by organizations and regions.

Conclusion: Healthcare providers should be involved in screening and managing childhood obesity. Addressing the challenges found in this study will enable healthcare providers to take a more active role in addressing childhood obesity in their day to day practices.

1. Introduction

Childhood obesity has been identified as a serious health concern in Canada and worldwide (Belanger-Ducharme and Tremblay, 2005). According to a recent survey, almost 1 in 3 Canadian children between the ages of 5 to 17 are either overweight or obese (Roberts et al., 2012). As a result, these children are at increased risk for a series of health issues such as type 2 diabetes, cardiovascular risk factors, hypertension and psychological issues (Singh et al., 2008; Going et al., 2011; Zalesin et al., 2008; Hopkins et al., 2011; Reilly et al., 2003).

As the majority of children seek medical treatment from their family physician (Mazur et al., 2013), the primary care setting provides an ideal opportunity for screening and treating for childhood obesity.

More specifically, about 84% of Canadians aged 12 or older reported having a regular family physician with between 8 in 10 contacting their doctor per year (Statistics Canada, 2013). Therefore, early detection of weight-related health issues by physicians is ideal since childhood obesity often tracks into adulthood (Singh et al., 2008).

Despite limitations that are well recognized, Body Mass Index (BMI) is accepted as a screening tool for obesity (Centers for Disease Control and Prevention, 2012). However, measurement of BMI is rarely undertaken for obesity screening in children (Hopkins et al., 2011; Mazur et al., 2013; He et al., 2010). Instead, 90% of healthcare providers report relying on their professional judgment (visual cues) to assess patients at risk for obesity which has led to many inadequate assessments of child weight status (He et al., 2010; Spurrier et al., 2006). In the past,

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<https://doi.org/10.1016/j.pmedr.2018.08.016>

Received 16 April 2018; Received in revised form 2 August 2018; Accepted 26 August 2018

Available online 30 August 2018

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only a small number of healthcare providers (30%) have reported using the recommended BMI-for-age-reference tool for classifying overweight/obesity (He et al., 2010). Despite recognizing the need to screen for childhood obesity, healthcare providers have identified the following barriers, including: beliefs in their capability to address the problem efficiently, lacking the skillsets to counsel children and their families about weight management, discomfort in dealing with weight related issues, being unable to engage parents on this issue, and lack of reimbursement for counseling and managing obesity in their practice (Hopkins et al., 2011; Mazur et al., 2013; Rand, 2014; Story et al., 2002; Krebs et al., 2007). However, when physicians have been specifically trained to address childhood obesity in their day to day practice, they were more likely to measure BMI, report BMI percentiles, and follow obesity prevention guidelines (Klein et al., 2010; Shaikh et al., 2013).

The most recent set of guidelines (2015) put forth by the Canadian Task Force for Preventive Healthcare (Care CTFoPH, 2015) provides recommendations for growth monitoring and the prevention and management of overweight and obesity in children and youth in primary care. To assist practitioners in interpreting these recommendations, Child Health BC (CHBC) worked with key provincial partners to arrive at consensus on the key components to include in a care pathway for overweight and obese children and youth in British Columbia Canada (BC). As a result, the “Pathway for the Identification, Assessment and Management of Overweight and Obese Children & Youth” (see Appendix A) was developed. Specifically, the “Pathway” is a tool that guides healthcare providers in the assessment of BMI, lifestyle habits (physical activity, nutrition, and sedentary behaviours), risk factors (family history and health history), and motivational readiness to change health behaviours. Healthcare providers move along the “Pathway” based on their assessments and are given various courses of action to help the child and their families live a healthier lifestyle. Therefore, the “Pathway” has the potential to be a valuable resource in the healthcare setting when it comes to managing obesity.

The purpose of this qualitative study was to understand the factors that facilitate or impede the implementation of the “Pathway” in various healthcare practice settings within British Columbia (BC). In particular, the study focused on healthcare providers' perspectives with regards to the ease of using this tool in their practice as well as their perceptions of barriers and facilitators to implement the tool in their practice.

2. Methods

2.1. Participants

Healthcare providers in BC were invited to participate in the study, if they met the following inclusion criteria: be a family physician, general pediatrician, nurse practitioner, or registered dietitian who sees an average of five or more patients per week between the ages of 2–17 years, fluent in English, and able to implement or try out the “Pathway” in their practices. Recruitment of healthcare providers in BC was initiated through means of purposive sampling and presentations made by members of the project advisory committee. A total of 32 healthcare providers were initially invited to participate in the interviews (41% response rate). Initially, we planned to interview 15 healthcare providers (8 family physicians, 2 pediatricians, 2 registered dietitians, and 3 nurse practitioners); however, recruitment was stopped at 13 since theoretical saturation was reached. Additionally, representation of healthcare provider selection was ensured across different practice settings (urban, suburban, and rural) (see Table 1).

2.2. Protocol

Healthcare providers were provided with the “Pathway” and were asked to implement it in five or more pediatric patients. The “Pathway” provided a visual guide for healthcare providers in identifying,

Table 1
Demographic characteristics of healthcare providers (N = 13).

		N (%)
Types of provider	Family physicians ^a	7 (53.8%)
	Pediatricians	2 (15.4%)
	Registered dietitians	2 (15.4%)
	Nurse practitioners	2 (15.4%)
Location of practice	Urban	7 (53.8%)
	Suburban	3 (23.1%)
	Rural	3 (23.1%)
Years of experience	1 to 10 years	7 (53.8%)
	11 to 20 years	1 (7.7%)
	21 + years	5 (38.5%)
Sex	Male	5 (38.5%)
	Female	8 (61.5%)

^a Note: we interviewed 1 family practice resident as the informant had interest in implementing the “Pathway” during the family practice rotation.

managing, and treating childhood obesity (see Appendix A). The “Pathway” was supplemented with: 1) a 1-page explanation to support implementation in practice, 2) a list of provincial programs providers can refer their patient to or patient can self-refer themselves to (i.e. the MEND and Shapedown BC programs were in-person programs that provide lifestyle modification interventions and the HealthLink BC Eating and Activity Program for Kids was a telephone counseling program (see Appendix A for further description of these programs); and 3) a link to a website that included resources for both practitioners and families. Importantly, the province ensured that all providers/families would have access to at-least one program. Semi-structured interviews commenced after each provider had gained practical experience with its use. Interviews began by asking participants questions about the “Pathway” and what they currently do in their practice. The second set of questions, informed by Diffusion of Innovations Theory (Rogers, 2003; Rogers, 1983; Rogers, 1995), asked participants to discuss specific attributes that facilitated or limited implementation of the “Pathway” (i.e., relative advantage, complexity, observability, compatibility, and usability of the tool within their practice). The second set of questions, informed by Organizational Theories (Steckler et al., 2002), asked participants to identify characteristics of their environment that impede or facilitate implementation. Concepts included in the interview were *organizational capacity* to implement the “Pathway”, *environmental influences* that affect the implementation of the “Pathway”, *linkage systems and agent* and their ability to refer their patients to other healthcare providers, and *level of institutionalization* of the “Pathway” (i.e. implementing the “Pathway” as routine practice in their practice). The last set of questions, informed by Social Cognitive Theory (Bandura, 2001), asked participants whether they felt they had the skills or resources to implement the “Pathway.” These questions focused on the participant's behavioural capacity and self-efficacy or confidence in using the “Pathway.”

The principal investigator along with another research member conducted the interviews from the end of February 2015 to the end of July 2015. The 60-min interviews were administered via telephone or in-person. Each healthcare provider received a monetary incentive for their participation based on sessional fees for each profession.

This study protocol was approved by the University of British Columbia Children's and Women's Research Ethics Board (H14-01735) as well as by the Vancouver Island Health Authority, Provincial Health Services Authority/Interior Health, and the Fraser Health Authority Ethics Board.

2.3. Data analysis

Interviews were recorded with permission from providers and transcribed verbatim. The principal investigator along with two staff coded the first three interviews to develop the coding scheme and

Table 2
Factors that impede or facilitate implementation of the “Pathway”.

Themes	Sub-themes/Description
Attributes of the “Pathway”	
Relative advantage	<ul style="list-style-type: none"> ● Points to useful resources (Live 5-2-1-0 & provincial programs) ● Helps structure processes for screening and clarifies management expectations ● Raises awareness for measuring BMI ● Normalizes assessments of BMI
Complexity	<ul style="list-style-type: none"> ● It's logically presented vs it's complex and not intuitive ● Lack of time ● Treatment complexity ● Overlap with other guidelines for special populations (e.g., mental health guidelines) ● Challenging to obtain accurate height and weight measurement in young children ● Improving readiness to change is a challenge
Compatibility	<ul style="list-style-type: none"> ● It's what I do or partially do ● Assessments in line vs not in line with what I measure ● Incompatible with purpose of visit
Outcome expectation	<ul style="list-style-type: none"> ● Potential harmful effects on both parents and children ● Not convinced that this will help with obesity ● The problem is much bigger than this
Usability	<ul style="list-style-type: none"> ● It needs the supporting resources and infrastructure ● It lacks the appropriate treatment resources
Characteristics of practices	
Organizational capacity	<ul style="list-style-type: none"> ● Having staff who can do height and weight measurement ● Having a team based practice ● Having valid screening tools to use ● Having proper infrastructure support (e.g., Body Mass Index (BMI) entered in an Electronic Medical Record system)
Linkages and system issues	<ul style="list-style-type: none"> ● Isolated communities have no resources or limited resources ● Some communities do not have the options to refer to specialists or experience difficulty in accessing specialized services ● Information is not shared among professionals
Institutionalization	<ul style="list-style-type: none"> ● Policy within practices can support implementation (e.g., stating when and how often BMI should be taken) ● Reimbursement/payment plan limits ability to do annual physicals ● Healthy Child Checkup provides an opportunity to implement the Pathway in younger children
Characteristics of providers: required skills and knowledge	
Lack skillsets and experiential training to	<p>Use Motivational Interviewing Know which strategies to use at different stages of readiness Know how to promote change in behaviours beyond promoting the health recommendations Deal with underlying family issues Address concerns of low income families Know how to sensitively deal with body image and weight bias issues</p>
Lack awareness of available resources or health recommendations	<p>Unsure which program to refer (Shapedown and/or MEND) Unaware of what is available in their communities (to supplement existing programs or if current programs are not available or appropriate for the family) Lack knowledge of health recommendation, 5-2-1-0 message, or overall dietary changes beyond the 5-2-1-0 message</p>

Live 5-2-1-0 educates about health where, 5 stands for enjoying 5 or more fruits and vegetables every day, 2 stands for no more than 2 h of screen time a day, 1 for 1 h of physical activity each day, and 0 stands for zero sugary drinks.

MEND (MIND, EXERCISE, NUTRITION, DO IT!) was a healthy lifestyle program that support both family and child in making healthy choices and was delivered in the community.

Shapedown is a lifestyle modification intervention for children that targets both the family and child and is delivered by a multi-disciplinary team.

incorporated elements from the theoretical perspectives (Diffusion of Innovations Model, organizational theories, and Social Cognitive Theory). However, these theoretical perspectives were only implicated during the initial coding. As the coders were immersed in the transcripts, new themes emerged inductively rather than being guided by the original theoretical perspectives. As new themes emerged, the coding scheme was adapted and the data was iteratively coded using a direct constant comparative analysis (taking multiple looks at the data). At least two individuals coded and reconciled the remaining interviews. All discrepancies were triangulated by having a third person. All interviews were coded into NVivo 9- qualitative software (SQR International PSY Ltd. Version 9, 2010).

3. Results

Table 2 summarizes the factors that facilitate or impede the implementation of the “Pathway” by: 1) attributes of the “Pathway”, 2) characteristics of practices, and 3) characteristics of providers.

3.1. Attributes of the “Pathway”

3.1.1. Relative advantage

In general, the “Pathway” was perceived to be advantageous as: it introduced them to useful resources they were unfamiliar with; it reminded them to measure BMI and health behaviours; and it triggered them to discuss important aspects when consulting those families affected by childhood obesity (i.e., assessing readiness to change and focusing on the familial environment). Additionally, providers mentioned the “Pathway” has the potential to reduce patients' feelings of stigma if BMI measurements and health questions became standard practice [Family Physician quote: ...if you have a Pathway, it's easier to not stigmatize it and just say “There are the guidelines and this the Pathway we are following,” and it makes it simpler sometimes to ask the questions that you might be uncomfortable asking].

3.1.2. Complexity

Some thought the “Pathway” presented information in a clear and

logical manner, while others found it complex. Other complexity issues pertained to the barriers encountered with implementation, including: a) struggling with the time-consuming nature of implementing the “Pathway” [Family Physician quote: *...it needs to be demonstrated...that it would fit into a 15-min appointment*]; b) unclear of whether they can be involved in treatment when the process likely extends over multiple visits; c) unclear how to implement the “Pathway” when it overlaps with others' established processes for measuring metabolic profiles in specific populations (e.g., mental health); d) inability to obtain accurate measurements of height and weight among younger children; and e) unclear what to do with families who are not ready and remain in this stage forever [Family Physician quote: *“... a lot of (children/parents) are in the “not ready box” ...improving readiness to change...is a challenge*].

3.1.3. Compatibility

Views among healthcare providers were mixed when it came to discussing compatibility with their current practice or roles as some indicated that they were already following it while others followed some of it. Although healthcare providers acknowledged their role in managing weight concerns, many were not properly assessing the situation or addressing all aspects. To improve the compatibility of the “Pathway” some suggested adding assessments that pertain to mental health issues and use of psychotropic drugs; aligning lab assessments with current recommendations (e.g., fasting lipids); and clarifying interpretation of the laboratory results for pediatric patients. Additionally, providers mentioned that the “Pathway” is incompatible with the purpose of the visit [Registered dietitian quote: *“...how to get patients open to even discussing some of this stuff when it is not the reason why they have come...we ask these questions and they just look at us strange like why are you asking these questions”*].

3.1.4. Outcome expectation

As a result of implementing the “Pathway”, providers had some concerns about the extent to which the “Pathway” can manage and treat childhood obesity and whether they can make a difference in a one-on-one interaction. In particular, issues ranged from potential harmful effects (e.g. children and parents feeling stigmatized, depressed, or anxious) to having realistic expectations about what lifestyle interventions can achieve [Registered Dietitian quote: *‘...that nutrition and physical activity are going to be the be all and end all of helping obesity, which is a dogma that is kind of pervasive and quite untrue, and so I wouldn't want that to be the thing that someone got out of it and they tried to teach patients over and over again*]. Additionally, it was suggested that the obesity problem requires a multi-strategy solution that involves social and environmental determinants of health and they did not see themselves as playing a larger role.

3.1.5. Usability

The biggest reluctance in using the “Pathway” was that practitioners felt the “Pathway” needed supporting resources and infrastructure along with appropriate treatment resources. Suggestions from practitioners to improve the uptake of the “Pathway” were as follows: supplement the “Pathway” with a BMI assessment manual; consider adding measurement of waist circumference; list the complications of obesity; explain resources in the “Pathway” and supplement the “Pathway” with resources. [Family Physician quote: *“...it's great that we can identify it (obesity), but if we don't have a definitive treatment plan to help change, and I know we change Shapedown, and I know we have MEND, but if we don't have anything else for the kids that fall in between then it's almost a futility thing. Why identify?”*]

3.2. Characteristics of practices and healthcare providers

Table 2 also highlights the characteristics of practices and providers that either facilitate or impede implementation. As the settings in which healthcare providers practice are so different and the amount of

resources for implementing the “Pathway” varies greatly, Table 2 highlights the resources some practitioners have, while for others it highlights the resources they would like to have in their practices to implement the “Pathway”. As stated by a family physician (see quote below), most physicians, nurse practitioners, and pediatricians have the skills to identify those who are “overweight/obese.” However, they lack the skillsets to address the underlying issues, either knowing what resources are available or having the skills to change behavior. Table 2 highlights what skillsets providers require as well as current knowledge gaps.

“...pediatricians, NPs, and physicians I think are very good at identification of this, you know, I don't want to call it ‘disease’, this chronic condition, it's the finishing piece, it's the skillsets that you find...adequate therapies to help it, either knowing what the resources are or having the skillset with behavior change, would push a kid and families even to be looking at, you know, even a 5-2-1-0 piece...I still think that there needs to be some skillsets and infrastructure to make this Pathway truly helpful.”

3.3. Constraints to implementation: healthcare behavior change system

Fig. 1, adapted from Michie's (Michie et al., 2011) behavior change system, highlights how the constraints identified in Tables 2 can be summarized. Briefly, the healthcare behavior change system shows that capability and expectation of healthcare providers as well as environmental constraints can directly influence healthcare providers' motivation to implement the “Pathway,” which in turn determines whether they implement the “Pathway” (i.e. the desired behavior). Interestingly, the system has feedback loops from behaviours as utilizing the “Pathway” may increase awareness of whether they lacked the capacity to implement or are encountering new or unexpected environmental constraints when they tried to implement it. All of these factors could potentially undermine the implementation of the Pathway in practice.

Fig. 2 expands the behavior change system in Fig. 2 to highlight the constraints that were identified in Tables 2 and 3 that limit implementation of the “Pathway”. The expanded system uses elements of the chronic care model adapted for childhood obesity (Gance-Cleveland et al., 2010) to organize the environmental constraints and constructs from social-cognitive theory (Baranowski et al., 2002) to identify the individual constraints. Fig. 2 synthesizes the information gathered from the interviews and serves to highlight that full implementation of the “Pathway” needs to address the complexity of both of these constraints. Developing integrative approaches that address both the environmental and healthcare providers' constraints are needed to develop proactive solutions to deal with childhood obesity in the healthcare context.

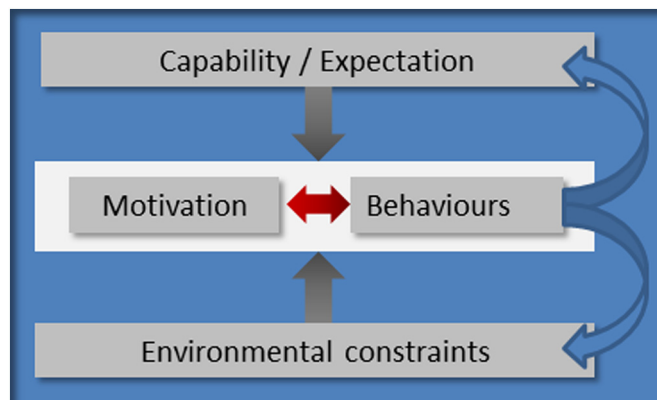


Fig. 1. Behaviour change system.

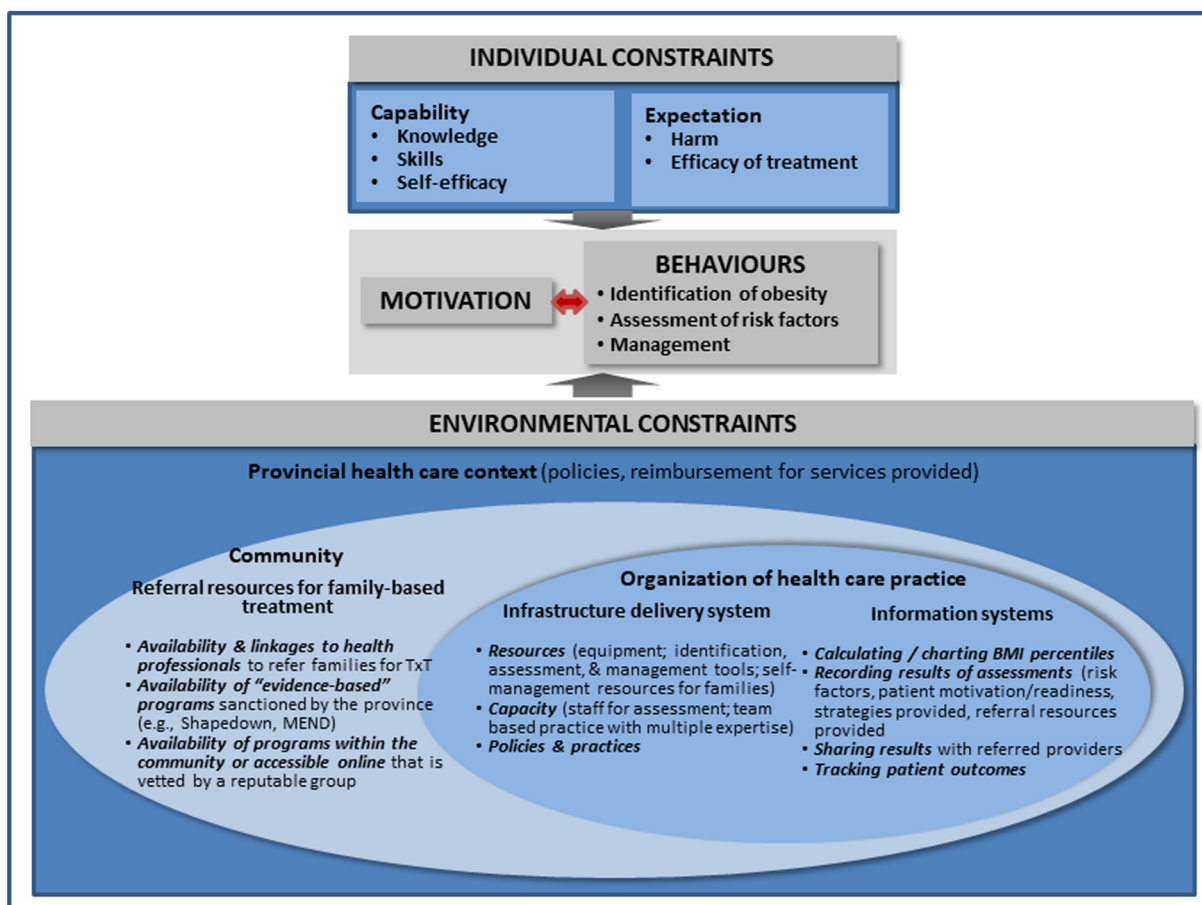


Fig. 2. Constraints that limit implementation of childhood obesity practice guidelines: A framework for action.

3.3.1. Environmental constraints

As shown in Fig. 2, the interviews revealed constraints that may affect implementation and were related to: a) *Organization of healthcare practices*, in terms of how they are organized and the extent to which they have appropriate infrastructure delivery systems (i.e., resources, capacity, and policies and practices) and supporting information systems (i.e., electronically calculating and charting BMI percentile, recording results of the assessments; sharing results with referred providers; and for tracking patient outcomes); b) *Community resources* which refers to the resources they have in their community for treatment, including availability and easy access (decent wait times) to health professionals (registered dietitians, psychologists, pediatricians); availability of evidence-based programs sanctioned by the province (Shapedown and MEND) for family-based treatment; and availability of other programs within the community or accessible online that are sanctioned or vetted by a reputable group to which they can refer families to; and c) the *Provincial healthcare context* such as policies about what services providers can claim or policies that extend well-child visits beyond a certain age.

3.3.2. Capability and expectation

As shown in Fig. 2, providers' individual constraints not only consisted of ensuring that they had the capability to implement the “Pathway,” but also included the need to address issues related to outcome expectation, meaning the extent to which providers perceived improvements in their patients' health outcomes as a result of using the “Pathway.” According to Table 2, increasing capability includes a broad set of skills in which more experiential training is required to know how to use motivational interviewing, which strategies to use at different stages of readiness, promote change in behaviours beyond providing

educational materials about current health recommendations, deal with underlying familial issues, address concerns of low income families, sensitively deal with body image and weight bias issues, and know what resources are available provincially and within the community for family-based treatment. Finally, as mentioned previously, Fig. 2 portrays the importance of expectation and whether providers expected their actions to lead to desired outcomes. While many thought and indicated that screening and managing for childhood obesity was something they needed to address, many had reservations about how to sensitively bring this up without causing any “harms” to either the parents or child. To ensure that healthcare providers will use the “Pathway”, we need to ensure that the management options we provide have some efficacy.

4. Discussion

The qualitative interviews uncovered the complexity of factors that influence practices of healthcare providers and uncovered three broad issues in order for the “Pathway” to be used and fully implemented in various practice settings: a) the “Pathway” itself needs to be modified in terms of how it is presented and explained as well as be supplemented with appropriate documentation and resources; b) constraints that limit implementation need to be addressed and should include a focus on both individual (i.e., the healthcare providers themselves) and environmental (i.e., factors within and outside of providers' organizations) factors; and c) establish processes and/or infrastructure for adapting the “Pathway” to the local context as resources and supports vary by organizations and regions.

The healthcare setting is viewed as an important environment for addressing childhood obesity (Care CTFoPH, 2015). Current interventions either target: a) health professionals such as integrating the 5A's

(Ask, Assess, Advice, Agree, and Assist) approach to increase healthcare providers confidence and self-efficacy in managing obesity (Sturgiss et al., 2017; Moore et al., 2003); or b) practices and intervene at the organizational level to change how care is provided to overweight or obese patients. As few well designed randomized control trials have been conducted, the efficacy of such interventions remains mixed and inconclusive (Flodgren et al., 2010). However, our qualitative findings highlight the complexity of factors that can influence practices among healthcare providers and suggest a need to design interventions that intervene on the healthcare providers as well as address both the upstream and downstream factors that influence their organizations and how healthcare providers practice.

Overwhelmingly, healthcare providers in various disciplines highlighted that they were not adequately trained to address some aspects of the “Pathway” such as using motivational interviewing techniques, supporting patients through the stages of readiness, addressing complex familial issues, or dealing with sensitive topics. The issues identified in this study have also been noted in other studies (Hopkins et al., 2011; Mazur et al., 2013; Rand, 2014; Story et al., 2002; Krebs et al., 2007). While Continuing Medical Education (CME) training on some of these topics is widely available, many providers indicated that the amount of experiential training remains largely inadequate, especially if it was related to using motivational interviewing. Motivational interviewing approaches have been successfully used by healthcare providers for a wide range of health behaviours (McKenzie et al., 2015). For healthcare providers who are currently practicing, developing better CME training may be the best approach as long as these strategies support their experiential training. However, if healthcare providers are going to take an active role in supporting patients in changing their health behaviours, it may be best to strengthen their counseling skills (i.e., motivational interviewing skills) and other skillsets needed to address childhood obesity as part of their formal training.

Our findings complement what others have highlighted—the need to take a system approach to empower healthcare providers to deal with childhood obesity which requires taking an organizational lens to change healthcare practices (Blake-Lamb et al., 2016; Dietz et al., 2015). Our findings also highlight the need to integrate healthcare services with community systems and resources. This is an aspect that has been highlighted by others and is further expanded in both Dietz et al. integrated framework for the prevention and treatment of obesity (Dietz et al., 2015) and Blake et al. collective impact model targeted at childhood obesity (Blake-Lamb et al., 2016). Essentially, emphasizing community resources needs to support healthcare providers in taking action to tackle childhood obesity as well as integrating prevention efforts in the community to provide collective and unified messages.

The results of this qualitative investigation need to be interpreted in light of the study limitations. First, the interviews were conducted in one province in Canada which has a specific healthcare system. Although the qualitative findings provided a lot of depth, it is important to understand the “local” context where changes are to be implemented – as context matters. Solutions and strategies will likely vary by provinces/states and country given that healthcare systems vary (e.g., national health insurance model, out-of-pocket model, or others). Second, healthcare providers with a broad range of expertise were interviewed, as a result the findings were aggregated instead of highlighting issues for specific practice areas. Finally, this study focused on obtaining a broad understanding of the constraints to implementing the “Pathway.” However, it remains unknown as to whether all the individual and environmental constraints need to be addressed to successfully change how healthcare providers acknowledge childhood obesity in their practices.

In conclusion, this study uncovered the complexity of factors that influence healthcare providers' ability to identify, assess, and manage childhood obesity. The healthcare behavior change system presented in this study was conceptualized in the context of childhood obesity. From this investigation, it is clear that changing healthcare providers practice

requires a solution that addresses both individual and environmental constraints. Moving forward, there is a need to focus on the key triggers or changes that are necessary to bring about change in healthcare providers practice as it relates to childhood obesity. This study provides a blueprint for developing future interventions that support healthcare providers to address childhood obesity in their day to day practices.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2018.08.016>.

Disclosure

LCM received salary support from the BC Children's Hospital Research Institute. Child Health BC commissioned and funded this evaluative work.

Acknowledgements

The authors would like to acknowledge Ivan Cepeda involvement in collecting the data as well as processing some of the data. The authors would also like to acknowledge the contributions of Drs. Shazhan Amed, Jean-Pierre Chanoine, and Nardia Strydom served on the advisory committee for this project and helping with the recruitment of the participants and provided valuable input on the development of this project.

References

- Bandura, A., 2001. Social cognitive theory: an agentic perspective. *Annu. Rev. Psychol.* 52, 1–26.
- Baranowski, T., Perry, C.L., Parcel, G.S., 2002. How individuals, environments, and health behavior interact: social cognitive theory. In: Glanz, K., Rimer, B.K., Lewis, F.M. (Eds.), *Health Behavior and Health Education*, third ed. Jossey-Bass, San Francisco, CA, pp. 165–184.
- Belanger-Ducharme, F., Tremblay, A., 2005. Prevalence of obesity in Canada. *Obes. Rev.* 6 (3), 183–186.
- Blake-Lamb, T.L., Locks, L.M., Perkins, M.E., Woo Baidal, J.A., Cheng, E.R., Taveras, E.M., 2016. Interventions for childhood obesity in the first 1,000 days a systematic review. *Am. J. Prev. Med.* 50 (6), 780–789.
- Care CTFoPH, 2015. Recommendations for growth monitoring, and prevention and management of overweight and obesity in children and youth in primary care. *CMAJ* 187 (6), 411–421.
- Centers for Disease Control and Prevention, 2012. *Childhood Overweight and Obesity*. 1904. www.cdc.gov/obesity/childhood/index.html, Accessed date: 4 April 2014.
- Dietz, W.H., Solomon, L.S., Pronk, N., et al., 2015. An integrated framework for the prevention and treatment of obesity and its related chronic diseases. *Health Aff.* 34 (9), 1456–1463.
- Flodgren, G., Deane, K., Dickinson, H.O., et al., 2010. Interventions to change the behaviour of health professionals and the organisation of care to promote weight reduction in overweight and obese adults. *Cochrane Libr* 17 (3), 1–104.
- Gance-Cleveland, B., Gilbert, L.H., Kopanos, T., Gilbert, K.C., 2010. Evaluation of technology to identify and assess overweight children and adolescents. *J. Spec. Pediatr. Nurs.* 15 (1), 72–83.
- Going, S.B., Lohman, T.G., Cussler, E.C., Williams, D.P., Morrison, J.A., Horn, P.S., 2011. Percent body fat and chronic disease risk factors in U.S. children and youth. *Am. J. Prev. Med.* 41 (4 Suppl 2), S77–S86.
- He, M., Piche, L., Clarson, C.L., Callaghan, C., Harris, S.B., 2010. Childhood overweight and obesity management: a national perspective of primary healthcare providers' views, practices, perceived barriers and needs. *Paediatr. Child Health* 15 (7), 419–426.
- Hopkins, K.F., Decristofaro, C., Elliott, L., 2011. How can primary care providers manage pediatric obesity in the real world? *J. Am. Acad. Nurse Pract.* 23 (6), 278–288.
- Klein, J.D., Sesselberg, T.S., Johnson, M.S., et al., 2010. Adoption of body mass index guidelines for screening and counseling in pediatric practice. *Pediatrics* 125 (2), 265–272.
- Krebs, N.F., Himes, J.H., Jacobson, D., Nicklas, T.A., Guilday, P., Styne, D., 2007. Assessment of child and adolescent overweight and obesity. *Pediatrics* 120 (Suppl. 4), S193–S228.
- Mazur, A., Matusik, P., Revert, K., et al., 2013. Childhood obesity: knowledge, attitudes, and practices of European pediatric care providers. *Pediatrics* 132 (1), e100–e108.
- McKenzie, K.J., Pierce, D., Gunn, J.M., 2015. A systematic review of motivational interviewing in healthcare: the potential of motivational interviewing to address the lifestyle factors relevant to multimorbidity. *J. Comorbidity* 5 (1), 162–174.
- Michie, S., van Stralen, M.M., West, R., 2011. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement. Sci.* 6, 42.
- Moore, H., Summerbell, C., Greenwood, D., et al., 2003. Improving management of obesity in primary care: cluster randomised trial. *BMJ* 327 (7423), 1085.

- Rand, E.M., 2014. Examining the Use of the 2006 and 2007 World Health Organization Growth Charts by Family Physicians in British Columbia.
- Reilly, J.J., Methven, E., McDowell, Z.C., et al., 2003. Health consequences of obesity. *Arch. Dis. Child.* 88 (9), 748–752.
- Roberts, K.C., Shields, M., de Groh, M., Aziz, A., Gilbert, J.A., 2012. Overweight and obesity in children and adolescents: results from the 2009 to 2011 Canadian Health Measures Survey. *Health Rep.* 23 (3), 37–41.
- Rogers, E.M., 1983. *Diffusion of Innovations*. New York (NY).
- Rogers, E.M., 1995. *Diffusion of Innovations*, fourth ed. (New York (NY)).
- Rogers, E.M., 2003. *Diffusion of Innovations*, fifth ed. Free Press, New York.
- Shaikh, U., Nettiksimmons, J., Joseph, J.G., Tancredi, D., Romano, P.S., 2013. Collaborative practice improvement for childhood obesity in rural clinics: the Healthy Eating Active Living Telehealth Community of Practice (HEALTH COP). *Am. J. Med. Qual.* 29 (6), 467–475.
- Singh, A.S., Mulder, C., Twisk, J.W., van M, W., Chinapaw, M.J., 2008. Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obes. Rev.* 9 (5), 474–488.
- Spurrier, N.J., Magarey, A., Wong, C., 2006. Recognition and management of childhood overweight and obesity by clinicians. *J. Paediatr. Child Health* 42 (7–8), 411–418.
- Statistics Canada, 2013. Table 105-0592 - Health Indicator Profile, Two-year Period Estimates, By Age Group And Sex, Canada, Provinces, Territories, Census Metropolitan Areas and Influence Zones. <http://www5.statcan.gc.ca/cansim/a26?Lang=eng&retrLang=eng&id=1050592&paSer=&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid=#F29>, Accessed date: 15 April 2014.
- Steckler, A., Goodman, R.M., Kegler, M.C., 2002. Mobilizing organizations for health enhancement: theories of organizational change. In: Glanz, K., Rimer, B.K., Lewis, B.M. (Eds.), *Health Behavior and Health Education*, second ed. Jossey-Bass, San Francisco, pp. 335–360.
- Story, M.T., Neumark-Stzainer, D.R., Sherwood, N.E., et al., 2002. Management of child and adolescent obesity: attitudes, barriers, skills, and training needs among health-care professionals. *Pediatrics* 110 (1 Pt 2), 210–214.
- Sturgiss, E., Haesler, E., Elmitt, N., van Weel, C., Douglas, K., 2017. Increasing general practitioners' confidence and self-efficacy in managing obesity: a mixed methods study. *BMJ Open* 7 (1), e014314.
- Zalesin, K.C., Franklin, B.A., Miller, W.M., Peterson, E.D., McCullough, P.A., 2008. Impact of obesity on cardiovascular disease. *Endocrinol. Metab. Clin. N. Am.* 37 (3), 663–684 (ix).