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A National Perspective on Childhood Obesity Medical Education: Do Medical Students in Canada Perceive That They Are Prepared to Treat Children with Obesity?


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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in
Health and Rehabilitation Sciences

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Abstract

The purposes of this survey-based, mixed-methods study were to investigate medical students' perceptions of: (1) the overall level of medical school training acquired in relation to childhood obesity treatment; (2) the medical school training acquired in relation to specific competencies associated with the treatment of children with obesity and their caregiver(s); and (3) additional training needed. Results showed that of the 507 students who provided complete data, approximately 60% ($n = 303$) *disagreed* or *strongly disagreed* that their medical training related to childhood obesity was adequate. With regard to specific competencies and additional training needed, quantitative and qualitative data revealed perceived inadequacies in areas including providing patients with motivational interviewing, weight-friendly medical practices, obesity staging, management options, and offering education and credible resources. The findings suggest that improvements may be necessary with regard to childhood obesity-related medical education in Canada, highlighting several specific competencies and areas that could be targeted.

Keywords: medical students, Canada, childhood obesity, treatment, management, training, medical education, medical school

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Chapter 1: Introduction and Literature Review

Childhood obesity represents a significant public health concern due to its elevated rates worldwide (e.g., Bhuyan et al., 2015; Kumar & Kelly, 2017; Roberts, Shields, De Groh, Aziz, & Gilbert, 2012). Among 34 industrialized countries, Canada ranks sixth for the greatest number of children with obesity per capita (Report of the Standing Senate Committee on Social Affairs Science and Technology, 2016). In Canada, the prevalence of childhood obesity has increased three-fold from the 1980s to the early 2000s (Report of the Standing Senate Committee on Social Affairs Science and Technology, 2016) moreover, obesity among children has increased at a faster rate than that among adults (Ickes, McMullen, Haider, & Sharma, 2014; Lau et al., 2007). While concerning, a recent study has shown that from 2004 to 2013, the proportion of children ages 3 to 19 in Canada who were *overweight* significantly decreased (from 30.7% to 27.0%), whereas the proportion of children in this age range with *obesity* remained stable (approximately 13%; Rodd & Sharma, 2016). In addition, more than half (i.e., 55%) of First Nations children ages 2 to 17 in Canada are classified as obese (First Nations Information Governance, 2012). Due to concerning rates of childhood obesity in Canada and worldwide, for the first time in the modern era, it has been suggested that the health ramifications in children with obesity may cause them to have shorter lifespans than those of their parents (Daniels, 2006).

Physical health consequences for children with obesity may include, among others, an increased risk for the development of asthma (i.e., inflammation of the airways; Papoutsakis et al., 2013), metabolic syndrome (i.e., a combination of hypertension, increased blood glucose, and abnormal triglycerides or cholesterol,

resulting in an increased risk of developing diabetes mellitus and cardiovascular disease; Calcaterra et al., 2008), and nonalcoholic fatty liver disease (i.e., fatty infiltration in liver cells) which is now the most common disease of the liver in children (Huang et al., 2013). Furthermore, diseases that in the past were seen primarily in adults are now being diagnosed in children with obesity (Daniels, 2006; Haines, Wan, Lynn, Barret, & Shield, 2007; Pinhas-Hamiel et al., 1996), including hypertension (i.e., abnormally high blood pressure; e.g., Sorof & Daniels, 2002), early symptoms of atherosclerosis (i.e., hardening of arteries; Sorof & Daniels, 2002), and type 2 diabetes (i.e., abnormally high levels of glucose on the blood; e.g., Fagot-Campagna et al., 2000).

Insofar as potential mental health consequences are concerned, children with obesity are more likely to experience poor self-esteem (Strauss, 2000), depression (Puder & Munsch, 2010), anxiety (Puder & Munsch, 2010), or social isolation (Lachal et al., 2013) than children who are not obese. Children with obesity are also more likely to develop comorbidities of the health sequelae described above (World Health Organization, 2016). In addition, Schwimmer and colleagues (2003) found that children (ages 5-18; $n = 106$) with obesity self-reported a health-related quality of life as low as children with cancer. This is an important finding given that when compared with healthy children, children with juvenile rheumatoid arthritis, type 1 diabetes mellitus and congenital heart disease, children with cancer receiving chemotherapy were previously demonstrated to have the lowest quality of life scores (Schwimmer, Burwinkle, & Varni, 2003).

Research has shown that obesity and obesity-related diseases acquired during childhood have the potential to persist into later years (Freedman, Dietz, Srinivasan, &

Berenson, 2005; Singh, Mulder, Twisk, Van Mechelen, & Chinapaw, 2008; Waters et al., 2014). For example, the authors of a systematic review ($n = 39$ studies) on childhood obesity related to adult morbidity and mortality reported that children with obesity (ages 2-19 years) had a 40 – 60% increased risk of all-cause mortality in their adult lives (Park, Falconer, Viner, & Kinra, 2012). Moreover, Park and colleagues (2012) found that obesity in childhood was associated with an increased risk of type 2 diabetes, hypertension, and coronary heart disease in adulthood. Therefore, targeting the early life-course for obesity management (defined as any healthcare intervention that includes patient involvement and may involve one or more individual treatments; Holtz-Eakin, 2004) is essential not only to combat obesity and protect health during childhood and adolescence, but also throughout the lifespan (Freedman et al., 2005; Kuhle, Doucette, Piccinini-Vallis, & Kirk, 2015).

Childhood Obesity Treatment: An Overview

Childhood obesity is a complex, multifactorial disease (World Health Organization, 2016); as such, interventions targeting children with obesity can occur in many settings. A number of community-, school-, and family-based interventions may have the potential to reduce the prevalence of childhood obesity (studies have reported results primarily in the short-term; Upton, Taylor, Peters, Erol, & Upton, 2013), however they are not without limitations. Furthermore, individual-level interventions that include lifestyle changes, motivational interviewing, medications, surgery, and various combinations of the interventions mentioned above have also demonstrated some effectiveness (again, typically in the short-term; Upton et al., 2013) in the treatment of childhood obesity. A brief overview of these interventions, and where possible, a

discussion of systematic reviews and/or meta-analyses that have examined their effectiveness, is provided below.

Community-based interventions. Although many community-based childhood obesity treatment interventions exist, to our knowledge, they have not been evaluated via systematic reviews or meta-analyses. As such, a number of primary studies will be discussed. One example of a community-based intervention that targeted children with obesity (ages 8-14; $n = 41$) and their families was a feasibility study consisting of a group-based program entitled the Children's Health and Activity Modification Program ("C.H.A.M.P."; Martin et al., 2009). This 4-week program was delivered to children in a camp-based format and parents were asked to attend four weekend educational sessions. Generally speaking, participation in C.H.A.M.P. was associated with positive outcomes for children including improvements in quality of life ([QOL]; Burke, Shapiro, et al., 2015), cardiovascular indices (McMordie et al., 2010), body composition (Burke, Shapiro, et al., 2015), and self-efficacy (Burke, Vanderloo, Gaston, Pearson, & Tucker, 2015). With regard to the short- versus longer-term impact of the program on body composition, children experienced significant improvements in fat and muscle mass from baseline to 4 weeks, but only z -BMI values decreased significantly and were sustained 6-months post-intervention (Burke, Shapiro, et al., 2015). Interestingly, children's self-reported emotional QOL increased following the intervention and was sustained at 12-months, as did parents' reports of their children's physical, emotional and social QOL (Burke, Shapiro, et al., 2015). Despite the promising results, the costs associated with C.H.A.M.P. were found to be high and results showed that although child attendance was excellent, mean adherence to the parental component of C.H.A.M.P. was moderate

(Burke, Shapiro, et al., 2015; Pearson et al., 2013). The authors noted that additional attention should be directed toward preventing high attrition rates among parents (e.g., accommodating parents' busy schedules) to enhance program sustainability (Pearson et al., 2013).

Another larger community- and family-based lifestyle intervention targeting children with obesity (ages 6-17, $n = 116$) aimed to evaluate the effectiveness of the Mind, Exercise, Nutrition, Do It! (MEND) Program by addressing specific components of behaviour change including education, skills training, and motivational enhancement (Sacher et al., 2010). The MEND Program was a randomized controlled trial (RCT) consisting of an intervention group (who started the 9-week program and subsequent 12-week family swim pass immediately) and a control group (who received the intervention after 6 months; Sacher et al., 2010). At 6 months, both standardized body mass index (z -BMI) and waist circumference were significantly reduced among participants in the intervention group in comparison to those in the control group (Sacher et al., 2010). In addition, at 6 months, children in the intervention group were significantly more active, less sedentary, and had an increased global self-esteem score compared to children in the control group (Sacher et al., 2010). At 9 months after completion of the intervention, participants' z -BMI and waist circumference significantly decreased, and children with obesity continued to improve their physical activity levels demonstrating sustainability of this community-based intervention in comparison to the control group (Sacher et al., 2010). Sacher and colleagues (2010) acknowledged similar limitations to those noted by the researchers involved in the C.H.A.M.P. study insofar as attributing their high attrition rates to logistical factors given there was only one opportunity to follow-up. In addition, a

limitation to many community-based interventions is measuring their long-term effects (Pearson et al., 2012; Sacher et al., 2010).

School-based interventions. To evaluate the effects of school-based interventions on reductions in children's body mass index (absolute BMI, acknowledged as a limitation by the authors due to the limited number of studies which measured z-BMI), a systematic review and meta-analysis was conducted in which 43 studies consisting of children ≤ 18 years old, at any baseline weight, were included (Lavelle, MacKay, & Pell, 2012). With regard to the types of interventions implemented in these studies, 35% used a single intervention (i.e., physical activity or education), while 65% of studies employed a combination of interventions (e.g., nutrition education, physical activity), behavioural (e.g., teaching self-management, self-esteem and decision making skills) and/or environmental (e.g., incorporating healthy vending machines, changing school meals; Lavelle et al., 2012). Among the interventions that targeted children who were overweight or obese specifically ($n = 6$ studies), Lavelle and colleagues (2012) reported significant reductions in BMI among children in the intervention group compared with those in the control group. Insofar as the type of intervention used, reductions in BMI were statistically significant for physical activity interventions only, as well as physical activity in combination with healthy diet changes (Lavelle et al., 2012).

Family-based interventions. There is a strong body of evidence that has shown or emphasized the importance of parent and/or caregiver involvement in childhood obesity interventions (e.g., Ball et al., 2012; Faith et al., 2012; Ickes et al., 2014; Janicke et al., 2014). Specifically, integrating family members in paediatric obesity treatment interventions is of critical importance as the lifestyle behaviours of children are strongly

influenced by those of the parents or caregivers (Faith et al., 2012).

A systematic review and meta-analysis ($n = 20$ studies containing 1,671 children < 19 years of age) aimed to evaluate the effectiveness of comprehensive behavioural family lifestyle interventions (CBFLIs) to produce weight loss or prevent weight gain among children who were overweight or obese (Janicke et al., 2014). Physical activity, dietary, and behavioural intervention components were included in all studies (Janicke et al., 2014). Results revealed significant reductions in (with an accompanying small effect size for) z -BMI with CBFLIs when compared to passive control groups (treatment or education without CBFLI, wait list control, or standard care). Larger effect sizes with respect to significant reductions in z -BMI were reported for longer treatment durations, therapy delivered to individual families, and in-person (Janicke et al., 2014). In sum, the authors concluded that multicomponent CBFLIs were effective in reducing standardized BMI among children with obesity, especially when delivered to families in-person and for a longer duration of time (Janicke et al., 2014). Further, the authors recommended that metabolic outcome parameters should be examined in future research, as weight outcomes are not the only measure of positive health (Janicke et al., 2014).

Lifestyle changes. A wealth of evidence has supported lifestyle change as a cornerstone for the treatment of childhood obesity (e.g., Ho et al., 2013; Reinehr, 2013). A systematic review and meta-analysis of 15 randomized trials targeting children ($n = 570$, ≤ 18 years of age) who were overweight or obese was conducted to evaluate the effects of lifestyle interventions (i.e., diet only versus diet and exercise) on metabolic outcomes and reductions in absolute BMI (Ho et al., 2013). Results showed that when compared to focusing on a healthy diet, resistance training coupled with a healthy diet

were associated with significantly greater improvements in high-density lipoprotein cholesterol (HDL-C) and fasting insulin levels among children with obesity (Ho et al., 2013). The reverse was true related to changes in absolute BMI; diet-focused interventions were associated with greater reductions in BMI than those that included diet and resistance training (Ho et al., 2013). Overall, the results of this review showed that lifestyle interventions appear to play a salient role in the treatment of childhood obesity with regard to reducing metabolic risks and BMI (Ho et al., 2013). However, as noted by the authors of this study, as well as the authors of a recent article related to redefining obesity, absolute BMI is not always an accurate measure of obesity as it does not consider muscle gain (Ho et al., 2013; Sharma & Campbell-Scherer, 2017).

Motivational interviewing (MI). In 2008, Borrelli and colleagues conducted a systematic review and meta-analysis related to the efficacy of motivational interviewing (i.e., asking permission, being empathetic, encouraging reflections, affirmations, and asking open-ended questions) in parent-child health interventions targeting children who were overweight or obese ($n = 12$ studies containing 5,130 children < 18 years of age and parents). Within these studies, motivational interviewing was delivered by one facilitator to children, or to parents only, whereas the control conditions consisted of the use of assessments only or 'standard' obesity treatment (Borrelli, Tooley, & Scott-Sheldon, 2008). Results showed that in comparison to the control groups, MI delivered to parents only was associated with significant reductions in absolute BMI, screen time and increased physical activity levels with their children (Borrelli et al., 2008). Borrelli and colleagues (2008) also found that MI was effective in improving diet in this population, especially when many MI components (e.g., reflections, expresses empathy, affirmation,

etc.) were used. Related to children who were overweight or obese and participated in the MI intervention, children who were overweight or obese had a lower BMI versus children in the control groups (Borrelli et al., 2008). The study's results show promising weight and behavioural outcomes with the use of MI in children who are overweight or obese and their parents (Borrelli et al., 2008).

Pharmacological treatment. The most recent guidelines on the treatment of paediatric obesity introduced by the American Pediatric Endocrine Society (Styne et al., 2017), and supported by Canadian childhood obesity treatment guidelines (Lau et al., 2007), recommend the use of pharmacotherapy after intense lifestyle interventions alone have failed. A recent Cochrane review aimed to assess such pharmaceutical interventions in the treatment of childhood obesity ($n = 21$ RCTs containing 2,484 children < 18 years of age; Mead et al., 2016). Interventions included the drugs metformin, sibutramine, orlistat, or a combination of metformin and fluoxetine and also combined a behavioural changing intervention; control groups included a placebo with a behaviour changing intervention (Mead et al., 2016). Significant mean reductions with absolute BMI (-1.3 kg/m²; 95% CI -1.9 to -0.8 ; $p < 0000.1$) and weight changes (-3.9 kg; 95% CI -5.9 to -1.9 ; $p < 0000.1$) among children in the intervention groups were found when compared to those in the control groups, in 16 trials ($n = 1884$ participants) and 11 trials ($n = 1180$ participants), respectively; both were associated with small effect sizes (Mead et al., 2016). The most common adverse events in orlistat and metformin trials (only these drug intervention trials measured adverse events as they had sufficiently long exposure times) were minor gastrointestinal side effects (e.g., diarrhea, mild abdominal pain or discomfort, fatty stools, etc.; Mead et al., 2016). Important to note is, orlistat is the only

available medication of its kind in Canada for the treatment of children with obesity who meet specific criteria (Canadian Task Force on Preventive Health Care, 2015; Peirson et al., 2015). Overall, the authors concluded that the RCTs included in the review were generally low in quality, with high attrition rates and short or no post-intervention follow-up (Mead et al., 2016).

Surgical treatment. When adolescents (ages 10-19) are diagnosed with severe obesity (i.e., BMI of $> 40 \text{ kg/m}^2$ or a BMI of $> 35 \text{ kg/m}^2$ and significant comorbidities), the most current clinical practice guidelines suggest bariatric surgery as an effective form of treatment (Styne et al., 2017). Clinicians have generally considered bariatric surgery as a *last resort* in the treatment of obesity among adolescents given the invasive nature of the surgery, its potential for serious operative complications and mortality, and the limited amount of data available to provide insight for the use of bariatric surgery (Canadian Task Force on Preventive Health Care, 2015; Ells et al., 2015).

A Cochrane review was conducted to examine the effectiveness of surgical treatment (i.e., laparoscopic adjustable gastric banding surgery) in comparison to a control group consisting of a multi-component lifestyle intervention (e.g., dietary, physical activity, and sedentary behavioural components) among adolescents with obesity (Ells et al., 2015). Only one completed RCT ($n = 50$ adolescents aged 14-18 years, with severe obesity) met the inclusion criteria of assessing BMI, weight loss, and adverse events, while four other relevant studies were ongoing. The authors of the study reported changes in BMI and mean weight were significantly reduced with the surgical intervention in comparison to the control group (Ells et al., 2015). In terms of adverse events associated with the surgeries, 28% of the patients in the study ($n = 14$) required

surgical revisions (Ells et al., 2015). Further, 12 adolescents who were in the surgical intervention group reported a combined total of 13 unfavourable events (i.e., six proximal gastric enlargements, two needlestick injuries due to tubing, one cholecystectomy, admittance to the hospital for depression, one lost to follow-up, and two unplanned pregnancies; Ells et al., 2015). Within the lifestyle group, 11 adolescents reported 18 unfavourable events (i.e., one hospital admission for depression and intracranial hypertension, one cholecystectomy, seven lost to follow-up, and two unplanned pregnancies; Ells et al., 2015).

Multicomponent interventions. Given the abundance of childhood obesity treatment interventions in the literature, and their seemingly varied effectiveness, a Cochrane review was conducted to determine the most effective type of childhood obesity treatment (Oude Luttikhuis et al., 2009). The review included 64 RCTs ($n = 5,230$ children with obesity < 18 years of age), and interventions included lifestyle (i.e., dietary, physical activity, behavioural therapy interventions and thinking pattern changes delivered by teachers, primary health care physicians, researchers, nurses, etc.), drug (i.e., orlistat, metformin, sibutramine, or rimonabant, these results will not be reported as the results of a more recent study by Mead et al. [2016] was mentioned above), and surgical interventions (no surgical studies met the inclusion criteria at the time of the study; Oude Luttikhuis et al., 2009). Although the authors found it challenging to ascertain which interventions were the most effective due to the limited quality of data, they found that in comparison to standard care conditions (e.g., information leaflets, internet based programs), interventions that included a *combination* of dietary, physical activity, and behavioural components had beneficial effects on child adiposity, including decreases in

absolute BMI (Oude Luttikhuis et al., 2009). Specific to the behavioural intervention group with the involvement of parents of pre-adolescent children (under 12 years), a small effect size in BMI-standard deviation scores (SDS) was statistically significant compared to the control (i.e., behavioural intervention for the parent and child; Oude Luttikhuis et al., 2009). Behavioural interventions significantly decreased absolute BMI and BMI-SDS in the long-term in adolescents (12 years and up). Thus, this study provides evidence for the use of combined lifestyle interventions, and parental involvement especially in pre-adolescent behavioural programs to yield positive weight outcomes for children with obesity (Oude Luttikhuis et al., 2009)

Summary of childhood obesity treatment interventions. Generally speaking, only modest changes in health outcomes over the short-term have been identified in the childhood obesity treatment intervention literature (e.g., Ho et al., 2013; Lavelle et al., 2012; Oude Luttikhuis et al., 2009). Given that the effectiveness of such interventions is dependent on age, initial weight, readiness for change, etiology, and family schedules, among other features (Ells et al., 2015; Mead et al., 2016; Oude Luttikhuis et al., 2009), a more ideal environment for the delivery childhood obesity interventions may be one in which the most appropriate mode of intervention for the individual child (based on the needs and causes for a child's obesity) is more easily and accurately assessed. A primary care setting may serve as an optimal environment for the delivery of patient-tailored treatment, and one that might also allow for longer-term follow up than that observed in the intervention literature described above.

Managing Childhood Obesity in the Primary Care Setting

Primary care physicians (i.e., family physicians and/or community paediatricians)

are well placed to treat childhood obesity given that in Canada, they are often the first point of contact for patients (Kuhle et al., 2015; Plourde, 2012). Primary care providers are trusted authorities of health information, and caregivers can seek continuity of care for their children from infancy through to adolescence (Seburg, Olson-Bullis, Bredeson, Hayes, & Sherwood, 2015). In addition to being able to assess and advise children with obesity and their caregiver(s), primary care providers can help connect children with obesity and their caregiver(s) to community resources that may be appropriate for the patient (e.g., specialist referrals, lifestyle programs, multidisciplinary care, etc.; Seburg et al., 2015).

Several studies have highlighted the pivotal role that primary care physicians can play in the management of childhood obesity (e.g., Bhuyan et al., 2015; Dietz et al., 2015; Peirson et al., 2015). For example, a 2015 systematic review of 9 studies ($n = 1,257$ children aged 2-18 years) aimed to examine the effectiveness of behavioural (physical activity and dietary lifestyle changes), technological (of which there was a lack of studies), educational (tailored to children with obesity and their parents), or a combination of interventions delivered to children with obesity by primary care physicians (Bhuyan et al., 2015). A behavioural intervention component was involved in all studies included in this review (Bhuyan et al., 2015). Approximately half of the studies that included behavioural interventions delivered by primary care physicians reported significant decreases in z -BMI scores among children with obesity (Bhuyan et al., 2015). Specifically, one study reported significant improvements in lifestyle behaviours (i.e., more time spent engaging in physical activity, improved healthy eating, and less screen time) after a behavioural intervention was delivered by a primary care

physician (Bhuyan et al., 2015). In regards to the effectiveness of interventions that included a component related to behaviour, education, or both, two additional studies reported significant decreases in percentage BMI, while two other studies did not report any significant changes in BMI (Bhuyan et al., 2015). On the basis of the findings presented in this review, Bhuyan and colleagues (2015) concluded that the involvement of primary care physicians may positively impact childhood obesity by improving their lifestyle behaviours and BMI. Bhuyan and colleagues (2015) also noted that more training may be needed, related to the use of technology, to optimize the treatment of children with obesity.

A more recent systematic review and meta-analysis of 12 studies targeting children with obesity ($n = 2,903$ children aged 2-18 years) was conducted to compare the effectiveness of typical office-based primary care weight management interventions (e.g., motivational interviewing and education related to lifestyle modification) with control interventions (i.e., no interventions, routine care, feedback given with z -BMI only, active control treatments; Sim, Lebow, Wang, Koball, & Murad, 2016). Findings revealed that primary care weight management interventions targeting children with obesity were associated with significant reductions in z -BMI compared to control interventions (Sim et al., 2016). However, given the limited amount of studies available, the authors noted that additional research in this area is needed, along with “more meaningful markers of health” than z -BMI (Sim et al., 2016, p. 8).

Another recent meta-analysis was conducted to examine the effectiveness of primary care weight management interventions (e.g., at least two lifestyle components) on BMI-related outcomes in children with overweight or obesity ($n = 3,358$ children ages

2-18 years) in comparison to active, education, or passive control groups (Mitchell et al., 2016). A total of 18 studies were included in the study, with the majority (i.e., 77% of studies) conducted within the past five years, indicating to the researchers that “this field is relatively new and rapidly growing” (Mitchell et al., 2016, p. 707). The overall effect of the relation between reduced BMI and primary care weight management interventions in comparison to control groups was small but significant (Mitchell et al., 2016). On the basis of additional findings related to treatment characteristics, the authors of this meta-analysis also concluded that more contact from paediatricians is warranted in the treatment of childhood obesity (Mitchell et al., 2016).

A systematic review conducted by Seburg and colleagues (2015) examined 31 RCTs (including children ages 1-18 years who were overweight or obese) that focused on childhood obesity treatment or prevention and included primary care involvement. Of the treatment interventions included in the RCTs, those with a parental component, multiple approaches (e.g., phone coaching, in-person discussions), delivery methods (e.g., information materials, computer-guided), and ≥ 10 intervention sessions were most effective in terms of improving children’s weight outcomes (Seburg et al., 2015). Specific to the role of primary care providers, Seburg and colleagues (2015) reported significant associations between the use of motivational interviewing by physicians and adolescent weight loss. This review provided additional evidence to support the conclusion that the primary care setting is promising for the treatment of children with obesity (Seburg et al., 2015).

Another team of researchers conducted a review and meta-analysis that included 31 RCTs containing treatment interventions (29 behavioural and 2 combined

pharmacological/behavioural) delivered to children who were overweight or obese ($n = 3,908$, 2-18 years of age) in primary care settings (Peirson et al., 2015). The aim of the study was to identify benefits and potential adverse effects of childhood overweight and obesity interventions for use in primary care, and to examine features of efficacious interventions (Peirson et al., 2015). Behavioural interventions included diet, exercise, and lifestyle strategies, and pharmacological interventions included the medication orlistat (Peirson et al., 2015). Findings from short-term interventions demonstrated a moderate effect, and significantly lowered absolute BMI and z -BMI among children who were in the behavioural and combined (behavioural and orlistat) intervention groups compared to participants in the control group (no intervention, usual care, placebo, or minimal component; Peirson et al., 2015). In the systematic review and meta-analysis, blood pressure outcomes were found to be significantly lower among participants who had participated in the behavioural intervention (systolic blood pressure mean difference -3.42 , 95% CI: -6.65 to -0.29 ; diastolic blood pressure mean difference -3.39 , 95% CI -5.17 to -1.60), and self-reported quality of life was significantly higher for those in the behavioural intervention group than in the control group (SMD 2.10 , 95% CI: 0.60 to 3.70 ; Peirson et al., 2015). Regarding which interventions were most efficacious, reported common elements included parental involvement, lifestyle treatment, and intervention delivery of at least three months (Peirson et al., 2015). The implication of the study by Peirson and colleagues (2015) demonstrated that moderate improvements of overall quality of life, and cardiometabolic outcomes (i.e. reducing blood pressure, and BMI) may be achieved when treating children who are overweight or obese in a primary care setting over the short term. To assist physicians in effectively managing children with

obesity, a set of clinical evidence-based guidelines were developed by a panel of Canadian obesity experts published by Lau and colleagues (2007).

The 2006 Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children (Lau et al., 2007) recommend that once health care professionals have clinically classified a child's weight status using the growth charts from the Centers for Disease Control and Prevention (CDC), children with obesity and their families or caregiver(s) should be assessed for readiness and barriers to change (Canadian Task Force on Preventive Health Care, 2015; Lau et al., 2007). To best empower parents and caregivers with a tailored treatment strategy for their child, primary care physicians are also recommended to obtain a thorough medical history to identify specific etiologies which may contribute to a child's unhealthy weight, and target treatment towards the cause of a child's obesity (Canadian Task Force on Preventive Health Care, 2015; Lau et al., 2007). Further, clinicians are urged to manage children with obesity using family-oriented lifestyle interventions (counselling on physical activity, dietary intervention), and/or pharmacotherapy, and/or bariatric surgery when appropriate, using nonjudgmental approaches (Lau et al., 2007).

Both a comprehensive literature review, and statistical analyses from the 2009/2010 Canadian Community Health Survey were used by Kuhle and colleagues (2015) to estimate the probability of primary care physicians who meet the 2006 Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children (Lau et al., 2007). Kuhle and colleagues (2015) estimated that only 50% of primary care physicians measure a child's weight and engaged a family on childhood obesity weight management. Further, Kuhle and colleagues (2015) proposed

that given the training, resource, and time limitations of physicians, only 20% of physicians were estimated to follow through with delivering lifestyle interventions to children with obesity and their caregiver(s). Overall, Kuhle and colleagues (2015) estimated, using evidence-based probabilities, that out of 1,000 children in Canada, approximately 117 children have obesity and that in the best case scenario eight children, and in the worst case no children, would benefit from primary care childhood obesity management. Another finding related to primary care physicians' perceptions of treating children with obesity in Canada point to a somewhat higher rate of 20% of perceived success (He, Piché, Clarson, Callaghan, & Harris, 2010). These low estimates are consistent with other literature which has shown that physicians rarely counsel patients with obesity (Loureiro & Nayga, 2006; Nawaz, Adams, & Katz, 1999; Scott et al., 2004).

The calculations used by Kuhle and colleagues (2015) to estimate the probability of weight management outcomes in a Canadian primary care setting had limitations that the authors outlined. For example, the calculations were independent from each other which is probably not the case in reality, and there was limited availability of data to base the calculations on which to base these calculations (Kuhle et al., 2015).

Childhood Obesity Treatment Barriers Identified by Primary Care Physicians

Kuhle and colleagues (2015) attributed the poor odds of success for primary care providers in the delivery of effective childhood obesity treatments to the presence of numerous barriers in primary care settings (Kuhle et al., 2015). For example, a lack of continuity of care (e.g., children with obesity may access walk-in clinics, emergency rooms, or regularly change their primary care physician) which impedes patient monitoring was cited as one such barrier (Kuhle et al., 2015). Specific to why a

significant portion of primary care physicians does not assess a child's weight status, Kuhle and colleagues (2015) identified a lack of BMI familiarity, time, and lack of agreement on screening tools as barriers. Other barriers identified by the authors included the obesogenic environment, lack of referral options, parental misperceptions of their child's weight status, lack of patient motivation, and parents who are perceived to be poor role models (Kuhle et al., 2015). To overcome some of these barriers Kuhle and colleagues (2015) suggest more education and clinical practice tools could be shared with primary care physicians.

In 2010, He and colleagues surveyed primary care physicians ($n = 860$ family physicians and community paediatricians) all across Canada on their views, practices, barriers, and needs for the management of children who were overweight or obese. Key barriers to successfully manage childhood obesity that were reported by practitioners included system barriers, patient barriers, and practice barriers (He et al., 2010). More specifically, one third of the primary care physicians in the study cited insufficient healthy public policies such as federal and provincial programs/services (e.g., amending billing codes to include paediatric obesity management, revising clinical practice guidelines pertaining to paediatric obesity management) as a system barrier (He et al., 2010). Approximately 90% listed caregiver(s) who were overweight/obese and who served as poor role models as a patient barrier, in addition to time constraints and insufficient levels of physician training as practical barriers (He et al., 2010).

With regard to time constraints, He and colleagues (2010) reported that family physicians in Canada ($n = 412$) spent an average of 13 ± 8.8 minutes on initial paediatric obesity consultations and 10 ± 6.0 minutes for follow-up appointments, while community

paediatricians ($n = 448$) spent more time with patients during such appointments (23 ± 17 min and 13 ± 8.3 min, respectively). Moreover, as noted above, primary care physicians have identified limited professional training as a key barrier to the effective treatment of paediatric obesity in Canada (e.g., He et al., 2010; Kuhle et al., 2015; Plourde, 2012). He et al. (2010) reported that 65% of family physicians and 50% of community paediatricians in their study felt that their professional training in this area was inadequate (He et al., 2010). Findings related to physicians feeling ill-equipped to manage children with obesity have been reported not only in Canada, but also in the United States (e.g., Jelalian, Boergers, Alday, & Frank, 2003), Australia (e.g., Gerner, McCallum, Sheehan, Harris, & Wake, 2006), Israel (e.g., Fogelman et al., 2002), and France (e.g., Franc, Van Gerwen, Le Vaillant, Rosman, & Pelletier-Fleury, 2009), among other countries.

As described in a recent systematic review, “a scarcity of information exists for undergraduate medical education in obesity” in general (Dietz et al., 2015, p. 2522). Given there is a paucity of literature, in Canada and abroad, that has examined where training gaps might exist in the medical school curriculum, and the recommendation of additional childhood obesity medical training by numerous research studies and national agencies (Dietz et al., 2015; Lau et al., 2007; Report of the Standing Senate Committee on Social Affairs Science and Technology, 2016), and Canadian health care professionals (Frankfurter, Cunningham, Morrison, Rimas, & Bailey, 2017; Gramlich et al., 2010; He et al., 2010; Plourde, 2012), an examination of *what* specific childhood-obesity competencies could be improved in medical school training is warranted.

The 5As of Pediatric Obesity Management Framework to Counsel Children with Obesity

Although national guidelines related to the treatment of childhood obesity exist (e.g., the 2006 Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children; Lau et al., 2007, and the Recommendations for Growth Monitoring, and Prevention and Management of Overweight and Obesity in Children and Youth in Primary Care; Canadian Task Force on Preventive Health Care, 2015), there is a dearth of concise and easy-to-use counseling techniques, tools, and strategies available for primary care physicians to successfully treat children with obesity in a primary care setting (He et al., 2010; Kuhle et al., 2015). To fill this gap, and to complement the Canadian childhood obesity clinical practice guidelines (Canadian Task Force on Preventive Health Care, 2015; Lau et al., 2007), the Canadian Obesity Network (CON) developed a comprehensive, patient-centered, step-by-step framework entitled the “5As of Pediatric Obesity Management” (Appendix A; CON Primary Care Working Group, 2013). The Canadian Obesity Network is a national federally-funded organization that uses evidence-based approaches for obesity treatment (CON Primary Care Working Group, 2013). The 5As of Pediatric Obesity Management was developed by CON, over the course of a year in 2012 (A. Buchholz, personal communications, April 27, 2017), in consultation with leading researchers and experts in childhood obesity, front-line primary care providers, and patients (CON Primary Care Working Group, 2013). The 5As of Pediatric Obesity Management is a framework grounded in evidence and theory including the Transtheoretical Model of Behaviour Change (Prochaska, Diclemente, & Norcross, 1992).

The 5 As is a behaviour change tool that is not new to physicians, originally developed by the American National Cancer Institute (Epps & Manley, 1991), it was first used to promote smoking cessation. Among children who smoked, the 5 As (*Anticipate, Ask, Advise, Assist, Arrange*) of smoking cessation were recommended by the American National Cancer Institute (Epps & Manley, 1991) to be used by physicians, and were found to be very effective in achieving higher motivation and more attempts at cessation (Fiore et al., 2008). The 5 As of smoking cessation has been modified for paediatric obesity counselling by the Canadian Obesity Network to be used by primary care practitioners who counsel children with obesity and their families, and is structured around the following 5As of Pediatric Obesity Management (CON Primary Care Working Group, 2013): *Ask, Assess, Advise, Agree, and Assist* (Vallis, Piccinini-Vallis, Sharma, & Freedhoff, 2013; CON Primary Care Working Group, 2013; see Appendix A), each of which are described below.

According to the Canadian Obesity Network, *Ask* is used by practitioners to give control to children with obesity and their caregiver(s) and to allow them to decide if they are open to the idea of discussing their weight (Vallis et al., 2013). Sample questions used by practitioners could include “*are you concerned about your child’s weight?*” and “*would it be alright if we discussed your child’s weight?*” (CON Primary Care Working Group, 2013). After permission is granted, physicians are encouraged to use motivational interviewing to guide children with obesity and their caregiver(s) in making positive behaviour changes through nonjudgmental, empathetic, and supportive dialogue (Resnicow, Davis, & Rollnick, 2006) and to explore the patient’s readiness for change using general questions, a readiness ruler, or Prochaska’s Transtheoretical model

(Prochaska, Diclemente, & Norcross, 1992).

Assess, according to the Canadian Obesity Network, is used to measure a child with obesity's BMI, weight circumference, stage obesity using the Edmonton Obesity Staging System for Pediatrics ([EOSS-P]; Hadjiyannakis et al., 2013) while identifying root causes of weight gain using the 4 Ms framework (i.e., *mental, mechanical, milieu, and metabolic* causes of obesity; Sharma, 2010; Sharma & Padwal, 2010). Specifically, the EOSS-P is a novel, comprehensive tool which stratifies children with obesity according to the 4 Ms framework to provide clinicians with not only the severity of the disease, but potential barriers and prognostic information related to health risks and comorbidities (Hadjiyannakis et al., 2016) before making clinical recommendations for weight loss, behaviour change, and/or medical interventions (Ferraro, Patterson, & Chaput, 2015). Research has shown that weight loss alone is a poor indicator of health status (Sharma & Campbell-Scherer, 2017), and indeed the EOSS-P is an important tool which may assist physicians in assessing a patient holistically, rather than solely based on their weight (Ferraro et al., 2015). The EOSS-P is a Canadian evidence-based assessment tool which is currently being evaluated for its reliability and validity in clinical practice (A. Buchholz, personal communications, April 27, 2017), as was evaluated with its adult counterpart, the Edmonton Obesity Staging System for Adults (Padwal, Pajewski, Allison, & Sharma, 2011; Sharma & Kushner, 2009).

The next "A", *Advise* serves to remind physicians to guide children with obesity and their caregiver(s) to learn about obesity health consequences and benefits of modest weight loss (e.g., improvements in self-esteem, blood pressure, fitness, etc.), family-based treatment options, and sustainable strategies (Vallis et al., 2013; CON Primary

Care Working Group, 2013). Specifically, a focus on improving health and well-being (e.g., body image, blood sugars, coping, etc.) instead of weight reduction is encouraged (CON Primary Care Working Group, 2013).

Agree, is the fourth “A” which is used for physicians and children with obesity and their caregiver(s) to engage in shared-decision making related to weight loss expectations, behavioural goals, and a realistic treatment plan (Vallis et al., 2013; CON Primary Care Working Group, 2013). The recommendation of using the acronym SMART (Specific, Measurable, Achievable, Relevant, Timely) for behavioural goals may help guide clinicians to recommend behaviour change that is sustainable rather than use specific weight targets (CON Primary Care Working Group, 2013).

Finally, *Assist* is the final “A” which serves to guide physicians to make appropriate referrals for children with obesity and their caregiver(s) to specialists for follow-up, schedule frequent check-ins, and provide education and credible weight management resources (Vallis et al., 2013; CON Primary Care Working Group, 2013). In addition, referrals to appropriate providers using an interdisciplinary team (e.g., dietitians, social workers, exercise physiologists, etc.) approach, and assisting families in identifying and addressing drivers (e.g., emotional, environmental factors) and barriers (e.g., socioeconomic, medical factors) has been deemed important to manage children with obesity by the Canadian Obesity Network (CON Primary Care Working Group, 2013).

In brief, the 5As of Pediatric Obesity Management tool offers a structured, and patient-centered childhood obesity treatment resource that is theory- and evidence-driven (Vallis et al., 2013). The 5As of Pediatric Obesity Management is the first Canadian tool

available to guide primary care physicians in counseling and treating children with obesity and may be used as an effective vehicle for the delivery of comprehensive childhood obesity treatment to children and their caregiver(s) (CON Primary Care Working Group, 2013).

More generally, the 5As model overcomes many barriers cited by primary care physicians (He et al., 2010; Kuhle et al., 2015) including being time-efficient (Schlair, Moore, McMacken, & Jay, 2012). As reported by He and colleagues (2010), primary care physicians spend an average time of 18 minutes during initial paediatric obesity consultations, and approximately 12 minutes for follow-up appointments. In total, one study quantified the amount of time it would take to go through the 5 As in one visit to a maximum time of 15 minutes (Schlair et al., 2012). The authors explained that the 5 As should be revisited with patients in an iterative process with follow-up consultations lasting between 5 – 15 minutes (Schlair et al., 2012).

Three government health agencies: the Centers for Medicare & Medicaid Services (Centers for Medicare & Medicaid Services, 2011), U.S. Preventive Services Task Force ([USPSTF]; U.S. Preventive Services Task Force, 2015), and the Canadian Task Force on Preventive Health Care (W. Elford, Canadian Task Force on Preventive Health Care, personal communications with the U.S. Preventive Services Task Force, December 2000) have advocated for the use of the 5 As framework for obesity counselling.

Recommendations from the North American task forces and the agency for Medicare have been substantiated by supportive literature for use of the 5 As model in the management of obesity (Plourde & Prud'homme, 2012; Sherson et al., 2014).

Several systematic reviews have provided evidence suggesting that using the 5 As

model for the management of obesity can successfully modify health behaviour and improve physical activity (Plourde & Prud'homme, 2012; Sherson et al., 2014). Plourde & Prud'homme (2012) conducted a literature search of 88 publications which included systematic reviews, RCTs and meta-analyses that were published after the 2006 Canadian Guidelines on the Management and Prevention of Obesity in Adults and Children (Lau et al., 2007) to provide evidence that may help primary care physicians improve obesity counselling in adults. Included in the review were dietary, physical activity, and psychological interventions (Plourde & Prud'homme, 2012). Strong evidence for the 5 As model of behavioural change was reported in terms of modifying patients' health behaviour, and promoting physical activity (Plourde & Prud'homme, 2012).

In a systematic review aimed to encourage patient-centered care, Sherson and colleagues (2014) compared the 5 As being used by primary care physicians during obesity counselling, with the counselling preferences of patients who are overweight or obese. Of 15 articles using a combination of the 5 As model (i.e., Ask or Assess, Advise, Agree, Assist, and/or Arrange), the authors reported that the majority of patients (i.e., 67 – 75%) believed physicians played a role with weight loss in the future, corresponding to the fifth “A”, *Assist* (Sherson et al., 2014). However, only a minority of physicians (i.e., 14 – 17%) were found to *Assist* patients with obesity in clinical practice (Sherson et al., 2014). Further, during the counselling practice, 30% – 50% of patients wanted physicians to *Advise* and *Agree* with them, of which half of physicians had used *Advise* for weight management, but rarely used *Agree* (Sherson et al., 2014). Meanwhile, other findings included that 10 – 12% of patients with obesity did not want weight-related counselling from their physicians, which may demonstrate the important role to *Ask* while using the 5

As framework (Sherson et al., 2014). One quarter to one half of physicians were found to *Ask* patients on their obesity (Sherson et al., 2014). Interestingly, approximately one third of patients with obesity reported that weight was not addressed by their physicians (Sherson et al., 2014). This systematic review has demonstrated that the majority of patients prefer for their physicians to *Assist*, followed by *Advise*, and *Agree* with patients in their obesity counselling (Sherson et al., 2014). Although there was no patient data on how often they wanted to be *Assessed*, Sherson and colleagues (2014) reported a disconnect in physician practices related to patient needs as physicians frequently *Advise* and *Assess*, but rarely *Agree*, or *Assist*. To close this gap, Sherson and colleagues (2014) have noted “an important additional area for future research is to assess the impact of improved physician training in nutrition, physical activity and behavioural change models, such as the 5 A’s...” (p. 397).

Medical School Education Related to Childhood Obesity

To support the role of primary care physicians in counseling children with obesity, numerous national agencies in Canada have recommended furthering current and future physicians’ educational development (i.e., Canadian Task Force on Preventive Health Care, 2015; Lau et al., 2007; Report of the Standing Senate Committee on Social Affairs, Science and Technology, 2016). Specifically, for over a decade, the 2006 Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children (Lau et al., 2007) have recommended “continuing education activities that provide physicians... with the skills they need to counsel people confidently in healthy weight management...” (Lau et al., 2007, p. s10). More recently, a similar recommendation was advanced by the Canadian Task Force on Preventive Health

Care to increase physician training in weight management programs (Canadian Task Force on Preventive Health Care, 2015). Finally, the most recent Report of the Standing Senate Committee on Social Affairs, Science and Technology (2016) highlighted that improved training for physicians is necessary to enrich childhood obesity treatments in Canada.

Suggestions in the scientific literature also emphasize the need to better equip primary care physicians to counsel children with obesity and their caregiver(s). While childhood obesity may be incorporated in Canadian medical schools' curriculum, researchers have suggested that physician training related to the treatment of childhood obesity may not be sufficient (e.g., "Canadian primary care providers are inadequately equipped to address the burgeoning paediatric obesity epidemic... [due to] limited professional training..."; He et al., 2010, p. 424, "We estimated that only 20% of PCPs [Primary Care Physicians] has [childhood obesity] training"; Kuhle et al., 2015, p. 6, and "medical school curricula should include a comprehensive component on assessing and counseling children with weight problems"; Plourde, 2012, p. 504). As such, asking future physicians (i.e., medical students) who may be better able to reflect on their medical education given they are currently in it, is timely.

Research Purpose

The purpose of this survey-based, mixed-methods study was to investigate medical students' perceptions of: (1) their *overall* level of agreement with regard to whether they have received adequate medical school training related to the treatment of childhood obesity; (2) whether they have received adequate levels of medical school training in relation to 25 competencies identified by the Canadian Obesity Network

(CON Primary Care Working Group, 2013) as important for the successful treatment of children with obesity and their caregiver(s); and (3) the additional medical school curriculum and/or training needed to better prepare them to manage children with obesity and their families.

On the basis of Canadian (Frankfurter et al., 2017; He et al., 2010) and international findings (e.g., Franc et al., 2009; Gerner et al., 2006) showing that many primary care physicians feel ill-equipped to treat children with obesity in practice, it was hypothesized that medical students would perceive their medical training related to childhood obesity (both in general and in relation to the specific competencies assessed) to be inadequate. Interestingly, informal discussions with several medical school instructors in Canada provided initial (anecdotal) support for the hypothesis that students may perceive that they are receiving inadequate amounts of—and varied levels and types of—training related to the treatment of childhood obesity throughout their medical school education in Canada.

Chapter 2: Methods

Sample and Participant Selection

Students studying at medical schools in Canada were invited to participate in the study. A list of medical schools in Canada was retrieved from the Association of Faculties of Medicine of Canada website (<https://afmc.ca/about-afmc/our-faculties>; retrieved January 6, 2017). In total, 17 Canadian medical schools were identified and contacted (see Appendix B for a descriptive overview of these institutions).

Inclusion criteria. English speaking males and females who were ≥ 18 years old and enrolled as a student in any medical school in Canada during the recruitment period (January – March 2017), and therefore in a 2017, 2018, 2019, or 2020 graduating class, were eligible to participate in the study. Students enrolled in Years 1 through 4 were eligible to participate given that exposure to childhood obesity training might occur in any year of study (and because there does not appear to be a standard or uniform timeline/year of study pertaining to when such curricula might be introduced in Canadian medical schools). Individuals were asked to provide responses to various questions prior to completing the survey (i.e., age, fluency in English, current year of study, and what medical school they were enrolled in) to confirm eligibility. If students did not meet the aforementioned inclusion criteria, they were not eligible to participate in the study.

Sample size. A total of 10,775 medical students across Canada were eligible to participate (see Appendix B for enrollment numbers for each medical school in Canada). On average, the response rate reported in other studies surveying medical students in Canada was 26% (Gramlich et al., 2010; Ng & Irwin, 2013). These studies differed from the current investigation with respect to the length of the recruitment period (up to seven

months; Gramlich et al., 2010; Ng & Irwin, 2013) and the recruitment strategies used (surveys were sent out by personnel in the medical education offices at Canadian medical schools; Gramlich et al., 2010; Ng & Irwin, 2013). As such, we did not estimate a response rate or determine an a priori sample size for the present study; rather, we aimed to recruit as many medical students as possible in our condensed timeline for recruitment.

Study Design and Procedures

A cross-sectional, mixed-methods, survey-based design was employed. All study-related procedures and documents were approved by Western University's Research Ethics Board (see Appendix C for initial approval, Appendix D for amendment approval, and Appendix E for revised study title approval).

Data collection protocol. As noted above, potential participants were recruited from mid-January until early March 2017. A variety of methods were utilized to disseminate the survey as widely as possible, including the use of both electronic (i.e., online) and hard copy versions of the instrument.

Protocol for recruitment of students to complete the electronic (online) survey. Medical student council representatives, as well as physicians who were supervising medical students, were contacted to assist with recruitment of medical students. E-mail addresses for student council representatives were retrieved from medical school websites, and if not listed, medical school administrators were contacted via telephone to gather this information. E-mail addresses for physicians were also collected from paediatric and family medicine faculty directories which were available on all 17 Canadian medical school websites.

Once the appropriate contact information was obtained, student council

representatives ($n = 42$ from 17 institutions) and physicians ($n = 717$ from 17 institutions) were sent an e-mail from the research team containing: (a) a letter of information (Appendix F); (b) a letter of approval from the Western University Research Ethics Board (Appendix D); (c) a template e-mail that could be used by these professionals if they wished to send/forward the survey link to medical students; and (d) social media templates which could be used by these professionals if they wished to post the survey link on their social media accounts (i.e., Facebook and Twitter; Appendix G). Please see Appendix H for all e-mail scripts. Finally, the researchers involved in this study also posted and/or shared the social media ads on their personal and professional social media accounts in an attempt to share the study information and recruit medical students to complete the online survey.

Protocol for recruitment of students to complete the hard copy survey. Given that the research team endeavored to recruit students from all medical schools across Canada, the bulk of the recruitment efforts were directed toward completion of the online survey. However, as noted above, hard copy versions of the survey were also printed in an attempt to recruit additional medical students in local community settings. Using this strategy, medical students were approached by the student researcher in public spaces such as the lobbies of university medical school buildings. A survey distribution script (Appendix I) was memorized and utilized so that all potential participants were appropriately informed of the study and that their participation was voluntary and anonymous. Prior to asking potentially eligible medical students if they were interested in completing the survey, some of the screening questions were asked to ensure they could be included in the study. The hard copy survey was identical to the online survey with the

exception of the letter of information (Appendix J) which contained instructions for the student to place the completed survey in the envelope provided, to seal it, and to hand it back to the researcher (serving as consent to participate in the study).

Protocol for completion of the survey. Once the survey was obtained, either online or in hard copy format, potential participants were asked to read the letter of information (see Appendices F and J for online and hard copy versions, respectively) and to provide consent to participate in the research. The letter of information outlined that participation in the study was voluntary and would have no effect on students' future or current academic or professional standing, that questions could be skipped, and that the student could stop answering questions at any time. Informed consent was provided by participants via completion of the online survey or by placing the completed hard copy survey in an envelope and handing it back to the researcher. The contact information of the primary investigators was clearly listed on the letter of information in the event that potential participants had questions or concerns. The one-time survey took students approximately 5 – 10 minutes to complete. As an incentive, medical students were able to select one of four Canadian charities at the end of the survey (Canadian Red Cross, Canadian Cancer Society, World Vision Canada, Heart and Stroke Foundation of Canada) to which \$1 per survey would be donated by the research team.

Instrument. In line with the purposes of the study, the survey was developed by the research team to examine medical students' perceptions of the childhood obesity-related training acquired in medical school and their level of preparedness to manage children with obesity and their caregiver(s). All items in the survey were designed using people-first language in accordance with recommendations advanced by the Canadian

Obesity Network and several obesity experts and researchers (Flint & Reale, 2014; Kyle & Puhl, 2014). The use of people-first language is recommended to reduce biases and stigma related to obesity, and to respectfully address people as individuals first, rather than identifying or labeling them by their chronic disease (i.e., instead of using the term “obese children”, we have deliberately used the term “children with obesity” on the survey and throughout the thesis).

The first seven questions in the survey were demographic in nature, five of which assisted with screening of eligible participants (i.e., whether they were a medical student, which medical school they attended, what year of study they were in, whether they were fluent in English, and their age). The remaining two demographic questions pertained to sex and ethnicity. On the electronic survey, a prompt informed students immediately if they were ineligible to complete the survey based on their responses to the screening questions. Responses to the screening questions on the hard copy surveys were examined by a researcher once the survey was completed and handed in to determine whether the participants’ data could be included in the study.

The next segment of the survey consisted of a three part series of 27 items which were designed to evaluate students’ perceptions of their *overall* level of agreement in regards to receiving adequate training related to the management of childhood obesity ($n = 1$ item), their level of preparedness with regard to specific competencies identified as important for managing childhood obesity ($n = 25$ items), and what additional training, if any, was needed in relation to the successful management of childhood obesity in clinical practice ($n = 1$ item; Appendix K).

The first item (i.e., “*I believe I have received adequate training in medical school*”

to be able to successfully treat children with obesity”) was ranked on a five-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). As noted above, the next set of 25 items were developed on the basis of a series of evidence-based competencies outlined in the Canadian Obesity Network’s *5As of Pediatric Obesity Management* (CON Primary Care Working Group, 2013); a tool for health professionals who work with children with obesity and their caregivers. These 25 items were organized into five sections according to the 5As: (1) Ask ($n = 6$ items); (2) Assess ($n = 7$ items); (3) Advise ($n = 5$ items); (4) Agree ($n = 3$ items); and (5) Assist ($n = 4$ items). All items contained the stem “*I have received adequate training in medical school to be able to successfully...*” and were ranked on a five-point Likert scale ranging from “strongly disagree” to “strongly agree”. As noted above, the first of these five sections contained six items related to **Ask**, and included statements such as “...ask children with obesity and their caregivers for permission to discuss the child’s weight” and “...determine children’s readiness for behaviour change.” The second section included seven items related to **Assess**, including “...assess potential mental causes (e.g., anxiety, depression, body image, trauma, etc.) of weight in children” and “...assess the etiology (endocrine, monogenic, genetic syndrome, CNS/hypothalamic damage, and/or acquired) of childhood obesity”. The third section included five items related to **Advise**, which included competencies such as “...advise children and caregivers in relation to the risks associated with the child’s stage of obesity” and “...advise children with obesity and their caregivers on family-based treatment options (i.e., interventions related to eating behaviours, physical activity, sleep management, mental health, sedentary behaviours, and/or bariatric surgery)”. The fourth “A” was **Agree** and contained three items

including “...agree on a realistic and sustainable treatment plan with both children with obesity and their caregivers” and “...plan and agree on behaviour change outcomes (e.g., prevention or slowing of weight gain) with children with obesity and their caregivers”. Finally, the fifth section contained four items related to *Assist* and included statements such as “...arrange long-term and frequent follow-up visits for children with obesity and their caregivers” and “...provide education and credible weight management resources to children with obesity and their caregivers”.

The final segment of the survey consisted of the following open-ended question: “What additional medical school curriculum and/or training (e.g., types of training, topics, focus on specific skills and/or competencies, etc.), if any, might have been (or might be) beneficial in order to better prepare you for the management of children with obesity and their families in practice? Please list.”. Respondents were given adequate space to type and/or write their responses.

Data Analysis

For the online surveys, a web-based platform (Qualtrics Version 4.02, Qualtrics, Provo) was used for data collection due to its anonymous, user-friendly, and secure features. Online survey data (e.g., responses to questions, duration of time to complete the survey, completion rate from 0% to 100%, date completed) were sent electronically to the researchers as soon as potential participants completed the survey. Raw data from online surveys were imported electronically from Qualtrics into an EXCEL spreadsheet (Microsoft Excel, 2016). Raw data from hard copy surveys were entered manually by the researcher into the same “Master” EXCEL spreadsheet.

All quantitative data were transferred from the EXCEL spreadsheet to SPSS

(version 24, SPSS Inc., Chicago), which was used for all subsequent data management and analyses. Once data were uploaded into SPSS, listwise deletion (i.e., the removal of an entire survey from analysis if any data on the survey were missing; Schlomer, Bauman, & Card, 2010) was selected as the most appropriate approach for handling missing data due to the fact that “small percentages of missing values are less problematic and may be corrected with simpler data imputation methods...” (Saunders et al., 2006, p. 21). It is important to note that one potential disadvantage of the listwise deletion approach to handling missing data is that it can lead to a loss in statistical power due to a reduced sample size given the exclusion of entire surveys from analyses (Cox, McIntosh, Reason, & Terenzini, 2013; Schlomer et al., 2010).

With regard to demographic variables, means, standard deviations, and ranges were calculated for the age variable, and frequencies were used to calculate the percentage of students who attended specific Canadian medical schools, year of enrollment, sex, and ethnicity. SPSS (version 24, SPSS Inc., Chicago) was used to analyze all quantitative findings. Insofar as the first research question was concerned (i.e., examining medical students’ overall level of agreement with regard to whether they have received adequate medical school training related to the treatment of childhood obesity), numbers and frequencies were used to calculate the percentage of students who ranked their level of agreement using the five-point Likert scale.

The subsequent 25 items were analyzed to evaluate the second research question (i.e., whether medical students felt that they had received adequate medical training in relation to several *specific competencies* outlined by the Canadian Obesity Network; CON Primary Care Working Group, 2013). Numbers and percentages were again tallied

to determine which proportion of medical students' "strongly disagreed", "disagreed", remained "neutral", "agreed", or "strongly agreed" with each of the 25 items. To organize the data pertaining to the two research questions above, the frequencies were collapsed into (and are presented in the Results section as) three broad categories. That is, rather than presenting the data using the five Likert responses ranging from "strongly disagree" to "strongly agree", three broad categories combining: (1) "disagree" and "strongly disagree" responses; (2) "neutral" responses; and (3) "agree" and "strongly agree" responses were calculated and are presented for all items according to the 5As.

Qualitative data obtained for the final question relating to curriculum and/or training needs were imported electronically from the EXCEL spreadsheet into NVivo (Version 11.4, 2016). NVivo is a software program that is widely used for organizing and analyzing qualitative data; as such, it was used to code medical students' responses from the single open-ended question. Inductive thematic analysis was used because it identifies themes (i.e., data organized into meaningful groups; Braun & Clarke, 2006) which are strongly associated with and identified in the data (Patton, 2002). In brief, to retain the integrity of the data, inductive analysis was used so that the qualitative analysis was data-driven (Braun & Clarke, 2006). More specifically, the six steps of general thematic analysis outlined by Braun and Clarke (2006) were adhered to in the present study, including: 1) *Familiarizing yourself with the data*, which includes repeated readings of the data, and actively searching for meanings and patterns. In the present study, the data were read twice, by two researchers (independently) to immerse themselves with the content; 2) *Generating initial codes*, which involves the development of codes from the data. Thus, the same two researchers independently (to ensure that preconceptions about

the data were not discussed or formed) and systematically reviewed all responses and identified patterns in the dataset that were repeated (i.e., themes that were entered into NVivo as “codes”). Responses were then coded by the two researchers, as driven by the data; as such, themes that were analyzed did not necessarily relate to the broad topic of the open-ended question; 3) *Searching for themes*, which consists of identifying broader themes from the codes generated in the previous step. After reviewing potential relationships and connections between “codes”, they were collapsed to develop potential themes and subthemes, again, by two independent researchers; 4) *Reviewing themes*, which involves refining developed themes. Thematic maps (i.e., “initial” and “developed”) were created independently by two researchers, on the basis of the themes and subthemes identified in Phase 3; 5) *Defining and naming themes*, as described by Braun and Clarke (2006), consists of analyzing and reviewing each theme and providing names and definitions for each. In the present study, the two independent researchers met to review and refine the preliminary themes and subthemes, and overarching themes and subthemes were identified, agreed upon, and included in a final thematic map. In addition, both researchers discussed definitions for themes that were not clearly understood and arrived at a consensus for each theme and subtheme; and 6) *Producing the report*, which involves finalizing the analysis through examples from the data, and linking the data back to the research question(s) and broader literature to produce a final report (Braun & Clarke, 2006). Example quotes were extracted from medical students’ open-ended responses which were deemed, collaboratively by the two researchers, to best illustrate each identified theme. Where possible, a vivid quote was selected from a medical student in each year of study, and reported through the means of this thesis.

Chapter 3: Results

Recruitment and Response Rates

In total, medical students from 15 of the 17 medical schools (i.e., 88% of medical schools) in Canada completed the survey. Approximately 56 medical students (including 42 student council representatives) who were contacted by physicians or our research team agreed to distribute the survey via e-mail to medical students. In addition, the Canadian Obesity Network posted the survey information in their online newsletter, and the social media advertisements containing study information and the survey link were shared widely (e.g., the Twitter scripts generated 84 “retweets”, and Facebook posts were “shared” approximately nine times). In total, 734 individuals clicked on the online survey link. In addition, four medical students were approached by a researcher in community settings; two completed the survey on-site, one asked for more time and later met with the researcher to return the completed survey, and one declined participation.

A total of 31% ($n = 227$) individuals were removed from the initial dataset due to: 1) insufficient data (i.e., the respondent opened the survey but did not answer any of the questions [$n = 42$] or did not answer any of the questions beyond the demographic/screening questions [$n = 49$]); 2) ineligibility (i.e., the respondent did not attend a Canadian medical school [$n = 14$] or was not fluent in English [$n = 7$]); and 3) listwise deletion (i.e., individuals responded to some, but not all, of the questions beyond the demographic/screening questions, and as such were removed from the dataset [$n = 115$]). The proportion of missing data was found to be 19% in the present study; deemed a “small amount of missing data” (Saunders et al., 2006, p. 21), and a typical value when compared to other research studies (i.e., less than 20%; Saunders et al., 2006; Schlomer et

al., 2010).

Theoretically, although all students attending a medical school in Canada ($n = 10,775$ in 2017; Liason Committee on Medical Education: Accreditation Standards, 2017) were invited to participate in the study, the actual reach of our recruitment efforts is unknown. Nonetheless, after extensive recruitment efforts in a seven-week timeframe, followed by the removal of ineligible cases and missing data, a total of 507 medical students completed our survey in its entirety and were included in the analyses. As such, the response rate in the current study was a conservative estimate of 4.7% (see Appendix B for an overview of medical student enrollment at each of the 17 medical schools in Canada, as well as response rates for medical students in this study by medical school).

Participant Demographics

Table 1 and Appendix B presents an overview of the demographic characteristics of medical students who participated in the study ($N = 507$). Participants ranged in age from 19 to 44 years ($M_{\text{age}} = 25.0$, $SD = 3.2$); the majority identified as female (67.1%) and Caucasian (69.8%). The greatest numbers of respondents reported enrollment in medical schools at Western University (15.8%), University of Saskatchewan (9.8%), and the University of Toronto (9.1%). There was a fairly even distribution of students across each year of study, with most reporting enrollment in Year 1 (29.8%).

Medical Students' Perceptions of their Overall Training Related to Treating Children with Obesity

Table 2 contains the numbers and percentages of medical students (in all years of study) who “agreed”, were “neutral”, or “disagreed”/“strongly disagreed” with the survey

Table 1

Characteristics of Medical Students in Canada Who Completed the Survey and Were Included in Analyses (N = 507)

Participant characteristics	<i>M</i>	<i>SD</i>
Age	25.0	3.2
	<i>n</i>	%
Sex		
Female	340	67.1
Male	165	32.5
Ethnicity		
Caucasian	354	69.8
Asian	102	20.1
Other	46	9.1
Region of medical school		
Western	115	22.7
Ontario	261	51.5
Eastern	131	25.8
Current year of academic enrollment		
1 st	151	29.8
2 nd	119	23.5
3 rd	111	21.9
4 th	126	24.9

Note. Medical schools that represented the Western region of Canada included the University of Calgary, University of Alberta, University of British Columbia, University of Manitoba, and University of Saskatchewan. Medical schools that represented Ontario included Western University, Queen's University, Northern Ontario School of Medicine, the University of Toronto, and the University of Ottawa. Medical schools that represented the Eastern region of Canada included Memorial University of Newfoundland, Dalhousie University, McGill University, Laval University, and the University of Montreal.

Table 2

Medical Students' (N = 507) Perceptions of their Overall Medical Education Related to the Treatment of Childhood Obesity

Item	Disagree or strongly disagree n (%)	Neutral n (%)	Agree n (%)
<i>"I believe I have received adequate training in medical school to be able to successfully treat children with obesity"</i>	303 (59.7)	124 (24.5)	80 (15.8)

Note. No medical students selected the "strongly agree" response to the item above.

item pertaining to whether they felt that they had acquired adequate training in medical school to be able to successfully treat children with obesity. Interestingly, no medical students (0%) “strongly agreed” with this statement and only 15.8% of students ($n = 80$) “agreed” that their training in this area was adequate. Close to 60% of medical students either “disagreed” (47.5%; $n = 241$) or “strongly disagreed” (12.2%; $n = 62$) with the statement, and 24.5% of students ($n = 124$) selected the “neutral” option.

Specific Competencies Related to the 5As of Pediatric Obesity Management

As noted previously, medical students were also asked to rate their level of agreement on a five-point Likert scale in accordance with the statement “*I have received adequate training in medical school to be able to successfully...*”, followed by a list of competencies identified by the Canadian Obesity Network (CON Primary Care Working Group, 2013) as important for health professionals to treat children with obesity and their caregiver(s). Tables 3 – 7 provide an overview of the total number and percentage of medical students who “strongly disagreed”/“disagreed”, were “neutral”, or “agreed”/“strongly agreed” with the specific competency-related items within each of the 5 A categories.

Medical students’ perceptions of their medical training in relation to the “Ask” competencies. Table 3 presents the results associated with six items related to the *Ask* competencies described in the 5As of Childhood Obesity Management framework. Less than half (42.2%, $n = 214$) of the medical students surveyed “agreed” or “strongly agreed” that they had received adequate training to ask permission to discuss a child’s weight, whereas 20.1% of students ($n = 102$) responded with “neutral”, and 37.7% ($n = 191$) “disagreed” or “strongly disagreed”. When asked about their perceptions in regards

Table 3

Medical Students' (N = 507) Perceived Level of Agreement Related to the Competencies within the "Ask" Category of the 5As of Pediatric Obesity Management

<i>"Ask" Competencies</i>	<i>Disagree or strongly disagree n (%)</i>	<i>Neutral n (%)</i>	<i>Agree or strongly agree n (%)</i>
<i>"Ask children with obesity and their caregivers for permission to discuss the child's weight"</i>	191 (37.7)	102 (20.1)	214 (42.2)
<i>"Counsel children with obesity and their caregivers using a non-judgmental approach"</i>	150 (29.6)	112 (22.1)	245 (48.3)
<i>"Determine children's readiness for behaviour change"</i>	219 (43.2)	127 (25.0)	161 (31.8)
<i>"Determine caregivers' readiness for behaviour change"</i>	179 (35.3)	124 (24.5)	204 (40.2)
<i>"Use motivational interviewing (MI) to move children with obesity and their caregivers along the stage(s) of change"</i>	206 (40.7)	131 (25.8)	170 (33.5)
<i>"Create and/or promote a "weight-friendly" medical practice (e.g., large restrooms, scales over 350lb capacity, appropriate reading material in waiting rooms, appropriate-sized garments and equipment in exam rooms, etc.)"</i>	312 (61.5)	107 (21.1)	88 (17.4)

Note. All items were ranked on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). From the "5As of Pediatric Obesity Management" by CON Primary Care Working Group, 2013.

Table 4

Medical Students' (N = 507) Perceived Level of Agreement Related to the Competencies within the "Assess" Category of the 5As of Pediatric Obesity Management

<i>"Assess" Competencies</i>	<i>Disagree or strongly disagree n (%)</i>	<i>Neutral n (%)</i>	<i>Agree or strongly agree n (%)</i>
<i>"Assess obesity status in children using body mass index (BMI) growth charts specific for age and gender (e.g., Centers for Disease Control and Prevention [CDC] and/or World Health Organization [WHO] growth charts"</i>	76 (15.0)	43 (8.5)	388 (76.5)
<i>"Assess the obesity stage of the child (e.g., using a tool such as the Edmonton Obesity Staging System – Pediatrics) in order to quantify the impact of obesity on children's overall health"</i>	329 (64.9)	71 (14.0)	107 (21.1)
<i>"Assess potential mental causes (e.g., anxiety, depression, body image, trauma, etc.) of weight gain in children"</i>	195 (38.5)	106 (20.9)	206 (40.6)
<i>"Assess potential mechanical causes (e.g., sleep apnea, MSK pain, reflux disease, etc.) of weight gain in children"</i>	171 (33.7)	113 (22.3)	223 (44.0)
<i>"Assess potential metabolic causes (e.g., IGT/Type II diabetes, dyslipidemia, hypertension, etc.) of weight gain in children"</i>	97 (19.1)	85 (16.8)	325 (64.1)
<i>"Assess potential milieu/environmental causes (e.g., family stressors, bullying/stigma, school support, food environment, opportunities for physical activity, etc.) of weight gain in children"</i>	106 (20.9)	109 (21.5)	292 (57.6)
<i>"Assess the etiology (endocrine, monogenic, genetic syndrome, CNS/hypothalamic damage, and/or acquired) of childhood obesity"</i>	147 (29.0)	118 (23.3)	242 (47.7)

Note. All items were ranked on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). From the “5As of Pediatric Obesity Management” by CON Primary Care Working Group, 2013.

Table 5

Medical Students' (N = 507) Perceived Level of Agreement Related to the Competencies within the "Advise" Category of the 5As of Pediatric Obesity Management

<i>"Advise" Competencies</i>	<i>Disagree or strongly disagree n (%)</i>	<i>Neutral n (%)</i>	<i>Agree or strongly agree n (%)</i>
<i>"Advise children and caregivers in relation to the risks associated with the child's stage of obesity"</i>	156 (30.8)	125 (24.7)	226 (44.6)
<i>"Offer health advice to children and caregivers that is not focused solely on weight loss"</i>	153 (30.2)	116 (22.9)	238 (46.9)
<i>"Explain the health benefits (e.g., improved lipid profile, self-esteem, sleep, fitness, etc.) associated with changes in health behaviours to children with obesity and their caregivers"</i>	81 (16.0)	94 (18.5)	332 (65.5)
<i>"Explain the need for feasible and long-term strategies, rather than "quick fixes" (e.g., fad diets, etc.), to children with obesity and their caregivers"</i>	91 (17.9)	78 (15.4)	338 (66.7)
<i>"Advise children with obesity and their caregivers on family-based treatment options (i.e., interventions related to eating behaviours, physical activity, sleep management, mental health, sedentary) behaviours, and/or bariatric surgery"</i>	176 (34.7)	123 (24.3)	208 (41.0)

Note. All items were ranked on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). From the "5As of Pediatric Obesity Management" by CON Primary Care Working Group, 2013.

Table 6

Medical Students' (N = 507) Perceived Level of Agreement Related to the Competencies within the "Agree" Category of the 5As of Pediatric Obesity Management

<i>"Agree" Competencies</i>	<i>Disagree or strongly disagree n (%)</i>	<i>Neutral n (%)</i>	<i>Agree or strongly agree n (%)</i>
<i>"Plan and agree on SMART (i.e., Specific, Measurable, Achievable, Rewarding, Timely) and sustainable behavioural goals with children with obesity and their caregivers"</i>	156 (30.8)	118 (23.3)	233 (46.0)
<i>"Plan and agree on behaviour change outcomes (e.g., prevention or slowing of weight gain) with children with obesity and their caregivers"</i>	162 (32.0)	141 (27.8)	204 (40.2)
<i>"Agree on a realistic and sustainable treatment plan with both children with obesity and their caregivers"</i>	172 (33.9)	162 (32.0)	173 (34.1)

Note. All items were ranked on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). From the "5As of Pediatric Obesity Management" by CON Primary Care Working Group, 2013.

Table 7

Medical Students' (N = 507) Perceived Level of Agreement Related to the Competencies within the "Assist" Category of the 5As of Pediatric Obesity Management

<i>"Assist" Competencies</i>	<i>Disagree or strongly disagree n (%)</i>	<i>Neutral n (%)</i>	<i>Agree or strongly agree n (%)</i>
<i>"Assist families in identifying and addressing drivers and barriers related to childhood obesity (e.g., environmental, socio- economical, emotional, and/or medical factors)"</i>	134 (26.4)	129 (25.4)	244 (48.1)
<i>"Provide education and credible weight management resources to children with obesity and their caregivers"</i>	218 (43.0)	157 (31.0)	132 (26.1)
<i>"Refer children with obesity to appropriate provider (physiotherapist/ occupational therapist, etc.)"</i>	127 (25.0)	102 (20.1)	278 (54.8)
<i>"Arrange long-term and frequent follow-up visits for children with obesity"</i>	120 (23.7)	124 (24.5)	263 (51.9)

Note. All items were ranked on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). From the "5As of Pediatric Obesity Management" by CON Primary Care Working Group, 2013.

to counselling children with obesity and their caregivers using a non-judgmental approach, almost half of students (48.3%, $n = 245$) “agreed” or “strongly agreed” that they had received adequate training in this competency, while 22.1% ($n = 112$) of students remained “neutral”, and 29.6% ($n = 150$) “disagreed” or “strongly disagreed”. Students were also asked, in separate items, if they received adequate training in medical school to be able to determine *children’s* and *caregivers’* readiness for change. Slightly more students felt that they received adequate education related to determining *caregivers’* readiness to change (40.2% [$n = 204$] “agreed” or “strongly agreed” and 35.3% [$n = 179$] “disagreed” or “strongly disagreed”) in comparison to determining *children’s* readiness to change (31.8% [$n = 161$] “agreed” or “strongly agreed” and 43.2% [$n = 219$] “disagreed” or “strongly disagreed”). Approximately one quarter of students remained “neutral” with regard to determining *caregivers’* and *children’s* readiness to change (24.5% [$n = 124$] and 25.0% [$n = 127$], respectively). With regard to students’ perceptions of their training in the area of motivational interviewing, 40.7% ($n = 206$) “disagreed” or “strongly disagreed” that they had received sufficient medical education in this area, whereas approximately one third of students reported that they “agreed” or “strongly agreed” (33.5%, $n = 170$), and one quarter remained “neutral” (25.8%, $n = 131$). Finally, when asked about creating and/or promoting a weight-friendly medical practice, the majority (61.5%, $n = 312$) of medical students “disagreed” or “strongly disagreed” that they had received adequate medical training in this area, and approximately one fifth of students responded with “neutral” or “agreed”/“strongly agreed” (21.1% [$n = 107$] and 17.4% [$n = 88$], respectively).

Medical students' perceptions of their medical training in relation to the "Assess" competencies. Table 4 contains seven items related to the *Assess* competencies described in the 5As of childhood obesity management model. The majority of the medical students surveyed (76.5%, $n = 388$) "agreed" or "strongly agreed" that they had received adequate training to assess a child's obesity status; smaller proportions remained "neutral" or "disagreed"/"strongly disagreed" (8.5% [$n = 43$] and 15.0% [$n = 76$], respectively) with this item. Conversely, the majority of students "disagreed" or "strongly disagreed" (64.9%, $n = 329$) that they had received adequate training related to assessing the obesity stage of a child (using a tool such as the Edmonton Obesity Staging System – Pediatrics), while 21.1% ($n = 107$) "agreed" or "strongly agreed" and 14.0% ($n = 71$) were "neutral". With regard to assessing potential mental causes (e.g., anxiety, depression, body image, trauma, etc.) of weight gain in children, 40.6% of students ($n = 206$) "agreed" or "strongly agreed" that their training was adequate, while 38.5% ($n = 195$) "disagreed" or "strongly disagreed" and 20.9% ($n = 106$) remained "neutral". In relation to receiving adequate training in the assessment of potential mechanical causes (e.g., sleep apnea, MSK pain, reflux disease, etc.) of weight gain in children, 44.0% ($n = 223$) "agreed" or "strongly agreed", while 33.7% ($n = 171$) "disagreed" or "strongly disagreed" and 22.3% ($n = 113$) remained "neutral". The majority of medical students agreed that their training regarding the assessment of potential metabolic causes (e.g., IGT/Type II Diabetes, dyslipidemia, hypertension, etc.) of weight gain in children was adequate (i.e., 64.1% [$n = 325$] "agreed"/"strongly agreed", 19.1% [$n = 97$] "disagreed"/"strongly disagreed", and 16.8% [$n = 85$] remained "neutral". Similarly, most students felt that their training related to the assessment of potential milieu/environmental causes

(e.g., family stressors, bullying/stigma, school support, food environment, opportunities for physical activity, etc.) was adequate (i.e., 57.6% [$n = 292$] “agreed”/“strongly agreed”, 20.9% [$n = 106$] “disagreed”/“strongly disagreed”, and 21.5% [$n = 109$] remained “neutral”). Lastly, almost half of students “agreed” or “strongly agreed” (47.7%, $n = 242$) that they had received adequate medical training to assess the etiology (endocrine, monogenic, genetic syndrome, CNS/hypothalamic damage, and/or acquired) of childhood obesity, while 29.0% ($n = 147$) “disagreed” or “strongly disagreed”, and 23.3% ($n = 118$) responded with “neutral”.

Medical students’ perceptions of their medical training in relation to the “Advise” competencies. Table 5 contains the results associated with the five items related to the *Assess* competencies described in the 5As of childhood obesity management. In terms of advising children and their caregivers on the risks associated with the child's stage of obesity, close to half of medical students “agreed” or “strongly agreed” (44.6%, $n = 226$) that they had received adequate training in this area, while 30.8% ($n = 156$) “disagreed” or “strongly disagreed” and 24.7% ($n = 125$) remained “neutral”. With regard to receiving enough training to offer health advice to children and caregivers that is not focused solely on weight loss, again, close to half of students “agreed” or “strongly agreed” (46.9%, $n = 238$) while 30.2% ($n = 153$) “disagreed” or “strongly disagreed” and 22.9% ($n = 116$) responded with “neutral”. The majority of students surveyed (65.5%, $n = 332$) “agreed” or “strongly agreed” that they had received adequate training to be able to explain the health benefits associated with changes in health behaviours to children with obesity and their caregivers; 16.0% ($n = 81$) “disagreed” or “strongly disagreed” and 18.5% ($n = 94$) remained “neutral” in their

response to this item. Further, with regard to perceptions of adequate training related to explaining the need for feasible and long-term strategies, rather than “quick fixes” (e.g., fad diets), to children with obesity and their caregivers, 66.7% ($n = 338$) of students “agreed” or “strongly agreed”, 17.9% ($n = 91$) “disagreed” or “strongly disagreed”, and 15.4% ($n = 78$) selected “neutral”. Lastly, insofar as advising children with obesity and their caregivers on family-based treatment options was concerned, 41.0% of students ($n = 208$) “agreed” or “strongly agreed”, 34.7% ($n = 176$) “disagreed” or “strongly disagreed” and 24.3% ($n = 123$) were “neutral” in their perceptions that their training was adequate.

Medical students’ perceptions of their medical training in relation to the “Agree” competencies. Table 6 contains an overview of the findings related to three items in the *Agree* category of the 5As of childhood obesity management. In terms of medical students’ perceptions that they had received adequate training to be able to plan and agree on SMART (i.e. Specific, Measurable, Achievable, Rewarding, Timely) and sustainable behavioural goals with children with obesity and their caregiver(s), close to half of students (46.0%, $n = 233$) “agreed” or “strongly agreed”, while 30.8% ($n = 156$) “disagreed” or “strongly disagreed”, and 23.3% ($n = 118$) remained “neutral”.

Approximately 40% of students ($n = 204$) “agreed” or “strongly agreed” that they had acquired sufficient training pertaining to planning and agreeing on behaviour change outcomes, while 32.0% ($n = 162$) “disagreed” or “strongly disagreed”, and 27.8% ($n = 141$) remained “neutral”. Specific to agreeing on a realistic and sustainable treatment plan with both children with obesity and their caregiver(s), approximately one third of medical students (34.1%, $n = 173$) “agreed” or “strongly agreed” that they had received adequate

training in this area, whereas 33.9% ($n = 172$) “disagreed” or “strongly disagreed”, and 32.0% ($n = 162$) remained “neutral”.

Medical students’ perceptions of their medical training in relation to the “Assist” competencies. Table 7 contains frequencies pertaining to the four items related to the *Assist* competencies found in the 5As of Childhood Obesity Management. First, in relation to assisting families in identifying and addressing drivers and barriers related to childhood obesity, almost half of medical students (48.1%, $n = 244$) “agreed” or “strongly agreed” agreed that they had received sufficient training in this competency, while 26.4% ($n = 134$) “disagreed” or “strongly disagreed”, and 25.4% ($n = 129$) remained “neutral”. Conversely, 43.0% of medical students ($n = 218$) “disagreed” or “strongly disagreed” that they felt equipped to provide education and credible weight management resources to children with obesity and their caregiver(s); 26.1% ($n = 132$) “agreed” or “strongly agreed”, and 31.0% ($n = 157$) responded with “neutral”. With regard to referring children with obesity to appropriate providers, more than half of students (54.8%, $n = 278$) “agreed” or “strongly agreed” that they had received sufficient training in this area, while 25.0% ($n = 127$) “disagreed” or “strongly disagreed”, and 20.1% ($n = 102$) were “neutral”. Lastly, as far as the ability to arrange long-term and frequent follow-up visits for children with obesity was concerned, more than half of students (51.9%, $n = 263$) “agreed” or “strongly agreed” that they had received adequate training to do so, while 23.7% ($n = 120$) “disagreed” or “strongly disagreed”, and 24.5% ($n = 124$) selected “neutral”.

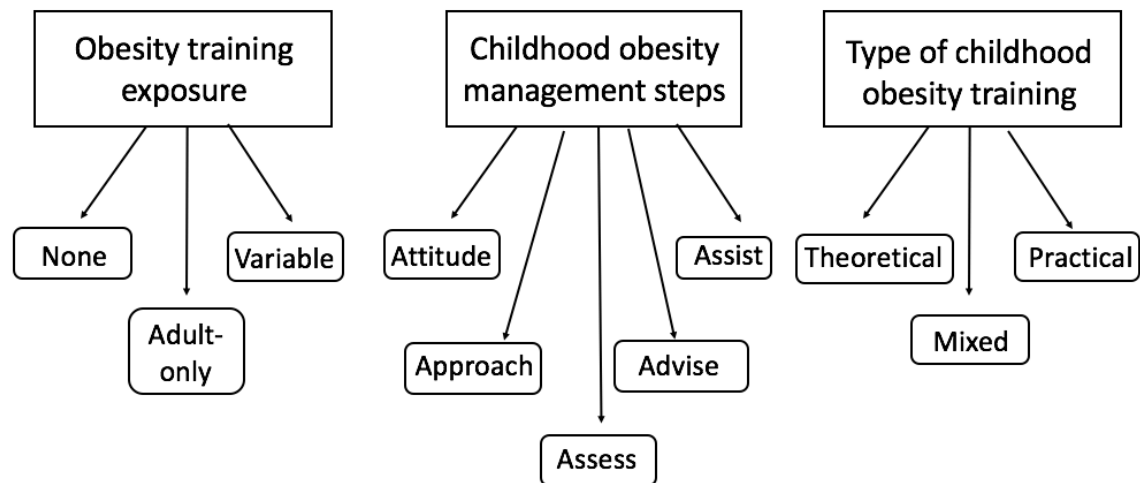
Qualitative Analysis

The third part of our overall research purpose related to what additional medical school curriculum and/or training students perceived would be beneficial or necessary to better prepare them to treat children with obesity and their families in practice. As noted in the Methods section, the six steps of thematic analysis outlined by Braun and Clarke (2006) were undertaken to inductively analyze the qualitative data obtained from this open-ended survey question. The three main themes that were analyzed from the data were *obesity training exposure*, *type of childhood obesity training*, and *childhood obesity management steps* (Figure 1). These three themes included various subthemes, all of which are discussed in the relevant sections below.

Obesity training exposure. Medical student responses that were deemed by the researchers to best reflect this theme and accompanying subthemes are presented in Table 8. Three subthemes that were identified by the researchers in relation to this broad theme included: “*adult-only*”, “*none*”, and “*variable*” obesity training exposure. For the *adult-only* subtheme, several medical students noted that they did not receive training specific to childhood obesity; rather, the obesity education delivered in medical school was reported to be limited to adult obesity primarily. This finding was supported by multiple student responses when they were asked what additional childhood obesity medical training would be beneficial (e.g., “*Training so far has focused on the adult population. While many of the principles may be applied to kids, no pediatric-specific scenarios have been practiced nor resources have been provided--hence, "neutral"*” [Year 1 medical student], and “*Lectures specifically focused on obesity in children. We have so far only discussed obesity in the general population [mostly adults]. Would be good to know how*

Figure 1

Thematic Map of the Childhood Obesity-Specific Themes and Subthemes That Were Analyzed from Medical Students' Responses to the Open-Ended Survey Question Pertaining to Additional Medical School Training Required



Note. Terms in rectangles represent major themes, arrows point to subthemes in the boxes below.

managing obesity in children differs from adults” [Year 2 medical student]).

Specific to the subtheme *none*, some medical students reported lacking medical training related to the treatment of childhood obesity altogether. Some examples illustrating this subtheme included, “*Would be nice to have lectures or clinical skills sessions on this topic. Currently there is no childhood obesity in the pre-clerk curriculum*” (Year 2 medical student), and “*All of the information on this list [within the survey] remains uncovered*” (Year 3 medical student).

The subtheme *variable* captured medical student responses suggesting that they received some exposure to childhood obesity treatment training depending on the training they received during their paediatric clinical rotations (i.e., if they encountered children with obesity and/or if the attending explained to the medical student they were supervising how to treat children with obesity) or if students completed a medical elective (i.e., a clinical rotation in a specialty as decided by the medical student) that would expose them to children with obesity.

Types of childhood obesity training. Table 9 presents an overview of the overarching theme *types of childhood obesity training* needed and the three subthemes that emerged from the data included *theoretical*, *practical*, and *mixed* training. Specifically, in response to the open-ended question about what additional training might be needed to better prepare medical students to treat children with obesity, many suggested that *theoretical* (i.e., in class) information delivered via lectures, small group discussions/sessions, presentations, guidelines, etc., *practical* (i.e., clinical) training that focused on standardized patients [SPs], clinical skills, role playing, etc., and *mixed* types of training (i.e., theoretical and practical) would be beneficial. Refer to Table 9 for

Table 8

Selected Medical Student Responses Related to the "Obesity Training Exposure" Theme

Survey question: "What additional medical school curriculum and/or training [e.g., types of training, topics, focus on specific skills and/or competencies, etc.], if any, might have been [or might be] beneficial in order to better prepare you for the management of children with obesity and their families in practice? Please list."

Broad Theme: Obesity Training Exposure*Subtheme 1: Adult-Only (i.e., medical training related to adult obesity only)*

"Focus on paediatrics (even in first year). Right now we get this training in first year but only with the adult population."

– *first year medical student*

"Our discussion of obesity was primarily limited to adults. It would be nice to apply it to children more specifically."

– *second year medical student*

"In Endocrinology classes, we discussed about obesity but not specific to the child. It could easily be incorporated. Or during the Peds rotation."

– *third year medical student*

"Information on strategies geared toward children (e.g. we received MI info geared towards adults - I am not sure if changed would have to be made for young patients)."

– *fourth year medical student*

Subtheme 2: None (i.e., no training specific to childhood obesity)

"I'm first year, so I don't know too much yet, but we've basically covered nothing so far on any of this (I'm not sure what's going to be covered ...)."

– *first year medical student*

"An introduction to the topic of child obesity and its repercussions."

– *second year medical student*

"Had no lecture on this at all that I can recall. Perhaps at least having some exposure during pre-clerkship."

– *third year medical student*

"Teaching about obesity in children, diagnosis, ethology, management (this was never specifically addressed)."

– *fourth year medical student*

Subtheme 3: Variable (i.e., only some medical students were exposed to childhood obesity training)

"We don't have a lot of classes during the 2 first years of medical school. In clerkship it depends on the exposure during the peds rotation."

– *fourth year medical student*

"I completed a 2 week elective with consultant paediatricians in which I was able to gain a lot of experience with childhood obesity. "

– *fourth year medical student*

"I did 4 weeks in pediatric endocrinology and it helped me a lot. Maybe if every student could go at least a day while they are doing general paediatrics it could help."

– *fourth year medical student*

Note. MI = motivational interviewing; Peds = paediatrics; Pre-clerkship = years 1 and 2 or non-clinical years of study.

Table 9

Selected Medical Student Responses Related to the “Type of Childhood Obesity Training” Theme

Survey question: “What additional medical school curriculum and/or training [e.g., types of training, topics, focus on specific skills and/or competencies, etc.], if any, might have been [or might be] beneficial in order to better prepare you for the management of children with obesity and their families in practice? Please list.”

Broad Theme: Type of Childhood Obesity Training

Subtheme 1: Theoretical (i.e., in-class) training

"A small group session led by a paediatrician with experience in dealing with patients with childhood obesity."

– *first year medical student*

"Multiple lectures on obesity, nutrition (adult and pediatric) in several blocks including Endocrinology, Cardiology and GI."

– *second year medical student*

“A better lecture on this subject!”

– *third year medical student*

“A specific lecture on obesity including etiology, h&p and management.”

– *fourth year medical student*

Subtheme 2: Practical (i.e., clinical) training

"Hands on training instead of just theoretical knowledge."

– *first year medical student*

"Practice interviewing sessions with obese children during clinical methods course."

– *second year medical student*

"Less didactic training, more practice."

– *third year medical student*

"Specific standardized patient encounter to the topic."

– *fourth year medical student*

Subtheme 3: Mixed (i.e., theoretical and practical) training

"As a first year student, we have discussed some of these components, but I don't know how comfortable I would be putting them into practice. In particular, I think anti-stigma type conversations need to be had more frankly, and we need to practice the actual words we would use to bring up the issue of obesity with a child and their caregiver. Though the theory makes sense in my head, it is much harder to put it into practice!"

–first year medical student

"A specific lecture or section of a lecture focusing on exactly what to do for children with obesity. Inclusion of problem based learning/case based learning with childhood obesity. A clinical skills simulation or mandatory shadowing experience for children with obesity. "

– second year medical

"Paediatrics rotation, motivational interview training, lecture about childhood obesity."

– third year medical student

"Small groups in Pediatric rotation to address obesity would be beneficial. Exposure to Pediatric metabolic clinics would be beneficial. Online learning module could palliate gaps in training/exposure gaps."

– fourth year medical student

Note. h&p = history and physical; GI = gastrointestinal

example quotes from medical students in each year of study that illustrate these three subthemes.

Childhood obesity management steps. Table 10 provides an overview of the main theme and lists five “steps” (i.e., subthemes) that emerged from medical student responses in relation to the management of childhood obesity. Table 10 also contains selected quotes from medical students in each year of study that are illustrative of this theme and the corresponding subthemes. *Attitude* and *approach* are two unique subthemes that were analyzed from the data and are defined below. Interestingly, three of the subthemes that researchers also defined as management “steps” were similar to three of the 5As of Pediatric Obesity Management outlined by the Canadian Obesity Network (CON Primary Care Working Group, 2013). These three subthemes were labeled *assess*, *advise*, and *assist*.

The subtheme *attitude* was defined as a health professional’s ability to address obesity in a timely manner, and without negative bias towards obesity. *Approach* was defined as a health professionals’ ability to counsel children with obesity and their caregiver(s) in a sensitive and understanding manner. The definitions that were developed by the researchers for the subthemes *assess*, *advise*, and *assist* reflected the present data and were not defined on the basis of the 5As of Pediatric Obesity Management. For the purpose of this study, *assess* was defined as a health professional’s ability to examine underlying causes for childhood obesity, and *advise* referred to the use of sustainable management and treatment options. Finally, *assist* was defined as a health professional’s ability to provide resources, programs, and appropriate referrals. Again, although overlap exists between the definitions in this study and the 5As of Pediatric Obesity Management,

Table 10

Selected Medical Student Responses Related to the “Childhood Obesity Management Steps” Theme

Survey question: “What additional medical school curriculum and/or training [e.g., types of training, topics, focus on specific skills and/or competencies, etc.], if any, might have been [or might be] beneficial in order to better prepare you for the management of children with obesity and their families in practice? Please list.”

Broad Theme: Childhood Obesity Management Steps

Subtheme 1: Attitude (i.e., addressing obesity in a timely manner, and without negative bias towards obesity)

"I am only in 1st year so not sure what is to come, but a bigger focus on motivational interviewing and non-judgemental practices would be helpful. Recently in a discussion group, the pediatrician facilitator told us that they tell parents it is their fault if they have a child who is obese. So to keep that type of attitude from being perpetuated, I think intervention in medical education is needed."

– *first year medical student*

"Some data on how to effect behavioural change would be very helpful. Some of my classmates explicitly believe that shaming someone for their weight is an effective strategy."

– *second year medical student*

“When you see a child with obesity in clinic for which weight is NOT the reason for the appointment, DONT defer the conversation for "another time".”

– *third year medical student*

“Assess causes of childhood obesity in a non-judgemental and non-stigmatizing way.”

– *fourth year medical student*

Subtheme 2: Approach (i.e., counselling in a sensitive and understanding manner)

"Practice having difficult conversations about weight management with parents without offending the parent or child.”

– *first year medical student*

"Interview approach to address childhood obesity in an effective, non-judgemental manner."

– *second year medical student*

"Paediatric motivational interviewing, how to broach topics such as obesity with patients and families."

– *third year medical student*

"Motivation interviewing in paediatrics, approaching the subject of weight loss in children tactfully and respectfully."

– *fourth year medical student*

Subtheme 3: Assess (i.e., examining underlying causes for a child with obesity)

"Psychology of weight in children to adults."

– *first year medical student*

"Identifying and dismantling barriers to reducing weight. Identifying causes of obesity whether physiological or social."

– *second year medical student*

"In general, we need to learn more about the basic medical workup to exclude endocrine, metabolic, etc. cause."

– *third year medical student*

"New onset eating disorder behaviours in adolescents."

– *fourth year medical student*

Subtheme 4: Advise (i.e., using sustainable management and treatment options)

"Have received introduction in lectures on eating and obesity physiology and pathology, with minimal focus on how to treat."

– *first year medical student*

"Clarity about which weight loss strategies are most effective in the long term."

– *second year medical student*

"Specific risks and health implications of obesity in childhood. Appropriate dieting/diet alteration in childhood."

– *third year medical student*

"Intervention options, e.g. diet types."

– *fourth year medical student*

Subtheme 5: Assist (i.e., providing resources, programs, and appropriate referrals)

"Dieting and exercise programs."

– *first year medical student*

"Increased training regarding multidisciplinary care."
– *second year medical student*

“More practical information rather than "gold standard" advice. Actual information on how to refer a kid to a current program available to them rather than what would be the ideal treatment in an ideal world.”
– *third year medical student*

“Info on local resources for families.”
– *fourth year medical student*

Note. MI = motivational interviewing; Peds = paediatrics; Pre-clerkship = years 1 and 2 or non-clinical years of study; info = information.

important differences also existed. In particular, no references were made by medical students in the current study regarding several components included in the definitions advanced by the Canadian Obesity Network (CON Primary Care Working Group, 2013) for *Assess* (students did not mention examining obesity related risk, obesity class, or stage), *Advise* (students did not mention discussing obesity risk or explaining benefits of health behaviour changes), and *Assist* (students did not mention addressing drivers and barriers of childhood obesity or offering education).

Chapter 4: Discussion

The authors of previous studies conducted in Canada have reported inadequate medical training as a key barrier for primary care physicians to provide treatment to children with obesity (Frankfurter, Cunningham, Morrison, Rimas, & Bailey, 2017; He, Piché, Clarson, Callaghan, & Harris, 2010). To our knowledge, this is the first Canadian study to investigate medical students' perceptions of the overall childhood obesity training acquired in medical school, the adequacy of this training in relation to several competencies identified as important in the treatment of children with obesity, and the training needed to enhance childhood obesity treatment medical education.

Overall, approximately 60% of medical students “disagreed” or “strongly disagreed” that they had received adequate medical education related to the treatment of childhood obesity (interestingly, only 15.8% “agreed” and no students “strongly agreed” with this item). These findings are in line with the results of another Canadian study which reported that 65% of family physicians and 50% of community paediatricians identified limited professional training as a key barrier for successfully managing paediatric obesity (He et al., 2010). Given the large proportion of future doctors and primary care physicians in Canada who may not feel equipped to treat children with obesity, educational reforms (Dietz et al., 2015), and mandated obesity aptitude testing in certification and licencing exams (Freedhoff et al., 2012) may be warranted.

In an attempt to investigate what specific childhood obesity treatment competencies medical students perceived to be lacking (or feel they are not adequately trained in) in the medical school curriculum, we developed a survey with “*made-in Canada*” resources (Avis et al., 2014, p. 226), including the 5As of Pediatric Obesity

Management (CON Primary Care Working Group, 2013). Thus, using these 5As as a general framework, our findings pertaining to the 5As (i.e., *Ask*, *Assess*, *Advise*, *Agree*, and *Assist*) will be discussed further below.

In terms of the *Ask* competency, only one third (i.e., 33.5%) of medical students “agreed” or “strongly agreed” that they had received adequate training related to motivational interviewing to move children with obesity and their caregiver(s) along the stage(s) of change. Interestingly and in relation to this quantitative finding, in our open-ended question on what additional training was needed to improve childhood obesity treatment education, some medical students commented on this competency (within the *approach* theme that was analyzed from the data; e.g., “*My curriculum has yet to teach me motivational interviewing, so definitely some of that!*” [Year 2 medical student], and “*Specific advice for counselling children and their parents and moving them along the stages of change*” [Year 2 medical student]). These results are also consistent with a study conducted in the United Kingdom which reported that 73% of medical students wanted more training on motivational interviewing to influence behaviour change among children with obesity (Peters et al., 2013). In addition, the most recent international clinical practice guidelines on treating paediatric obesity have recommended assessing a child’s readiness for change and the use of motivational interviewing to facilitate behaviour change (Styne et al., 2017). Further, in a systematic review and meta-analysis discussed previously, motivational interviewing was shown to be effective in reducing children’s z-BMI, and promoting positive lifestyle changes (Borrelli et al., 2008). Thus, the results of this study, in concert with the findings of previous scientific studies and guidelines, suggest that additional medical education and training related to the effective

use of motivational interviewing with children with obesity and their caregiver(s) might have a positive impact on important behavioural and health outcomes in this population.

Another notable finding pertains to medical students' perceptions of whether they received adequate training in medical school to create and/or promote a weight-friendly medical practice (e.g., scales over 350lb capacity, appropriate reading material in waiting rooms, appropriate-sized equipment in exam rooms, etc.; CON Primary Care Working Group, 2013). Specifically, more than half of medical students disagreed (i.e., 61.5% "disagreed" or "strongly disagreed") with having received adequate medical training related to tailoring medical practices in consideration of children with obesity. This finding aligns with the qualitative data obtained from the open-ended question pertaining to additional training needed, which demonstrated that many students felt that they did not receive any training, received adult-only obesity training, and/or received variable exposure related to childhood obesity-related information throughout their medical education (e.g., "*More exposure to paediatrics and more education regarding obesity [is needed], specifically in younger patient populations*" [Year 2 medical student]). Learning about creating a weight-friendly medical practice is of critical importance to minimize stigma and body shaming (e.g., by eliminating glossy fashion magazines in waiting rooms), to be respectful of all patients, and to maximize patient confidence and comfort (e.g., through the use of appropriate-sized gowns and blood pressure cuffs, wide doors, large restrooms, etc.; CON Primary Care Working Group, 2013).

Medical students who participated in the present study were asked a series of questions related to whether they had acquiring adequate training related the assessment of health status (e.g., obesity class and stage), root causes of obesity, and obesity

complications and barriers, all within the *Assess* competency of the 5As of Paediatric Obesity Management (CON Primary Care Working Group, 2013). A positive (and perhaps not entirely surprising) finding in our study is that more medical students agreed than disagreed to having received adequate training related to assessing obesity status (76.6% “agreed” or “strongly agreed” vs. 15.0% who “disagreed” or “strongly disagreed”), potential mental causes (40.6% “agreed” or “strongly agreed” vs. 38.5% who “disagreed” or “strongly disagreed”), potential mechanical causes (44.0% “agreed” or “strongly agreed” vs. 33.7% who “disagreed” or “strongly disagreed”), potential metabolic causes (64.1% “agreed” or “strongly agreed” vs. 19.2% of students who “disagreed” or “strongly disagreed”), potential milieu/environmental causes (57.6% “agreed” or “strongly agreed” vs. 20.9% who “disagreed” or “strongly disagreed”), and the etiology of childhood obesity (47.7% “agreed” or “strongly agreed” vs. 29.0% who “disagreed” or “strongly disagreed”). Our results align with an abovementioned systematic review suggesting that the competencies listed within the *Assess* category are commonly used practices in obesity-related patient visits (Sherson et al., 2014).

Conversely, most students disagreed (64.9% “disagreed” or “strongly disagreed”) with one of the items in the *Assess* category; in particular, regarding having received adequate training to assess the obesity stage of a child (e.g., using a tool such as the Edmonton Obesity Staging System - Pediatrics) in order to quantify the impact of obesity on children's overall health. The Edmonton Obesity Staging System – Pediatrics (Hadjiyannakis et al., 2016) is a newly developed Canadian tool that can be used by health professionals to assess children with obesity using information beyond anthropometric/weight status information (i.e., BMI, BMI percentile, or z-BMI) and to

“stage” patients according to obesity-related complications and barriers (Hadjiyannakis et al., 2016). It is therefore understandable that medical students may not yet be familiar with the EOSS-P given the infancy of its development; however, it may be worth introducing this tool into the Canadian medical curriculum given its promise as an assessment tool which overcomes the numerous limitations associated with BMI measurements (Avis et al., 2014; Hadjiyannakis et al., 2016), and its use in practice by some primary care physicians in Ontario (A. Buchholz, personal communication, April 27, 2017).

In general, our quantitative results pertaining to the *Advise* category were consistent with the literature, as medical students were generally agreeable to having received adequate training in medical school to successfully advise a child with obesity and his or her caregiver(s). Specifically, more medical students agreed than disagreed that they had received adequate levels of training with regard to advising on the risks associated with a child’s stage of obesity (44.6% “agreed” or “strongly agreed” vs. 30.8% who “disagreed” or “strongly disagreed”), offering advice not focused solely on weight loss (46.9% “agreed” or “strongly agreed” vs. 30.2% who “disagreed” or “strongly disagreed”), explaining health benefits associated with behaviour change (65.5% “agreed” or “strongly agreed” vs. 16.0% who “disagreed” or “strongly disagreed”), explaining the need for feasible, long-term strategies (66.7% “agreed” or “strongly agreed” vs. 17.9% who “disagreed” or “strongly disagreed”), and advising children with obesity and their caregiver(s) on treatment options (41.0% “agreed” or “strongly agreed” vs. 34.7% of students who “disagreed” or “strongly disagreed”). Interestingly, and in support of such findings, in a recent study of 527 encounters between adolescents with

obesity and primary care physicians, it was found that 73% of physicians possessed the training to *Advise* their patients on paediatric obesity management options (Pollak et al., 2016).

Notably, our qualitative data provided some additional context for students who disagreed with having received adequate training related to the *Advise* group of competency items. Specifically, some medical students reported that they wanted to know more about specific topics and strategies (e.g., "*Clarity about which weight loss strategies are most effective in the long-term*" [Year 2 medical student] and "*More on specific nutrition and exercise strategies to implement with families*" [Year 2 medical student]). In 2010, Gramlich and colleagues conducted a survey-based study to examine medical students' ($n = 933$ from nine Canadian medical schools) perceptions of medical nutrition training. Results showed that on average, medical students rated their general satisfaction with nutrition instruction in medical school as a 4.7 on a 10-point scale (1 = "very dissatisfied", 10 = "very satisfied"; Gramlich et al., 2010). Overall, close to 90% of medical students reported that more time devoted to nutrition-related education in medical school was needed (Gramlich et al., 2010). Another study of medical trainees ($n = 1691$ from eleven Canadian medical schools) showed that only 25% of students counseled patients on physical activity during patient encounters (Ng & Irwin, 2013). Both studies advocated for more nutrition and physical activity education in Canadian medical schools to improve counseling to patients (Gramlich et al., 2010; Ng & Irwin, 2013).

Specific to the item pertaining to agreeing on a realistic and sustainable treatment plan with both children with obesity and their caregiver(s) (within the *Agree* category of

the pediatric 5As), approximately one third (i.e. 34.1%) of students “agreed” or “strongly agreed” that they were adequately prepared in this area, close to one third (i.e., 32.0%) remained “neutral”, and about one third (i.e., 33.9%) “disagreed” or “strongly disagreed”. In support of this finding, open-ended responses from medical students in this study included, *“I would like to know how to help children with unsupportive caregivers, or caregivers who want a quick fix for their child without changing any of their own behaviours for the benefit of their child”* (Year 2 medical student), and *“Some data on how to effect behavioural change would be very helpful. Some of my classmates explicitly believe that shaming someone for their weight is an effective strategy”* (Year 2 medical student). Although these were the only quotes from students that were deemed to be related to the *Agree* category (and therefore were not classified as a subtheme in our thematic analysis), the students’ responses—and overall lack of responses related to *Agree*—shed light on the fact that medical students may not be aware of recommendations to agree with children with obesity and their families on behaviour change outcomes, sustainable goals and health outcomes, and management plans. The need to develop aptitudes related to *Agree* aligns with a systematic review which showed that few practicing (i.e., approximately 25%) physicians use *Agree* competencies when counselling patients on weight loss or lifestyle changes (Sherson et al., 2014). This is an important finding as Sherson and colleagues (2014) also reported that up to half of patients want physicians to *Advise* and *Agree* with them during obesity counselling.

A noteworthy finding from survey items related to the *Assist* competency within the 5As of Pediatric Obesity Management (CON Primary Care Working Group, 2013), was that more medical students were in disagreement (43.0% “disagreed” or “strongly

disagreed” while 26.1% “agreed” or “strongly agreed”) about having received sufficient training related to providing education and credible weight management resources to children with obesity and their caregiver(s). Findings from the systematic review by Sherson and colleagues (2014) revealed that up to 75% of patients believe that physicians who *assist* them during counselling can improve health outcomes in the future. Despite this finding, less than half (10 – 40%) of primary care physicians have been found to *assist* patients during obesity counseling (Sherson et al., 2014). Example responses from medical students in the present study have highlighted several areas where additional training related to *Assist* is needed: “*Provide learners with formal resources available for both practitioner and patient/family*” [Year 3 medical student], “*WHEN to be referring to extra help like physio/OT?*” [Year 4 medical student], and “*I think more clearly accessible resources regarding potential medical causes of obesity and what childhood obesity resources are available*” [Year 4 medical student].

Given that the use of the 5As counselling framework has been successful with improving behavioural and weight outcomes among adults (e.g., Jay, Gillespie, Schlair, Sherman, & Kalet, 2010; Sherson et al., 2014; Whitlock, Orleans, Pender, & Allan, 2002), recommendations to use the 5 As have been made by numerous government health agencies (i.e., Centers for Medicare & Medicaid Services, 2011; U.S. Preventive Services Task Force; W. Elford, Canadian Task Force on Preventive Health Care, personal communications with the U.S. Preventive Services Task Force, December 2000). Further, given the integration of the 5As of Pediatric Obesity Management in the medical community (A. Buchholz, personal communication, April 27, 2017), as well as the fact that medical students have identified numerous areas in which additional childhood

obesity treatment training may be required, there appears to be a solid base of evidence for the inclusion of the 5As into the medical undergraduate curriculum. Medical students in this study have indicated they want more training related to childhood obesity treatment in the form of theoretical (e.g., didactic training, presentations), practical (e.g., the use of standardized patients, electives), or a mixture of the two. Of note, Vitolins and colleagues (2012) concluded that interactive lectures, behaviour change training, and practicing obesity-related clinical scenarios with standardized patients was associated with self-efficacy and knowledge related to physical activity and nutrition counseling among medical students.

Taken together, our quantitative and qualitative findings could help to inform curriculum changes, as currently the Liason Committee on Medical Education (i.e., the accreditation board of medical education programs in Canada) does not mandate paediatric obesity training as an accreditation standard (Liason Committee on Medical Education: Accreditation Standards, 2017), despite the persistence of high rates of childhood obesity in Canada (Rodd & Sharma, 2016). To be accredited by the Association of Faculties of Medicine of Canada, a medical school must update their curriculum to reflect health issues of “common societal problems” (<https://afmc.ca/accreditation/interim-accreditation-review-process-irp/checklists>, p.10). Childhood obesity is a priority health problem in Canada and abroad. As such, the development of specific learning outcomes with regard to the treatment of childhood obesity in medical schools could benefit Canadian children with obesity and their families (Rodd & Sharma, 2016).

Limitation and Future Directions

This study was not without limitations. The first limitation pertained to recruitment. There was a short recruitment timeframe (i.e., one month and a half), and our recruitment overlapped with Canadian Residency Matching Services (CaRMS) interviews. Further, we did not ask participants how they were informed about this study, in order to capitalize on that recruitment strategy and maximize participation. Further limiting our study, self-selection bias could have occurred. Thus, medical students interested in childhood obesity may have been more likely to complete this survey.

Future studies could attempt an environmental scan to map out current childhood obesity curriculum in medical schools across Canada, and to examine whether the curriculum is homogenous or heterogeneous from school to school. In addition, a pilot childhood obesity curriculum could be developed and evaluated in a Canadian medical school, taking the feedback from medical students in this study into consideration (e.g., “*The use of online learning module[s]...*” [Year 4 medical student]).

Conclusion

There is a paucity of literature that has examined medical students’ perceptions of training related to specific competencies required to treat children with obesity and their caregiver(s) in Canada. The aim of this study was to provide an overview of medical students’ perceptions of their training related to the treatment of children with obesity and their caregiver(s). The results from this study have demonstrated that overall, medical students perceived that they have received inadequate levels of training in medical school with regard to the treatment of childhood obesity. Our findings have also highlighted specific competencies and areas related to the treatment of childhood obesity that medical

students perceive to be lacking in terms of the training received in medical school.

Finally, many areas of additional training and curriculum needed to improve childhood obesity-related training in medical school were also identified. It should be noted that all medical schools that participated in this study will be provided with a brief report highlighting the aggregated results of the study, which in combination with this dissertation, may serve as an opportunity to improve the medical school curriculum related to the treatment of childhood obesity in Canada.

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Appendix A: The Canadian Obesity Network’s 5As of Pediatric Obesity Management

1) ASK

Be Non-judgmental

- Do NOT blame, threaten, or provoke guilt in children or parents.
- Do NOT make assumptions about children’s lifestyles or motivation; they may already be living a healthy lifestyle or have started to make changes.
- Do acknowledge that weight management is difficult and hard to sustain.

Explore Readiness for Change

- Determining children’s and parents’ readiness for behaviour change is essential for success.
 - Recognize that children & their parents may be at different stages.
- Use a family centred, collaborative approach.
- Initiating change when children and/or parents are not ready can result in frustration and may hamper future attempts to make healthy changes.

Use Motivational Interviewing to Move Families Along the Stages of Change

- Ask questions, listen to responses, and reply in a way that validates experiences and acknowledges that children and parents are in control of their decisions to change.
- If they are NOT ready for change, be prepared to address their concerns and other health issues. Then ask if you can speak with them about health behaviours in the future.

Create a Weight-Friendly Practice

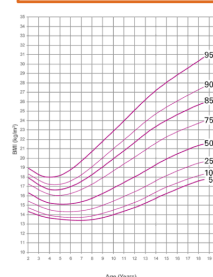
- **Facilities:** wide doors, large restrooms, floor-mounted toilets,
- **Scales:** over 350lb/160kg, wheel-on accessible, located in private area and used with sensitive weighing procedures
- **Waiting room:** sturdy, armless chairs, appropriate reading material – no glossy fashion magazines
- **Exam room:** appropriate-sized gowns, wide and sturdy exam tables, extra-large blood pressure cuffs, longer needles and tourniquets, long-handled shoe horns

2) ASSESS

Assess for Obesity Class and Stage

- Obesity in children is defined using BMI growth charts specific for age and gender.
 - CDC >95th percentile
 - WHO > 97th percentile
- Obesity Stage is based on the 4Ms (Mental, Mechanical, Metabolic and Milieu), which quantify the impact of obesity on children’s overall health.

Obesity Class BMI for age percentiles

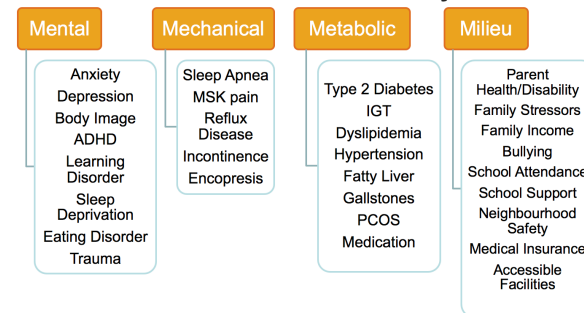


Obesity Stages (EOSS-P*)

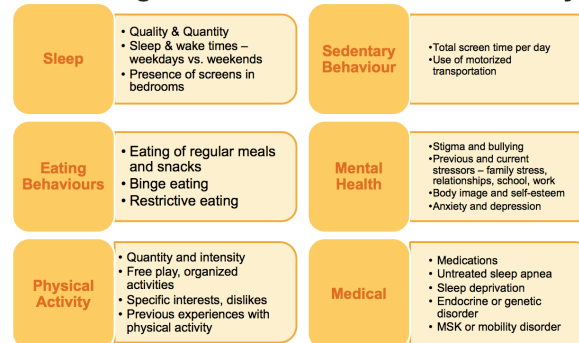


* Edmonton Obesity Staging System - Pediatrics

Use the 4Ms of Pediatric Obesity



Assessing Root Causes of Pediatric Obesity



Adapted from “5As of Pediatric Obesity Management” by CON Primary Care Working Group, 2013. Retrieved December 20, 2016, from http://www.obesitynetwork.ca/5As_pediatrics. Copyright 2013 by Canadian Obesity Network. Adapted with permission.

3) ADVISE

Advise on Obesity Risks

- Obesity risks are more related to the OBESITY STAGE than to BMI
- Focus of management should be on IMPROVING HEALTH and WELL-BEING rather than simply losing weight

Explain Benefits of Health Behaviours

- The first goal is to STABILIZE BMI
- Changes in health behaviours can result in substantial health benefits including improvements in:
 - Lipid profile
 - Blood sugar control
 - Blood pressure control
 - Fitness
 - Sleep
 - Body image
 - Self-esteem
 - Coping

Explain Need for Long-Term Strategy

- Relapse is virtually inevitable when any intervention stops.
- This means that all management strategies must be FEASIBLE and SUSTAINABLE.
- Interventions focusing on “quick fixes” and unsustainable strategies will result in an inability to maintain health behaviours.

Advise on Family-Based Management Options

Sleep	•management interventions can significantly improve eating and activity behaviours as well as mood and school performance.	Sedentary Behaviour	•should be limited through minimizing recreational screen time to less than 2 hours per day, choosing active transportation over motorized, and increasing active play and active family time.
Eating Behaviours	•should focus on eating & drinking hygiene. Extreme and “fad” diets are not sustainable in the long-term.	Mental Health	•treatment referrals to help manage underlying /co-morbid psychological issues •interventions can improve body-esteem, self-esteem, reduce emotional eating, and promote coping strategies.
Physical Activity	• interventions should, rather than focusing on “burning calories”, aim at reducing sedentariness and increasing daily physical activity levels to promote fitness, overall health, and general well-being.	Bariatric Surgery	•may be considered for adolescents who’ve reached their final adult height, with BMI>40, and with obesity related health complications. Candidates & their families are required to have completed a multidisciplinary 6-month presurgical intervention.

4) AGREE

Agree on Sustainable Behavioural Goals and Health Outcomes

- Focus on sustainable behavioural changes rather than on specific weight targets
- Behavioural goals should be SMART:
 - Specific
 - Measurable
 - Achievable
 - Relevant
 - Timely

Agree on Behaviour Change Outcomes

- Unrealistic weight-loss expectations can lead to DISAPPOINTMENT and NON-ADHERENCE.
- For some children, PREVENTION or SLOWING of WEIGHT GAIN may be the best goal.

Agree on Management Plan

- Management plans should be REALISTIC and SUSTAINABLE.
 - Be mindful of need to set goals with both adolescent and parent as their goals may differ
- Management plans should be with ADDRESSING the DRIVERS of weight gain (e.g. anxiety, sleep apnea fatty liver, family stressors, etc.).
- The SUCCESS of treatment should be measured in improvements in HEALTH and WELL-BEING (e.g. self-esteem, body image, sleep, fitness, blood sugars, etc.)

Adapted from “5As of Pediatric Obesity Management” by CON Primary Care Working Group, 2013. Retrieved December 20, 2016, from http://www.obesitynetwork.ca/5As_pediatrics. Copyright 2013 by Canadian Obesity Network. Adapted with permission.

5) ASSIST

Assist Families in Identifying and Addressing Drivers and Barriers

- Drivers and barriers may include ENVIRONMENTAL, SOCIOECONOMICAL, EMOTIONAL, or MEDICAL factors.
- Obesogenic MEDICATIONS (e.g. atypical antipsychotics, anti-diabetics, anti-convulsants, etc.) may make obesity management difficult.
- PHYSICAL BARRIERS that limit access (transportation, turnstiles, limited seating, etc.) in school settings, work places, and recreational facilities, may deter from active participation in everyday life.

Provide Education and Resources

- Family EDUCATION is central to management.
- Help children and their families identify CREDIBLE weight management information and resources.

Refer to Appropriate Provider

- Evidence supports the need for an INTERDISCIPLINARY team approach
- Choice of appropriate provider (e.g. physician, nurse, dietitian, psychologist, social worker, exercise physiologist, PT/OT, surgeon, etc.) should reflect identified DRIVERS and COMPLICATIONS of obesity as well as BARRIERS to weight management

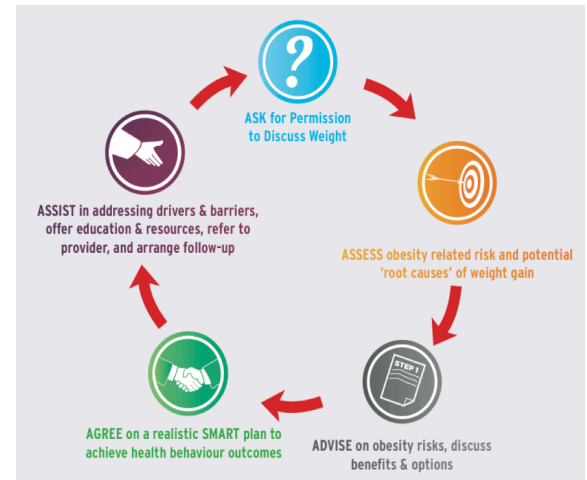
Arrange Follow-Up

- Given the chronic nature of obesity, LONG-TERM follow-up is ESSENTIAL.
- Success is directly related to FREQUENCY of provider contact.
- Weight cycling and weight gain should not be framed as “failure” – rather, they are the natural and expected consequence of dealing with this chronic condition.

Adapted from “5As of Pediatric Obesity Management” by CON Primary Care Working Group, 2013. Retrieved December 20, 2016, from

http://www.obesitynetwork.ca/5As_pediatrics. Copyright 2013 by Canadian Obesity Network.

Adapted with permission.



Appendix B: Survey Response Rates for Students enrolled in Canadian Medical Schools (2017 – 2020 Graduating Classes)

University (Medical School)	No. of students enrolled in 2013 - 2016	No. (and %) who responded to the survey in its entirety and were included in the study
Dalhousie University	455	27 (5.9%)
Laval University	923	11 (1.2%)
McMaster University (Michael G. DeGroot School of Medicine)	613	0 (0.0%)
McGill University	606	22 (3.6%)
Memorial University of Newfoundland	318	8 (2.5%)
Laurentian University and Lakehead University (Northern Ontario School of Medicine)	253	7 (2.7%)
Queen's University (Queen's School of Medicine)	400	28 (7.0%)
Western University (Schulich School of Medicine & Dentistry)	677	107 (15.8%)
University of Alberta	648	18 (2.8%)
University of British Columbia	1,149	17 (1.5%)
University of Calgary (Cumming School of Medicine)	460	15 (6.0%)
University of Manitoba	435	26 (6.0%)

University of Montreal	935	63 (6.7%)
University of Ottawa	647	25 (3.9%)
University of Saskatchewan	396	39 (9.8%)
University of Sherbrooke	823	0 (0.0%)
University of Toronto	1,037	94 (9.1%)
TOTAL	10,775	507 (4.7%)

From “Admission requirements of Canadian faculties of medicine: Admission in 2017” by the Association of Faculties of Medicine of Canada, 2017. Retrieved December 20, 2016, from https://afmc.ca/sites/default/files/documents/en/Publications/Admission_Requirements_en.pdf

Appendix C: Western University Non-Medical Research Ethics Board Initial Approval



Western
Research

Research Ethics

Western University Non-Medical Research Ethics Board NMREB Delegated Initial Approval Notice

Principal Investigator: Dr. Shauna Burke

Department & Institution: Health Sciences\Faculty of Health Sciences, Western University

NMREB File Number: 108548

Study Title: Canadian Medical Students' Perceptions of their Medical School Training Related to the Treatment of Childhood Obesity

NMREB Initial Approval Date: January 06, 2017

NMREB Expiry Date: January 06, 2018

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Western University Protocol		2016/12/17
Instruments	Appendix A - Demographic and Screening Survey	2016/12/17
Instruments	Appendix B - 5 As Online Survey	2016/12/07
Recruitment Items	Appendix C - Social Media Scripts	2016/12/17
Recruitment Items	Appendix D - Email Scripts	2016/12/17
Letter of Information & Consent	Appendix E	2016/12/17
Other	Appendix F - Research Protocol	2016/12/17


The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the above named study, as of the NMREB Initial Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.


Ethics Officer, on behalf of Dr. Riley Hinson, NMREB Chair or delegated board member

Ethics Officer: Erika Basile ___ Nicole Kaniki ___ Grace Kelly ___ Katelyn Harris Vikki Tran ___ Karen Gopaul ___

Western University, Research, Support Services Bldg., Rm. 5150
London, ON, Canada N6G 1G9 t. 519.661.3036 f. 519.850.2466 www.uwo.ca/research/ethics

Appendix D: Western University Non-Medical Research Ethics Board Amendment Approval



Western
Research

Research Ethics

Western University Non-Medical Research Ethics Board NMREB Amendment Approval Notice

Principal Investigator: Dr. Shauna Burke

Department & Institution: Health Sciences\Faculty of Health Sciences, Western University

NMREB File Number: 108548

Study Title: Canadian Medical Students' Perceptions of their Medical School Training Related to the Treatment of Childhood Obesity

NMREB Revision Approval Date: February 02, 2017

NMREB Expiry Date: January 06, 2018

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Revised Western University Protocol		2017/02/02
Letter of Information & Consent	Appendix F - Hard Copy	2017/02/02
Recruitment Items	Appendix G - Verbal In-person Recruitment Script	2017/02/02
Recruitment Items	Appendix C - Social Media Scripts	2017/01/13
Recruitment Items	Email Scripts	2017/01/13


The Western University Non-Medical Science Research Ethics Board (NMREB) has reviewed and approved the amendment to the above named study, as of the NMREB Amendment Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.


Ethics Officer, on behalf of Dr. Riley Hinson, NMREB Chair

EO: Erika Basile ___ Nicole Kaniki ___ Grace Kelly ___ Katelyn Harris Nicola Morphet ___ Karen Gopaul ___

Western University, Research, Support Services Bldg., Rm. 5150
London, ON, Canada N6G 1G9 t. 519.661.3036 f. 519.850.2466 www.uwo.ca/research/ethics

Appendix E: Western University Non-Medical Research Ethics Board Amendment (Revised Study Title) Approval



Research Ethics

Western University Non-Medical Research Ethics Board NMREB Amendment Approval Notice

Principal Investigator: Dr. Shauna Burke

Department & Institution: Health Sciences\Faculty of Health Sciences, Western University

NMREB File Number: 108548

Study Title: A National Perspective on Childhood Obesity Medical Education: Do Medical Students in Canada Perceive that they are Prepared to Treat Children with Obesity?

NMREB Revision Approval Date: April 25, 2017

NMREB Expiry Date: January 06, 2018

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Revised Western University Protocol	Revised study title	2017/04/25


The Western University Non-Medical Science Research Ethics Board (NMREB) has reviewed and approved the amendment to the above named study, as of the NMREB Amendment Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.


Ethics Officer, on behalf of Dr. Riley Hinson, NMREB Chair

EO: Erika Basile ___ Grace Kelly ___ Katelyn Harris Nicola Morphet ___ Karen Gopaul ___

Appendix F: Online Version - Letter of Information for Medical Students

A National Perspective on Childhood Obesity Medical Education: Do Medical Students in Canada Perceive That They are Prepared to Treat Children with Obesity?

Investigators:

Dr. Shauna Burke, Ph.D., Associate Professor, Western University Canada

Dr. Dalia Hasan, M.D., M.Sc. Student, Western University Canada

1. Invitation to Participate

You are invited to participate in this research study regarding childhood obesity training because you are a Canadian medical student who may counsel and treat children with obesity and their families and/or caregivers.

2. Purpose of the Letter

The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research study.

3. Purpose of this Study

The purpose of this study is to assess Canadian medical students' perceived level of training with regard to the treatment of children with obesity and their caregiver(s).

4. Inclusion Criteria

English speaking individuals who are ≥ 18 years old and currently enrolled as a medical student at any medical school in Canada are eligible to participate in the study.

5. Exclusion Criteria

Individuals who are less than 18 years old, do not speak English, and are not currently enrolled in a Canadian medical school are not eligible to participate in this study.

6. Study Procedures

If you agree to participate, you will be asked to complete a brief questionnaire. It is anticipated that the entire task will take approximately 5 – 10 minutes, in one sitting. You will be able to complete the survey on your time at a location of your choice (where internet is available).

7. Possible Risks and Harms

There are no known or anticipated risks or discomforts associated with participating in this study.

8. Possible Benefits

The possible benefits of participation in this study may be to increase your awareness of or consideration in regards to your training related to managing children with obesity and their caregiver(s).

9. Compensation

You will not be compensated for your participation in this research. However, you will have the opportunity to choose a charity from a list of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) to which \$1 will be donated for every participant that completes the survey.

10. Voluntary Participation

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future or current academic or professional standing.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. While we do our best to protect your information there is no guarantee that we will be able to do so. The inclusion of your age, ethnicity, year of study, sex, medical school, and year of medical school enrollment may allow someone to link the data and identify you. After a minimum of 5 years, all data (electronic and/or paper) will be destroyed. By participating in this research, you agree that the results may be used for scientific purposes, including publication in scientific journals. You do not waive any legal rights by consenting to this study. The results of the study will be reported without identifying you personally thus maintaining your confidentiality. Representatives of The University of Western Ontario Non-Medical Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact Dr. Dalia Hasan [REDACTED] or Dr. Shauna Burke [REDACTED].

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics [REDACTED], for non-local participants you may contact: [REDACTED].

13. Publication

If the results of the study are published, your name will not be used. If you would like to receive a copy of any potential study results, contact us.

14. Consent

Completion of the survey is indication of your consent to participate.

Thank you for considering participation in this study.

Version Date: 2016/12/17

Appendix G: Example Social Media Advertisement Scripts

Twitter advertisements:

Please choose from any of the following tweets to post on your social media account:

.@WesternU researchers seeking med students to complete a brief survey about #ChildhoodObesity & #MedEd: [REDACTED]

OR

Don't delay! Med students needed to take a brief survey on #ChildhoodObesity & #MedEd today! [REDACTED]

OR

Have your say on #ChildhoodObesity & #MedEd! Western researchers seeking med students to complete 5-10 min survey: [REDACTED]

OR

~1 in 3 children obese. Western researchers seeking med students 2 complete brief survey on #ChildObesity & #MedEd: [REDACTED]

OR

**Attn #MedStudents! Complete survey on #ChildhoodObesity & #MedEd and donation will be made to [Canadian flag emoji] charity: [REDACTED]

OR

**[Canadian flag emoji] Med Students, you work hard! Take a 5–10 min study break to advance #ChildObesity & #MedEd research: [REDACTED]

OR

Want to advance #ChildhoodObesity research? Tweet a [Canadian flag emoji] #MedStudent to complete a brief #MedEd survey: [REDACTED]

OR

**Pls RT: Want to advance #ChildhoodObesity research? Tweet a [Canadian flag emoji] #MedStudent to complete a brief #MedEd survey: [REDACTED]

OR

**[Canadian flag emoji] Med Students: Have you gained enough #MedEd to treat a child with obesity? Let Western researchers know! [REDACTED]

OR

**[Canadian flag emoji] Med Students: Nationwide brief survey on #ChildhoodObesity & #MedEd underway: [REDACTED]

Facebook advertisements:

Please choose from any of the following Facebook posts to share on your social media account:

Attention Medical Students!! Let researchers at Western University know what you think about #ChildhoodObesity and your #MedicalEducation! To participate, please click on the following link: [REDACTED]

For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as **chosen by you**.

For additional information please contact Dr. Dalia Hasan [REDACTED]

OR

~1 in 3 children are obese. Western University researchers seeking med students to complete brief survey on #ChildhoodObesity and your #MedicalEducation! To participate, please click on the following link: [REDACTED]

For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as **chosen by you**.

For additional information please contact Dr. Dalia Hasan [REDACTED]

OR

Have your say on #ChildhoodObesity and your #MedicalEducation! Western University researchers seeking med students to complete 5-10 min survey. To participate, please click on the following link: [REDACTED]

For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as **chosen by you**.

For additional information please contact Dr. Dalia Hasan [REDACTED]

OR

Don't delay! Western University researchers seeking med students survey to complete survey on #ChildhoodObesity and your #MedicalEducation today! To participate, please click on the following link: [REDACTED]

For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as **chosen by you**.

For additional information please contact Dr. Dalia Hasan [REDACTED]

OR

Want to advance #ChildhoodObesity research? Tag a [Canadian flag emoji] #MedStudent to complete a brief #MedicalEducation survey: [REDACTED]

For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as chosen by the participant.

For additional information please contact Dr. Dalia Hasan [REDACTED]

*Above Twitter scripts may also be used on Facebook

Version Date: 2017/01/13

Appendix H: E-mail Scripts to: (1) Medical School Student Council Representatives Asked to Extend Invitation to Medical Students; and (2) Physicians Supervising Medical Students

E-MAIL TO STUDENT COUNCIL REPRESENTATIVES:

Subject Line: Invitation to participate in research related to childhood obesity training

Dear [insert specific student council recipient contact],

All medical students in Canada are being invited to participate in a study that we, Dr. Dalia Hasan and Dr. Shauna Burke, are conducting. This study allows medical students to share their thoughts about medical school training related to the treatment of childhood obesity, so that we can identify and outline what might be necessary in order to improve such training across Canada.

Our one-time online survey takes approximately 5 – 10 minutes for students to complete.

Please see the attached letter of information for specifics about this study. It would be highly appreciated if you could e-mail your medical students the following message and study link:

Subject Line: Your invitation to have a say related to #childhoodobesity, and #meded!

Dear Student Doctors,

A nationwide survey on medical students' perceived level of training with regard to the treatment of childhood obesity is underway!

This is your chance to share your thoughts about medical school training related to the treatment of childhood obesity, so that we can identify and outline what might be necessary to improve such training.

Please take a few minutes to complete the survey: [REDACTED]

*The **one-time survey** is voluntary and anonymous, and there are no known risks to participation in this survey. The questionnaire should take you approximately **5 – 10 minutes to complete**.*

*For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as **chosen by you**.*

We thank you for your time and consideration.

Sincerely,

*Dalia Hasan, MD
Master's Student Researcher, Western University*

*Shauna Burke, PhD
Associate Professor, Western University*

In addition, we have created example tweets and Facebook scripts for you to choose from in the attached document, should you wish to share them on your social media platform(s).

Thank you very much for your time and consideration,

Dalia Hasan, MD
Master's Student Researcher
School of Health Studies
Western University

E-MAIL TO PHYSICIANS SUPERVISING MEDICAL STUDENTS:

Subject Line: Kind request to distribute survey on research related to childhood obesity

Dear _____, [insert specific physician or resident's name]

Our Western University research team is conducting a study about medical students' perceived level of training with regard to the treatment of children with obesity.

This **one-time online survey** will take medical students approximately 5 – 10 minutes to complete.

At this time, we invite you to kindly e-mail the medical students you have supervised and/or are currently supervising the following message and study link. This would be very much appreciated:

Subject Line: Your invitation to have a say related to #childhoodobesity, and #meded!

Dear Student Doctors,

A nationwide survey on medical students' perceived level of training with regard to the treatment of childhood obesity is underway!

This is your chance to share your thoughts about medical school training related to the treatment of childhood obesity, so that we can identify and outline what might be necessary in order to improve such training.

Please take a few minutes to complete the survey: [REDACTED]

The **one-time survey** is voluntary and anonymous, and there are no known risks to participation in this survey. The questionnaire should take you approximately **5 – 10 minutes to complete**.

For every survey completed, the researchers will donate \$1 to one of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) as **chosen by you**.

We thank you for your time and consideration.

Sincerely,

Dalia Hasan, MD
Master's Student Researcher, Western University

Shauna Burke, PhD
Associate Professor, Western University

For your information, please see the letter of information for specifics about this study. We have also created example Tweets and Facebook scripts for you to choose from in the attached document, should you wish to share them on your social media platform(s).

If you would like more information on this study, please do not hesitate to contact me by e-mail [REDACTED] or by phone [REDACTED].

Thank you very much for your time and consideration,

(Name and contact information of research team member distributing survey)

Version Date: 2017/01/13

Appendix I: In-person scripts for physicians and medical students assisting with and/or completing hard copy surveys

Hard copy survey distribution script when approaching physicians for assistance with recruitment:

Hi _____,

My name is _____ and I'm a researcher at Western University. Our research team is conducting a study which allows medical students to share their thoughts about medical school training related to the treatment of childhood obesity, so that we can identify and outline what might be necessary in order to improve such training across Canada.

I was wondering if you are supervising any medical students?

If the physician is supervising medical students:

That's great! The survey will take approximately 5 – 10 minutes to complete, and is completely anonymous. For every survey completed, the researchers will donate \$1 to one of four Canadian charities as chosen by the student.

Would it be possible to ask your medical student(s) if they are interested in participating in our study?

If the physician is not supervising medical students:

We are currently looking to recruit medical students for our study, thank you for your time.

Hard copy survey distribution script when approaching medical students (i.e., potential participants):

Hi _____,

My name is _____ and I'm a researcher at Western University. Our research team is conducting a study which allows medical students to share their thoughts about medical school training related to the treatment of childhood obesity, so that we can identify and outline what might be necessary in order to improve such training across Canada.

For every survey completed, the researchers will donate \$1 to one of four Canadian charities as chosen by you. This survey is completely anonymous and voluntary, you have the right to decide if you would like to complete it or not. Would you be interested in completing a 5 – 10 minute survey on your medical education?

If the participant agrees to complete the survey:

Great! I can wait for you to complete the survey here and collect it from you when you are finished, or we can make arrangements for you to drop it off with the secretary in the office, or I can make arrangements to pick it up from you at another time. Please ensure that once you complete the survey you place it in the envelope provided and seal it before handing it back to the researcher or secretary.

If the participant agrees to complete the survey:

Thank you for your time and consideration.

Version Date: 2017/02/02

Appendix J: Hard Copy Version - Letter of Information for Medical Students

A National Perspective on Childhood Obesity Medical Education: Do Medical Students in Canada Perceive That They are Prepared to Treat Children with Obesity?

Investigators:

Dr. Shauna Burke, Ph.D., Associate Professor, Western University Canada

Dr. Dalia Hasan, M.D., M.Sc. Student, Western University Canada

1. Invitation to Participate

You are invited to participate in this research study regarding childhood obesity training because you are a Canadian medical student who may counsel and treat children with obesity and their families and/or caregivers.

2. Purpose of the Letter

The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research study.

3. Purpose of this Study

The purpose of this study is to assess Canadian medical students' perceived level of training with regard to the treatment of children with obesity and their caregiver(s).

4. Inclusion Criteria

English speaking individuals who are ≥ 18 years old and currently enrolled as a medical student at any medical school in Canada are eligible to participate in the study.

5. Exclusion Criteria

Individuals who are less than 18 years old, do not speak English, and are not currently enrolled in a Canadian medical school are not eligible to participate in this study.

6. Study Procedures

If you agree to participate, you will be asked to complete a brief questionnaire. It is anticipated that the entire task will take approximately 5 – 10 minutes, in one sitting. You will be able to complete the survey on your time at a location of your choice (where internet is available).

7. Possible Risks and Harms

There are no known or anticipated risks or discomforts associated with participating in this study.

8. Possible Benefits

The possible benefits of participation in this study may be to increase your awareness of or consideration in regards to your training related to managing children with obesity and their caregiver(s).

9. Compensation

You will not be compensated for your participation in this research. However, you will have the opportunity to choose a charity from a list of four Canadian charities (i.e., the Canadian Red Cross, Canadian Cancer Society, World Vision Canada and the Heart and Stroke Foundation of Canada) to which \$1 will be donated for every participant that completes the survey.

10. Voluntary Participation

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your future or current academic or professional standing.

11. Confidentiality

All data collected will remain confidential and accessible only to the investigators of this study. While we do our best to protect your information there is no guarantee that we will be able to do so. The inclusion of your age, ethnicity, year of study, sex, medical school, and year of medical school enrollment may allow someone to link the data and identify you. After a minimum of 5 years, all data (electronic and/or paper) will be destroyed. By participating in this research, you agree that the results may be used for scientific purposes, including publication in scientific journals. You do not waive any legal rights by consenting to this study. The results of the study will be reported without identifying you personally thus maintaining your confidentiality. Representatives of The University of Western Ontario Non-Medical Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

12. Contacts for Further Information

If you require any further information regarding this research project or your participation in the study you may contact Dr. Dalia Hasan [REDACTED] or Dr. Shauna Burke [REDACTED].

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics [REDACTED], for non-local participants you may contact: [REDACTED], e-mail: [REDACTED].

13. Publication

If the results of the study are published, your name will not be used. If you would like to receive a copy of any potential study results, please contact us.

14. Consent

Placing the completed survey in the envelope provided (addressed to the researcher), sealing it, and handing it back to the researcher who provided the survey is indication of your consent to participate in this study.

Thank you for considering to participate in this study.

This letter is for you to keep.

Version Date: 2017/02/07

Appendix K: A National Perspective on Childhood Obesity Medical Education: Do Medical Students in Canada Perceive That They are Prepared to Treat Children with Obesity? Survey

Demographic and Screening Questions

- 1) Do you attend a medical school in Canada? (if answered “no” a prompt will inform them that they are not eligible to complete this survey)
 - a) Yes
 - b) No

- 2) What medical school do you attend? (if answered “none of the above” a prompt will inform them that they are not eligible to complete this survey)
 - a) Dalhousie University
 - b) McGill University
 - c) McMaster University
 - d) Memorial University of Newfoundland
 - e) Northern Ontario School of Medicine
 - f) Queen’s University
 - g) Western University
 - h) University of Alberta
 - i) University of British Columbia
 - j) University of Calgary
 - k) Université *Laval*
 - l) University of Manitoba
 - m) Université *de Montréal*
 - n) University of Ottawa
 - o) *University of Saskatchewan*
 - p) Université *de Sherbrooke*
 - q) University of Toronto
 - r) None of the above

- 3) In what year of medical school are you currently enrolled? (if answered “none of the above” a prompt will inform them that they are not eligible to complete this survey)
 - c) 1
 - d) 2
 - e) 3
 - f) 4
 - g) None of the above

- 4) Are you fluent in English? (if answered “no” a prompt will inform them that they are not eligible to complete this survey)
 - a) Yes
 - b) No

- 5) What is your age? _____ (if less than 18 a prompt will inform them that they are not eligible to complete this survey)
- 6) What is your sex?
 a) Male
 b) Female
- 7) What is your ethnicity?
 a) Caucasian
 b) Hispanic
 c) African American
 d) Asian
 e) Other, please specify: _____

8) **INSTRUCTIONS:** The following question relates to the overall level of medical school training you feel that you have acquired in relation to the **treatment of children with obesity**.

Please indicate your level of agreement by choosing one of the following 5 options, ranging from “**Strongly Disagree**” to “**Strongly Agree**”.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe I have received adequate training in medical school to be able to successfully treat children with obesity					

9) **INSTRUCTIONS:** The following questions relate to the level of medical school training you feel that you have acquired in relation to specific competencies associated with the **treatment of children with obesity and their caregivers**.

For each of the following questions, please indicate your level of agreement by choosing one of the 5 following options, ranging from “**Strongly Disagree**” to “**Strongly Agree**”.

<i>“I have received adequate training in medical school to be able to successfully...”</i>	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Ask children with obesity and their caregivers for permission to discuss the child’s weight					
Counsel children with obesity and their caregivers using a non-judgmental approach					

Determine children's readiness for behaviour change					
Determine caregivers' readiness for behaviour change					
Use motivational interviewing (MI) to move children with obesity and their caregivers along the stage(s) of change					
Create and/or promote a "weight-friendly" medical practice (e.g., large restrooms, scales over 350lb capacity, appropriate reading material in waiting rooms, appropriate-sized garments and equipment in exam rooms, etc.)					
Assess obesity status in children using body mass index (BMI) growth charts specific for age and gender (e.g., Centers for Disease Control and Prevention [CDC] and/or World Health Organization [WHO] growth charts)					
Assess the obesity stage of the child (e.g., using a tool such as the Edmonton Obesity Staging System – Pediatrics) in order to quantify the impact of obesity on children's overall health					
Assess potential <u>mental</u> causes (e.g., anxiety, depression, body image, trauma, etc.) of weight gain in children					
Assess potential <u>mechanical</u> causes (e.g., sleep apnea, MSK pain, reflux disease, etc.) of weight gain in children					
Assess potential <u>metabolic</u> causes (e.g., IGT/Type II diabetes, dyslipidemia,					

hypertension, etc.) of weight gain in children					
Assess potential milieu/environmental causes (e.g., family stressors, bullying/stigma, school support, food environment, opportunities for physical activity, etc.) of weight gain in children					
Assess the etiology (endocrine, monogenic, genetic syndrome, CNS/hypothalamic damage, and/or acquired) of childhood obesity					
Advise children and caregivers in relation to the risks associated with the child's stage of obesity					
Offer health advice to children and caregivers that is not focused solely on weight loss					
Explain the health benefits (e.g., improved lipid profile, self-esteem, sleep, fitness, etc.) associated with changes in health behaviours to children with obesity and their caregivers					
Explain the need for feasible and long-term strategies, rather than "quick fixes" (e.g., fad diets, etc.), to children with obesity and their caregivers					
Advise children with obesity and their caregivers on <u>family-based treatment options</u> (i.e., interventions related to eating behaviours, physical activity, sleep management, mental health, sedentary behaviours, and/or bariatric surgery)					
Plan and agree on SMART (i.e. <u>S</u> pecific, <u>M</u> easurable, <u>A</u> chievable, <u>R</u> ewarding, <u>T</u> imely) and sustainable					

behavioural goals with children with obesity and their caregivers					
Plan and agree on behaviour change outcomes (e.g., prevention or slowing of weight gain) with children with obesity and their caregivers					
Agree on a realistic and sustainable treatment plan with both children with obesity and their caregivers					
Assist families in identifying and addressing drivers and barriers related to childhood obesity (e.g., environmental, socioeconomic, emotional, and/or medical factors)					
Provide education and credible weight management resources to children with obesity and their caregivers					
Refer children with obesity to appropriate providers (e.g., dietician, surgeon, social worker, psychologist, physiotherapist/occupational therapist, etc.)					
Arrange long-term and frequent follow-up visits for children with obesity					

10) What additional medical school curriculum and/or training (e.g., types of training, topics, focus on specific skills and/or competencies, etc.), if any, might have been (or might be) beneficial in order to better prepare you for the management of children with obesity and their families in practice?

Please list.

Thank you for completing this survey.

Please choose a charity that you would like the researchers to donate \$1 to on your behalf from the following list of Canadian charities:

- a) Canadian Red Cross
- b) Canadian Cancer Society
- c) World Vision Canada
- d) Heart and Stroke Foundation of Canada

Curriculum Vitae

Name	Dalia Hasan
Post-Secondary Education and Degrees	<p>Master of Science in Health Promotion Western University London, Ontario, Canada 2005 – 2017</p> <p>Doctor of Medicine (<i>Cum Laude</i>) University of Szeged Szeged, Hungary 2009 – 2015</p> <p>Bachelor of Health Sciences with Biology (Honours) Western University London, Ontario, Canada 2005 – 2009</p>
Additional Training	<p>Certificate in University Teaching and Philosophy 2016 – 2017</p> <p>Practical French Certificate 2005 – 2009</p> <p>Scholars Electives Program 2008 – 2009</p>
Honours and Awards	<p>Western Graduate Research Scholarship (value: \$20,000) 2015 – 2017</p> <p>Faculty of Health Sciences Graduate Student Conference Travel Award (value: \$525) April 2016</p> <p>CIHR Population and Public Health Travel Award (value: \$1,500) March 2016</p> <p>Dean's Honour List 2012 – 2015</p> <p>Queen Elizabeth II Aiming for the Top Scholarship (value: \$3,500) 2005 – 2006</p> <p>Western Scholarship of Excellence (value: \$2,000) 2005 – 2006</p>

**Teaching
Experience**

Head Teaching Assistant: Anatomy of the Human Body – Part II
School of Health Studies
Western University
January – April 2017

Course Instructor: Systemic and Functional Human Anatomy
School of Health Studies *and* Labatt Family School of Nursing
Western University
September – December 2016

Guest Lecturer: Systemic Approach to Functional Anatomy
School of Health Studies
Western University
June 2016

Lab Instructor: Systemic Approach to Functional Anatomy
School of Health Studies
Western University
May – June 2016

Teaching Assistant: Analysis and Interpretation of Biological Data
Faculty of Biology *and* Statistical and Actuarial Sciences
Western University
September – December 2015

Guest Lecturer: Personal Determinants of Health
School of Health Studies
Western University
October 2015

Lab Instructor: Microbiology and Immunology
Faculty of Microbiology and Immunology
University of Szeged
September – December 2013

**Research
Experience**

Graduate Research Assistant: Health Promotion Lab
School of Health Studies
Western University
2015 – Present

Research Assistant: The Human Environments Analysis
Laboratory (HEAL)
Faculty of Health Geography
Western University
2015 – 2016

Publications

Hasan, D., & Reilly, K. (2016). A gut reaction: Novel concerns and recommendations to address inappropriate antibiotic use. *The University of Western Ontario Medical Journal*, 85(1), 5-7. Retrieved from <http://www.uwomj.com/wp-content/uploads/2016/05/v85no1-2.pdf>.

Hasan, D. (2014). Are hospitals going up in smoke? *The Oxonian Globalist*. Retrieved from <http://tglobalist.org/2014/12/are-hospitals-going-up-in-smoke>.

Peer-Reviewed Conferences

Burke, S. M., Reilly, K., & **Hasan, D.** (2017, April 28). *Parents' perceptions of the family- and community-based resources and support required to enhance physical literacy in children: An exploratory study*. 5th Canadian Obesity Summit. Banff, Canada. *Abstract and oral presentation*.

Hasan, D., Reilly, K., & Burke, S. M. (2016, June 15). *Empowering "C.H.A.M.P. Families" through the development of a comprehensive childhood obesity program*. Public Health 2016. Toronto, Canada. *Abstract and poster presentation*.

Hasan, D., Reilly, K., & Burke, S. M. (2016, June 13). *Empowering "C.H.A.M.P. Families" through the development of a comprehensive childhood obesity program*. Student and early career forum: Public Health 2016. Toronto, Canada. *Abstract and two poster presentations*.

Hasan, D. (2016, April 1). *Weighing in on how well prepared tomorrow's doctors are in managing children with obesity in Ontario*. Robert Macmillan Graduate Research in Education Symposium. London, Canada. *Abstract and round table presentation*.

Hasan, D., Reilly, K., & Burke, S. M. (2016, February 3). *A prevention and treatment initiative to support parents in advocating for the health of their child*. Health and Rehabilitation Sciences Graduate Research Conference. London, Canada. *Abstract and oral presentation*.

Hasan, D. (2015, February 13). *The need for smoking cessation in preventive medicine*. Scientific Student Conference 2015. Szeged, Hungary. *Abstract and poster presentation*.