Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, and health behaviours

by

Lori Zehr

M.Sc. (Human Biodynamics), McMaster University, 1993

B.Sc. (Human Performance, Hons), University of Victoria, 1991

Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Education

in the

Educational Leadership in Post-Secondary Contexts Program

Faculty of Education

SIMON FRASER UNIVERSITY

Summer 2021

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Name:	**Lori Zehr**
Degree:	**Doctor of Education**
Title:	**Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, and health behaviours**
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	Scott Lear Supervisor Professor, Health Sciences
	Michelle Pidgeon Committee Member Associate Professor, Education
	Dawn Mackey Examiner Associate Professor, Biomedical Physiology and Kinesiology
	Jennifer Irwin External Examiner Professor, Health Studies Western University

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Abstract

The growing Exercise is Medicine (EIM) initiative recommends that physicians assess and prescribe physical activity as part of their patient care to tackle the physical inactivity public health crisis (Sallis, 2009). The purpose of this study was to investigate whether University of British Columbia (UBC) Doctor of Medicine (MD) students have the physical activity related knowledge, attitudes, and health behaviours to include physical activity when prescribing treatment plans for their patients and whether the knowledge, attitudes, and behaviours differ between years of the medical program.

In a cross-sectional design, an online survey was administered to profile the UBC MD student population and investigate variables addressing the research questions. Statistics were used to examine frequency distributions, measures of central tendency, and any significant ($P \leq 0.05$) differences between years of the medical program.

The response rate was 18.9% (217/1150). Mean age (SD) of participants was 25.5 (3.9) years and the majority were female (60.7%), white (58.1%), single (72.9%), first year (41.6%), and from Vancouver Fraser (61.1%). The main findings were: 90.3% were aware of the Canadian Physical Activity Guidelines for Adults, but their understanding was poor; 78.8% recalled seven hours or less time spent discussing physical activity, and 74.4% would like to see more time dedicated to learning how to talk to their patients about physical activity; 98.0% strongly agreed or agreed that physical activity counselling is important, only 57.0% felt they have sufficient knowledge, and only 36.6% felt confident in suggesting specific physical activity programs; 96.0% felt medical schools should encourage healthy lifestyles, but only 49.0% felt they do; 89.8% reported their health as excellent or good, but 29.5% identified as having mental health concerns; 76.8% were meeting Canadian Physical Activity Guidelines, and the mean (SD) Godin Leisure Time Exercise Score was 55.6 (25.4) which is a classification of Active.

Participants were receptive to an EIM approach to increase physical activity levels and health outcomes of the population. Given the lack of necessary knowledge, training, and confidence to support EIM in clinical practice, recommendations for medical education, policy, and practice are provided to better equip medical students to positively impact global health.

Keywords: exercise; exercise is medicine; health; medical education; physical activity

Acknowledgements

I would like to acknowledge, and I am thankful for the tremendous supervision from Dr. Scott Lear who provided guidance, advice, and support during this EdD process. Your leadership was invaluable and more than words can describe. And to Dr. Michelle Pidgeon, thank you for always being engaged, responsive, and steering this process. For both of you, I appreciated that you were available when there was opportunity to push forward, and you waited patiently when life's challenges dictated that the time was not right. You provided compassion, encouragement, and drive, despite the gaps of time in between.

I'd also like to acknowledge gratitude for the time, effort, and critical input provided by other members of the examing committee: Chair, Dr. Lucy LeMare, internal examiner, Dr. Dawn Mackey, and external examiner, Dr. Jennifer Irwin. Thank you for helping to lift this dissertation and bettering the final product and outcome.

There were many others along the way who contributed to this EdD journey in various ways from one off conversations and meetings to more regular communication and advice. Your expertise is respected and was instrumental in the process. Thanks go to Arielle, Bill, Charles, Dawn, Irene, Kathy, Lee, Sandra, and Sharleen.

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List of Acronyms

ACSM	American College of Sports Medicine
AMA	American Medical Association
BC	British Columbia
CDC	Centre for Disease Control and Prevention.
EIM	Exercise is Medicine
Kcal	Kilocalorie
MD	Doctor of Medicine
METS	Metabolic Equivalents
UBC	University of British Columbia
WHO	World Health Organization

Chapter 1:

Introduction

Who are our future physicians? Are they interested and receptive to tackling the physical inactivity public health crisis, by promoting and prescribing recommended levels of physical activity to reduce the risk of chronic disease in their patients and help decrease health care costs? With that, are they being taught exercise medicine so they will have the knowledge, skills, and behaviours to be confident and effective in their clinical practice?

The Cost of Physical Inactivity

Physical inactivity is a major public health problem (Blair, 2009; Joy, Blair, McBride, & Sallis, 2013; Sallis et al., 2014; World Health Organization [WHO], 2009). In 2010 almost one third of the world population were categorized as physically inactive or insufficiently active for not meeting recommended levels of physical activity (Hallal et al., 2012). Physical inactivity is a modifiable major risk factor that is the fourth leading cause of morbidity and mortality globally (Lee et al., 2012; WHO, 2009). Independently, physical inactivity is associated with an increased risk of chronic disease (Katzmarzyk. Church, Craig, & Bouchard, 2009). As a result, inactivity is strongly associated with several chronic diseases that have increased dramatically in prevalence in the past few decades: cardiovascular disease; obesity; diabetes; cancer; osteoarthritis; hypertension; stroke; and depression (Haskell et al., 2007; Lee et al., 2012; Pate, Pratt, & Blair, 1995; Warburton, Nicol, & Bredin, 2006; Warburton, Charlesworth, Ivey, Nettleford, & Bredin, 2010).

Globally, Lee, et al. (2012) estimated that physical inactivity causes 6-10% of all deaths from non-communicable diseases and that inactivity causes 9% of premature deaths, or more than 5.3 million deaths annually worldwide. If the prevalence of inactivity is reduced by 25%, 1.3 million deaths per year could be prevented and moving the population from inactive to active could increase life expectancy by 0.68 years (Lee et al., 2012). Comparable estimates have been identified as significant in Canada where inactivity is more prevalent than other modifiable risk factors (Warburton et al., 2006).

In addition to the detrimental health outcomes associated with physical inactivity, there are economic incentives to try to reduce the inactivity levels among the population. The estimated direct, indirect, and total health care costs of physical inactivity in Canada are $2.4 billion, $4.3 billion, and $6.8 billion, and this represent 3.8%, 3.6%, and 3.7% of the overall healthcare costs, respectively (Janssen, 2012). Similar to global estimates, increasing physical activity levels in Canadians so that 1% more people met the physical activity recommendations would save $2 billion per year with a $20 billion reduction in health care spending by 2031 (Krueger, Turner, Krueger, & Ready, 2014). The public health impact of insufficient physical activity and the potential gains from even small population increases in physical activity are substantial.

The Benefits of Physical Activity and Physical Activity Guidelines

Physical activity is a key component to a healthy lifestyle and disease prevention. Physical activity makes lives better and longer. Physical activity for health is nothing new. Pedersen and Saltin (2015) articulated the accumulated and well established evidence for the benefits of physical activity to prevent and manage over 20 chronic conditions such as cardiovascular disease, hypertension, diabetes, cancers, osteoporosis, obesity, mental illness, and all-cause mortality rates (Haskell et al., 2007; Lee et al., 2012; Pate et al., 1995; Physical Activity Guidelines Advisory Committee, 2008; Physical Activity Guidelines Advisory Committee, 2018; Ross et al., 2020; Warburton et al., 2006, 2010). The connection between physical activity and health is clear, clear enough that physical activity should be prescribed as a cost-effective medication and treatment for chronic disease (Lobelo, Duperly, & Frank, 2009; Pedersen & Saltin, 2015; Petrella, Lattanzio, & Overend, 2007; Sallis et al., 2014).

The physical activity and health literature suggests a linear relationship between volume of physical activity and health benefits, and this has been proven regardless of age, sex, race or environmental condition (Pate et al., 1995; Pedersen & Saltin, 2015; Ross et al., 2020; Warburton et al., 2006, 2010). A linear relationship implies that some physical activity is better than none, and more is better than some. No longer having the need to argue whether there is a positive relationship between physical activity and health outcomes, research efforts have focused on the nature of the relationship such as

how much or defining the threshold of physical activity that is required for optimal health benefit.

With only minor country to country variation in messaging, not surprising given the evidence base, national physical activity guidelines and recommendations are essentially the same, suggesting adults should engage in at least 150 minutes or more of moderate to vigorous activity each week (Hallal et al., 2012; Physical Activity Guidelines Advisory Committee, 2018; Ross et al., 2020). Throughout the years, this threshold has remained with a few changes such as the elimination of the requirement that recommended levels of moderate to vigorous physical activity needs to occur in bouts of at least 10 minutes, and the inclusion of health benefits associated with light intensity physical activity (e.g., activities of daily living) (Hallal et al., 2012; Pedersen & Saltin, 2015; Physical Activity Guidelines Advisory Committee, 2018; Ross et al., 2020). The biggest positive change in health risk is going from inactive to somewhat active (75-90 minutes per week) (Lee & Sherret, 2001; Thornton et al., 2016; Warburton et al., 2006). Specific physical activity components (such as frequency, intensity, time, and type) to achieve the physical activity recommendations can be designed to optimize the health of all (Solmundson, Koehle, & McKenzie, 2016).

Evidently, meeting physical activity guidelines, which highlight the scientific evidence base of physical activity recommendations for health, can reduce risk of developing disease and ease costs on the health care system. Despite the known evidence supporting the role of regular physical activity in the prevention and management of chronic disease, insufficient levels of physical activity, or physical inactivity, remains the norm for the population. Finding ways to increase physical activity levels in the population is critical to improving health outcomes and the burden on the healthcare system.

Exercise is Medicine, and the Role of Physicians and Medical Schools

A potential solution to the physical inactivity crisis is the promotion of physical activity in the health care sector. While it’s acknowledged the health care sector is big and broad, and recognizing many health professionals have an important role in the health care sector and patient care, physicians have been identified as having a key role

to play in addressing the prevalence of physical inactivity and its impact on the development of chronic disease (Thornton et al., 2016). Many feel physicians have an ethical duty to inform their patients of the risk of inactivity and to advise their patients about the benefits of being active (Joy et al., 2013; Sallis et al., 2014). In 2007 the American College of Sports Medicine (ACSM) in partnership with the American Medical Association (AMA) launched the Exercise is Medicine (EIM) initiative in an effort to bring attention and advocacy to the role of the physicians and the heath care setting to increase physical activity levels of the population. The goal of EIM is to make physical activity assessment and prescription a standard part of disease prevention and treatment paradigm (Sallis, 2009), through the use of evidence-based strategies that elevate the status of physical activity in the healthcare systems (http://www.exerciseismedicine.org). Robert Sallis (2011) urges physical activity be considered a vital sign in every patient visit; physicians should treat exercise like any other vital sign and that exercise should become one of the most potent prescriptions a physician can give to prevent and manage a number of diseases.

Almost everyone visits their family physician annually, and these visits are an opportune time for physicians to educate and distribute physical activity guidelines and recommendations with the potential to reach the vast population (Lobelo et al., 2009). Patients regularly seek out health information from their physicians and the advice they give is respected by their patients (Radenkovic, Aswani, Ahmad, Kreindler, & Robinson, 2019). Furthermore, patients are more likely to become physically active if their physician recommends it (Hebert, Caughy, & Shuval, 2012). Unfortunately, despite the evidence physical activity is instrumental for the prevention and management of chronic disease, and knowing the influence they have on their patients, only 30-50% of physicians promote physical activity and even fewer provide exercise prescription to their patients (Buffart et al., 2009; Gnanendran, Pyne, Fallon, & Fricker, 2011; Kennedy & Meeuwisse, 2003; Petrella et al., 2007; Solmundson et al., 2016).

It has been consistently shown physicians believe physical activity and a healthy lifestyle are core to chronic disease risk reduction and promoting and prescribing physical activity to their patients is significant to their clinical practice (Buffart et al., 2009; Hebert et al., 2012; Vallance, Wylie, & MacDonald, 2008). In addition, physicians who are more physically active themselves and/or have positive attitudes towards physical activity are more likely to promote physical activity to their patients (Abramson, Stein,

Schaufele, Frates, & Rogan, 2000; Frank, Tong, Lobelo, Carrera, & Duperly, 2008; Gnanendran et al., 2011; Green, Engstrom, & Friis, 2018; Lobelo et al., 2009; Lobelo & Garcia de Quevedo, 2014; Stanford et al., 2014). Physicians who are active are seen as good role models and providing credible advice to their patients (Frank, Wright, Serdula, & Elon, 2003; Lobelo & Garcia de Quevedo, 2014; Petrella et al., 2007). However, even with these engaged physicians, they are few and far between, and the number of physicians practicing an EIM approach is suboptimal and as such the field of medicine is unable to tackle the physical inactivity problem. Physicians report a number of barriers to successfully assessing and prescribing physical activity including a lack of time, knowledge, training, confidence, and a lack of tools and/or resources (Abramson et al., 2000; Hebert et al., 2012; Kennedy & Meeuwisse, 2003; Lobelo & Garcia de Quevedo, 2014).

Not unlike practicing physicians, the majority of medical students believe physical activity education and counselling their future patients about physical activity is important and highly relevant to their practice (Dacey, Kennedy, Polak, & Phillips, 2014; Frank et al., 2003, 2008; Holtz, Kokotilo, Fitzgerald, & Frank, 2013; Ng & Irwin, 2013; Solmundson et al., 2016; Vallance et al., 2008). And similarly, medical students who are physically active themselves are more likely to have positive attitudes toward physical activity promotion, and feel it is their role as future physicians to counsel their patients in an effort to prevent and manage disease. (Frank et al., 2003, 2008; Holtz et al., 2013; Lobelo et al., 2009; Ng & Irwin, 2013; Solmundson et al., 2016)

Research has shown that medical students seem to be aware of the risks of being physically inactive and the benefits of being active, but they are unsure of national physical activity guidelines and recommendations for physical activity, and as such feel they are not able to provide physical activity advice, specific exercise prescriptions, or lifestyle counselling to their future patients (Dunlop & Murray, 2013; Gnanendran et al., 2011; Holtz et al., 2013; Radenkovic et al., 2019; Solmundson et al., 2016; Vallance et al., 2008). They also feel they are not adequately prepared and report that they want more time spent on these topics as part of their education and training (Dunlop & Murray, 2013; Gnanendran et al., 2011; Holtz et al., 2013; Pandya & Marino, 2018; Radenkovic et al., 2019; Solmundson et al., 2016; Vallance et al., 2008).

In response to feedback from medical students and physicians about the gaps in physical activity education and exercise medicine, the past decade has seen a progressive increase in the number of medical schools reporting that they provide physical activity education as part of their curriculum (Stoutenberg et al., 2015; Strong et al., 2017). The majority teach to national physical activity guidelines and include biophysiological content, but few provide training to prepare graduates to properly counsel patients (Cardinal, Park, Kim, & Cardinal, 2015; Dunlop & Murray, 2013; Garry, Diamond, & Whitley, 2002; Stoutenberg et al., 2015; Strong et al., 2017; Weiler, Chew, Coombs, Hamer, & Stamatakis, 2012). When quantified, this physical activity curriculum delivery is only four to 17 hours across the four years of medial school (Cardinal et al., 2015; Garry et al., 2002; Stoutenberg et al., 2015; Strong et al., 2017; Weiler et al., 2012). This underprovided allotment of time is inconsistent with the needs of society.

Worldwide, most medical school leaders report it is their responsibility to provide training in physical activity education, but admittedly feel what they offer is insufficient for their medical students (Connaughton, Weiler, & Connaughton, 2001; Garry et al., 2002; Stoutenberg et al., 2015; Strong et al., 2017). Distressingly, they also feel graduates are not capable of writing an exercise prescription or prepared to counsel their patients about the health benefits of physical activity (Connaughton et al., 2001; Garry et al., 2002). Given the competing demands for curricular time, medical schools are looking for creative and integrated ways to incorporate important physical activity education into their medical programming to address the demand for this better education (Solmundson et al., 2016).

Physicians, are in a powerful position to influence their patients and the broader population. They play a key role in getting people to be more active, more often (Blair, 2009). The evidence has shown that medical students, and subsequently future physicians, who are exposed to healthy lifestyle education or are physically active themselves are more likely to promote and prescribe physical activity to their patients. However, even though medical schools report they offer exercise medicine including physical activity content and behavioural counselling skills, the education and training is nonexistent at less than 20 hours of curriculum across four years of medical education. It’s vital students develop the skills to be competent physicians. Providing adequate knowledge, skills, and competencies of exercise medicine (i.e. physical activity, behaviour change, and self care) would increase practicing physicians’ confidence and

ability to provide appropriate physical activity advice and options for patients. Helping communities achieve recommended physical activity levels leads to reduced risk of disease and better health for all.

The Context: University of British Columbia Medical School

The University of British Columbia (UBC) Faculty of Medicine plays an instrumental role in training future health professionals. UBC offers the only Doctor of Medicine (MD) undergraduate medical program in British Columbia (BC). The medical school focuses on providing graduates with the knowledge, training, and experience needed to meet the health care challenges of today and tomorrow. The MD undergraduate program is a distributed medical education program with four geographically distinct sites in BC: Island Medical Program (University of Victoria, Victoria), Northern Medical Program (University of Northern British Columbia, Prince George), Vancouver Fraser Medical Program (UBC, Vancouver), and the Southern Medical Program (UBC-Okanagan, Kelowna). Each year there is an intake of 288 medical students with 32 located in each of the Island, Northern and Southern sites and 192 in Vancouver Fraser. In addition to the dedicated medical program site, medical education and training is provided at more than 80 hospital and clinical sites across BC. As a four-year undergraduate program, the first two years of medical education are focussed on foundations of medicine and the latter two years are focussed on clinical clerkships and practice (http://www.med.ubc.ca).

The UBC MD student population is heavily surveyed and studied. On the topic of exercise is medicine or physical activity education, published research in the past 5-10 years have included fourth year students (Holtz et al., 2013) and family medicine residents (Solmundson et al., 2016). Holtz et al (2013) found that fourth year medical students were more active than age matched Canadians and the medical students who engaged in more strenuous physical activity had better attitudes toward future counselling practices but they felt they might not have the training to effectively address physical activity with their patients. Solmundson et al (2016) found that family medicine residents reported that exercise prescription is important for their future practice but they did not perceive to be sufficiently prepared to provide exercise prescription. Neither of these studies investigated the entire four-year undergraduate medical school population providing an opportunity to address this broader population.

Given the research landscape to date, there is evidence physicians and physicians in training who are exposed to physical activity education, have positive attitudes about physical activity in the field of medicine, and those who are more physically active themselves, are more likely to promote, prescribe and/or advise their patients about physical activity in their clinical practice. Each of these constructs of physical activity related knowledge, attitudes, and personal health behaviours are independent predictors and correlates of physicians' behaviour to prescribe physical activity. In addition, medical schools play a role in educating and training medical students about physical activity content, and can influence their knowledge, attitudes and behaviours towards an active lifestyle. Of interest in this study is the medical students' current physical activity related knowledge, attitudes, and health behaviours, and whether this is brought to medical school or a result of exposure during the four years of medical education. In addition, given that at a global level exercise medicine has been mandated as a prominent feature for medical curriculum, it is pertinent to identify whether there have been any changes in physical activity related education since the work of Holtz et al. (2013) and Solmundson et al. (2016).

Introducing the Researcher

I have been involved in the health and fitness industry for over 25 years, and most recently held leadership positions at Camosun College for 15 years. I completed a BSc (Kinesiology, Honours) from the University of Victoria in 1991 and an MSc (Human Biodynamics) from McMaster University in 1993. Further to my graduate work and after a number of years working in private sector leadership positions I also completed the Management Studies Certificate (Honours) at Grant MacEwan University and the York University Schulich School of Business Division of Executive Development Executive Management Program in 2002.

As a practitioner, academic, educator, scholar, and administrator, my interests have been to investigate health promotion strategies and programs which increase physical activity levels of the population. I have also been interested in the role of the exercise professional in promoting and changing behaviours that lead to a more active population in an effort to prevent and manage chronic diseases. I have devoted myself to preparing and mentoring trainees and practitioners and championed the role of

exercise professionals in promoting behaviours leading to an active and healthy population.

As an active Board member and former President of the Canadian Society for Exercise Physiology (CSEP) I contributed much of my volunteerism to CSEP's strategic initiative in Advancing the Future of Physical Activity Measurement and Guidelines, and consistently provided the voice of end-user exercise professionals on Canada's Physical Activity, Sedentary Behavior, and 24 Hour Movement Behavior Guidelines. In addition, I was passionately involved in bringing the EIM initiative to Canada as a way to connect the healthcare sector with exercise professionals in the community for a combined effort towards better health outcomes for all.

The contribution of physical inactivity to the growing epidemic of obesity and chronic diseases is generating world-wide concern leading to both national and international calls for comprehensive and collaborative action. The need for promoting healthy lifestyles in Canada has never been more critical. With baby boomers aging and childhood sedentary behaviours and obesity on the rise, the human and financial burden of obesity and physical inactivity is expected to escalate. If present trends continue, this increased burden will have a dramatic effect on the future of the health system and society as a whole.

A key component to addressing the health and wellness of the population is to address the major risk factors, including physical inactivity, which is directly related to the incidence of major chronic diseases. Even small reductions in physical inactivity would translate into significant impacts on morbidity and mortality and the direct and indirect costs with which they are associated.

All of this background and experience culminated in the decision to utilize the EdD (Educational Leadership in Post-Secondary Contexts) program to investigate the EIM initiative, in particular, to have a better understanding of our medical trainees and the education and training they receive in preparing them to take an EIM approach in their future clinical practice. Given my interests and know how, this dissertation was approached from Andrew Tannahill's health promotion theoretical framework (Tannahill, 1985).

Tannahill (1985) proposed a health promotion model that is comprised of three overlapping components including health education, prevention, and health protection. Health education is communication to enhance well-being and prevent or reduce ill-health by influencing the knowledge, attitudes, and behaviours of the community. Prevention includes the reduction of risk or avoidance of consequences and complications of disease, illness, or injury through early detection. And health protection involves the legal or fiscal controls, regulations, policies, and practices to prevent ill-health or for the enhancement of well-being. This model is a useful framework for planning health promotion strategies, inititiaves, and activities (Tannahill, 1985). For my dissertation, the health promotion initiative of EIM was the perspective, or lens, through which I examined the UBC MD students' physical activity knowledge, attitudes, and behaviours, and the potential influence on their clinical practices, and subsequent impact on physical activity levels and overall health outcomes of the population.

Overview and Purpose of the Study

The purpose of this study was to investigate whether the UBC MD students have the physical activity related knowledge, attitudes, and health behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their patients and whether the knowledge, attitudes, and behaviours differs across the four years of medical school preparation and training.

Central Research Questions

1. What knowledge do UBC MD students have with regards to physical activity recommendations, prescription, and programming?

2. What are the attitudes of UBC MD students for incorporating physical activity into the design of prevention and treatment plans for their patients? Do they see it as their role?

3. What are the personal health practices of UBC MD students with respect to physical activity? Are they role models?

Research Study Design

This research study incorporated a quantitative research paradigm to describe the UBC MD student population and to examine variables between groups (years of

medical program). A cross sectional design was employed, and a self-report quantitative closed-ended 75 question online survey was administered at one point in time, with a short window of response, for the advantage of capturing the context in which the survey was administered.

Participants, Recruitment, and Consent

All (~1150) students in the UBC MD undergraduate program were invited to participate in the research study. This included students participating at the collaborative locations of the Vancouver-Fraser, Southern, Northern, and Island Medical Programs. There were no exclusion criteria. All enrolled students were eligible to participate. The UBC MD Office of Student Affairs contacted prospective participants on behalf of the researcher inviting them to volunteer to participate in the research study. The email invitation included participant information and instruction for consent (Appendix A, B, and C). Participation was completely voluntary. Volunteers were asked to dedicate approximately 15 minutes of their time to participate in the research study. Volunteer participants could withdraw at any time. If they withdrew part way through the process, any data collected continued to be used in the analysis. Any identifiers were removed and at no time was personal information linked to individual responses.

Instrument and Data Collection

A hybrid questionnaire package (Appendix D) consisting of questions taken from previous peer reviewed studies (primarily guided by Erica Frank's questionnaires), Canadian Community Health Survey, and the standardized Godin - Shephard Leisure Time Exercise Questionnaire (Godin & Shephard, 1985) was used to survey participants in a single stage format. The online survey included questions related to personal demographics, characteristics, and general health, as well as their knowledge and attitudes about the role of physical activity and/or exercise in the field of medicine. Participants did not need to answer any questions they were not comfortable answering. The online survey was delivered via email on September 19, 2018, with a response date of 12 weeks after the invitation to participate. A reminder was sent at 8 weeks (November 13, 2018) following the initial invitation and survey dissemination.

Data Analysis

Raw data from the online survey were exported into Microsoft Excel and grouped by cohort in order to compare variables between groups (years of medical program). Descriptive statistical analysis using Microsoft Excel involved examining frequency distributions and measures of central tendency for each of the variables concerning the research questions. Continuous data were examined via means (standard deviations) and medians where relevant, while categorical data were calculated as percentages. R Studio software was employed to run inferential statistics to assess any significant differences between groups. One way analysis of variance and subsequent t-Test (two sample assuming equal variances) and Mood's Median tests were used where appropriate. Significance for all statistical analyses were set at alpha ≤ 0.05.

Initial Delimitations, Limitations, and Assumptions

For the purpose of this study, UBC MD students in any year of the undergraduate medical program and in any geographic location were invited to participate. There were a number of initial limitations related to the population sample of this study. Firstly, there may be a limitation in ensuring accurate or up to date contact information for UBC MD students and a lack of correct contact information would be a barrier to reaching students to participate in the study. Secondly, if contact information was accurate, it is possible not all eligible participants would be interested or choose to participate in the study. Both of these concerns would result in an underrepresented sample and/or smaller sample size impacting the quantity and quality of data collected. Reduced data could lead to an inability to describe and infer relationships among the research study's variables.

Another limitation was related to the ability to define and measure the physical activity knowledge and attitudes, as well as behaviours related to physical activity/health practices. Although a standard instrument was used to survey the participants, it is possible participants may have interpreted the survey questions inaccurately. In addition, survey questions required self reporting and thus a limitation related to response and recall bias resulting in over or underreporting by the participants. These varying responses would influence the descriptive and inferential analysis and generalizability of the survey results.

And finally, the survey instrument itself may have influenced the research results. While the standard instrument may be appropriate for the research questions, it may have lower reliability, validity, and/or sensitivity, which would impact the ability to confidently interpret the results and generalize any findings.

Significance of the Study

Physical activity is a key determinant of health. Physical inactivity is one of the four leading risk factors contributing to global mortality (Lee et al., 2012). Physicians are in an influential role to be able to help increase physical activity levels and health of the population. Despite this awareness there are many barriers to physicians being successful in playing a role in health promotion efforts. The EIM global initiative is bringing attention and expectations the health care sector, and in particular physicians, do play a role in counselling and prescribing physical activity to their patients.

Learning more about the profile of UBC MD students' physical activity knowledge, attitudes, and own personal preferences for an active lifestyle will help identify "who" our future physicians are and identify whether or not they are interested and receptive to EIM in the health care setting. In addition, the research will set a course for implementing further curriculum, supports, and materials for physicians to be better equipped and confident in providing physical activity advice and/or referring to exercise professionals in their communities. Having a better understanding of UBC MD students could help inform situations and strategies that would positively impact global health. It is an emergent area of interest given these future physicians are practicing in an era of high health care need and shrinking resources.

The results of this research could help inform health promotion efforts and the leadership of medical students and future physicians as role models for the greater population. It could also help advise medical schools and health care systems in an effort to reduce barriers and facilitate an EIM approach to increase physical activity levels and health of the population. This could involve adopting and implementing policies related to supporting physician based healthy lifestyle interventions, recognizing other health and exercise professionals in the referral and service network, and ongoing education and training in both post-secondary education programs and healthcare setting practices.

Chapter 2:

Literature Review

Physical activity has been defined as any bodily movement produced by skeletal muscle that requires energy expenditure (Caspersen, Powell, & Christ, 1985). Physical activity can occur in a number of domains including leisure time, occupational time, while doing household chores, and during transportation. The amount of physical activity performed is often described by the four dimensions of frequency (number of times per week), intensity (amount of effort), duration (minutes per session), and type (e.g. cardiorespiratory endurance or muscular strength). The rate of energy expenditure or intensity of physical activity varies from that of a light level (>1.5 METS) like leisurely walking and incidental movements throughout the day, to moderate and vigorous activity that causes increased heart and breathing rates such as jogging or resistance training. Individuals who achieve the recommended 150 minutes of moderate to vigorous physical activity per week are classified as being physically active (Ross et al., 2020; Tremblay et al., 2011; WHO, 2009).

Physical inactivity, in opposition to being physically active, is the inability to achieve the recommended amounts of physical activity. Thus a physically inactive individual may be performing some physical activity, but not enough. A term often used interchangeably with physical inactivity is sedentary behaviour. However, sedentary behaviour is the time spent in low energy expenditure (<1.5 METS) while sitting or lying down such as seated office desk work, passive modes of commuting, or watching television (Sedentary Behaviour Research Network, 2012). Individuals who are physically active and achieving recommended levels of physical activity, may also be sedentary. Evidence has demonstrated that those who engage in high amounts of sedentary behaviour are at an increased risk of mortality and morbidity even if they achieve the recommended amount of physical activity (Katzmarzyk et al., 2009). Physical activity is a determinant of health and conversely physical inactivity and sedentary behaviour are leading risk factors for morbidity and mortality.

The Cost of Physical Inactivity

Despite the overpowering knowledge that physical activity is beneficial for cardiorespiratory and muscular fitness, bone health, and a reduced risk of chronic disease, there is an abundance of evidence showing adults are still not active enough for health benefits (Colley et al., 2011; Hallal et al., 2012). The Canadian Health Measures Survey indicated that when physical activity levels were measured objectively via activity monitors, only about 15% of Canadian adults are actually meeting Canadian Physical Activity Guidelines (Colley et al., 2011) and this has remained consistent during cycles of data collection from 2007 – 2015 (https://www150.statcan.gc.ca/n1/daily-quotidien/190417/dq190417g-eng.htm). This is a reflection of reduced physical activity in leisure time and increased sedentary behaviour in occupational and domestic activities. In addition, there has been an increase in passive modes of transportation which is also associated with reducing physical activity (Hallal et al., 2012; Haskell et al., 2007).

Physical inactivity is a modifiable risk factor for several chronic (and largely preventable) diseases and premature death. As a result, physical inactivity constitutes the fourth leading cause of death worldwide and is a leading contributor to the burden of disease (WHO, 2009). Globally, the five leading risk factors with attributions for pre-mature death are high blood pressure (7.5 million deaths), tobacco use (5.1 million deaths), high blood glucose (3.4 million deaths), physical inactivity (3.2 million deaths) and overweight/obesity (2.8 million deaths) (WHO, 2009). Therefore, it's no surprise inactivity is strongly associated with several chronic diseases that have increased dramatically in prevalence in the past few decades: cardiovascular disease; obesity; diabetes; cancers; osteoarthritis; hypertension; stroke; and depression (Haskell et al., 2007; Lee et al., 2012; Pate et al., 1995; Warburton et al., 2006, 2010).

Beyond the effects of physical inactivity on morbidity and mortality, there are clear economic reasons to try to increase physical activity levels among the population. There have been a number of analyses on national and/or global healthcare costs due to physical inactivity (Bounajm, Dinh, & Theriault, 2014; Janssen, 2012; Krueger et al., 2014). These analyses vary based on a number of factors including: the risk reduction and prevalence data, or lack thereof; data based on subjective versus objective measures; different formulas, adjustment factors, and modeling approaches; varying definitions and/or cut points for physically active versus inactive; changing cost

categories; and distribution of health care costs (Krueger et al., 2014; Pratt, Norris, Lobelo, Roux, & Wang, 2014).

The estimated direct, indirect, and total health care costs of physical inactivity in Canada are $2.4 billion, $4.3 billion, and $6.8 billion, and this represent 3.8%, 3.6%, and 3.7% of the overall healthcare costs, respectively (Janssen, 2012). Direct costs include hospital care, physician and other health care professional services, drugs, and other health care expenditures, whereas indirect costs include productivity losses due to premature death, as well as short and long term disability (Janssen, 2012). When looking at the economic benefits of long term health risk reduction, increasing physical activity levels in Canadians so that 1% more people met the physical activity recommendations would save $2 billion per year with a $20 billion reduction in health care spending by 2031 (Krueger et al., 2014).

Globally, Lee et al. (2012) quantified the effect of physical inactivity on the world's major non-communicable diseases with an estimate of how much risk reduction would be the result of inactive people becoming active. They estimated that physical inactivity is associated with 6-10% of all deaths from the major non-communicable diseases (cardiovascular disease, type 2 diabetes, colon and breast cancer) and that inactivity is associated with 9% of premature deaths, or more than 5.3 of the 57 million deaths that occur worldwide (Lee et al., in 2012). If there were an elimination of physical inactivity (moving the inactive population to an active population), life expectancy of the world's population might be expected to increase by 0.68 years and if the prevalence of physical inactivity was reduced by 25%, 1.3 million deaths could be prevented (Lee et al., 2012).

The Benefits of Physical Activity and Physical Activity Guidelines

The evidence to support physical activity as prevention for chronic disease began with the work of Jerry Morris in the 1950s who investigated the relationship of physical inactivity and chronic disease risk. His work was some of the first epidemiological evidence to demonstrate that men in physically demanding occupations (bus conductors and postmen) had a significantly lower risk of mortality rates from heart disease

compared to individuals in less physically demanding jobs (bus drives and office workers) (Morris, Heady, Raffle, Roberts, & Parks, 1953).

Years later, research from Paffenbarger, Hyde, Wing, and Hsieh (1986) and the Harvard Alumni Study revealed an inverse dose response relationship between physical activity and all-cause mortality rates by following more than 20,000 men over a 16 year period. In particular they found men expending more than 2,000 kcal of energy per week (200-300 minutes of recommended levels of physical activity) had a 27% lower risk of mortality compared to men expending less than 2,000 kcal of energy per week. Over time more science has accumulated to demonstrate that even 1,000 kcal of energy expenditure per week is associated with a 20-30% reduction in all-cause mortality (Lee & Sherrett, 2001). As such, the more recent literature supports a minimum volume of physical activity equal to 1,000 kcal per week (or 30 minutes of moderate intensity activity on most days of the week) with added health benefits and reduced risk of early death resulting from higher activity levels (Lee et al., 2012; Warburton et al., 2006, 2010).

The importance of a physically active lifestyle is well known and it has been widely substantiated and accepted as a preventive measure for a variety of health risks. Over time, physical activity has been found to have beneficial effects for more than 20 health conditions including the prevention of major chronic diseases such as cardiovascular disease, hypertension, diabetes, cancers, osteoporosis, obesity, mental illness, and all-cause mortality rates (Haskell et al., 2007; Lee et al., 2012; Pate et al., 1995; Pedersen & Saltin, 2015; Physical Activity Guidelines Advisory Committee, 2008, 2018; Ross et al., 2020; Warburton et al., 2006, 2010). Pedersen and Saltin (2015) conducted a comprehensive literature search for each of 26 different chronic diseases including Cochrane Library and MEDLINE databases, reference lists, original articles and reviews to identify systematics reviews and meta-analysis as well as control trials in order to summarize the benefit of exerise as medicine for these diseases. In all cases, and similar to the work of others, this literature supports a linear relationship between volume of physical activity and health benefits, and this has been proven regardless of age, sex, race or environmental condition (Pate et al., 1995; Pedersen & Saltin, 2015; Ross et al., 2020; Warburton et al., 2006, 2010). The recommendation for a reduced risk for premature mortality is 30 minutes or more of moderate to vigorous activity on most days of the week with greater health benefits appearing with higher volumes and/or

intensities of activity (Warburton et al., 2010). Some physical activity is better than none, and more is better than some.

The dose response relationship is well defined between physical activity and premature all-cause mortality. The greatest difference in risk occurs between the lowest activity levels suggesting sedentary individuals can markedly reduce their risk for all-cause mortality with relatively minor increments in physical activity (Lee & Sherret, 2001; Physical Activity Guidelines Advisory Committee, 2018; Ross et al., 2020; Warburton et al., 2006). Although the target of 150 minutes of aerobic physical activity per week may seem out of reach for many who are sedentary, studies have shown significant benefits for those who complete even small amounts of physical activity and the biggest positive change in health risk is going from inactive to somewhat active (75-90 minutes per week) (Lee & Sherret, 2001; Thornton et al., 2016; Warburton et al., 2006).

In 1995 the Centre for Disease Control and Prevention (CDC) and the ACSM launched national Physical Activity Guidelines for Americans that recommended that every adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week (Pate et al., 1995). This recommendation was based on evidence at the time and was stated to try to encourage increased physical activity in the population. As new science accumulated and there was a greater understanding of how physical activity provides health benefits these guidelines were updated in 2007.

Revised guidelines from the CDC and ACSM (Haskell et al., 2007) stated that to promote and maintain health, all healthy adults need moderate intensity aerobic physical activity for a minimum of 30 minutes on five days of the week, or vigorous intensity aerobic activity for a minimum of 20 minutes on three days of the week. It was also recommended that combinations of moderate and vigorous intensity activity could be performed to meet this recommendation. In addition, to promote and maintain good health and physical independence, adults would benefit from performing activities that maintain or increase muscular strength and endurance for minimum of two days per week. It was also clearly stated that physical activities above the minimum recommended amounts would provide additional health benefits and result in higher levels of physical fitness (Haskell et al., 2007).

Some of the highlighted changes between 1995 and 2007 included: a prescribed frequency of five days a week; the inclusion of vigorous intensity physical activity is explicit; identification that moderate and vigorous intensity activity is complimentary; performance of aerobic activity is in addition to light intensity activities of daily living; physical activity can be accumulated in bouts of 10 minutes; messaging that more physical activity than the minimum recommendation would result in greater health benefits; and that muscle-strengthening activities were incorporated (Haskell et al., 2007).

Most recently, the latest Physical Activity Guidelines for Americans were released in 2018 and build upon the well established and extensive scientific evidence base about the health benefits of physical activity, as well as new knowledge gained since 2008 (Piercy et al., 2020). Overall, the physical activity guidelines for adults remain a minimum of 150 minutes of moderate intensity or 75 minutes of vigorous intensity aerobic physical activity or an equivalent combination of moderate and vigorous intensity aerobic activity, and muscle strengthening activities on two or more days a week. Recommendations emphasize that individuals performing the least physical activity benefit most by even modest increases in moderate to vigorous activity, and additional benefits occur with more physical activity (Piercy et al., 2020; Physical Activity Guidelines Advisory Committee, 2018).

New highlights for 2018 include the growing body of evidence that health benefits start immediately after being active and even short bouts of physical activity are beneficial, and this is reflected in the elimination of the requirement that physical activity for adults needs to occur in episodes of at least 10 minutes. And of additional interest is the updated specific recommendations and guidance for different ages and populations now including preschool aged children (3-5 years), as well as children and adolescents, older adults, pregnant and postpartum women, and adults with chronic conditions or disabilities (Piercy et al., 2018; Physical Activity Guidelines Advisory Committee, 2018).

Much like the development of national physical activity guidelines in the United States, Canadian Physical Activity Guidelines have been informed by a rigorous and transparent process and recommendations are based on grading of the scientific evidence related to the relationship between physical activity and health outcomes (mortality and/or the incidence of major common chronic diseases) (Ross et al., 2020;

Tremblay et al., 2011, Warburton et al., 2010). Canadian Physical Activity Guidelines were developed to promote healthy active living in the Canadian population. The first guidelines were presented in the form of ‘‘guides’’ and began with the publication of a Canadian Physical Activity Guide for Adults in 1998, for Older Adults in 1999, for Children, and Youth in 2002 (Tremblay et al., 2011). In 2011, the “guides” were updated and replaced by a simultaneous release of Canadian Physical Activity Guidelines for the Early Years, Children and Youth, Adults, and Older Adults (Tremblay et al., 2011).

The 2011 Canadian Physical Activity Guidelines for Adults stated that to achieve health benefits, adults should: accumulate at least 150 minutes of moderate to vigorous intensity aerobic physical activity per week, in bouts of 10 minutes or more; add muscle and bone strengthening activities that use major muscle groups, at least two days per week; and identified that more physical activity provides greater health benefits (Tremblay et al., 2011). These scientifically evidence based guidelines also had supporting messages such as: relevancy to all apparently healthy adults irrespective of gender, race, ethnicity, or socioeconomic status; guidelines can be met through planned activity sessions, transportation, recreation, sports or occupational demands; should be achieved above and beyond incidental physical activities accumulated throughout the day; the potential benefits far exceed the potential risks associated with physical activity; and it’s appropriate to start with smaller amounts of physical activity and gradually increase to meet the guidelines (Tremblay et al., 2011).

Recognizing other health behaviours besides physical activity are associated with morbidity and mortality, Canada has forgone the use of single movement behaviour guidelines (i.e. Canadian Physical Activity Guidelines), and has introduced 24-Hour Movement Guidelines to acknowledge the importance of integrating all movement behaviours (physical activity, sedentary behaviour, and sleep) (Ross et al., 2020). While the 24-Hour Movement Guidelines do include required levels of physical activity, the emphasis is on the emerging research of how sleep, sedentary behaviour, and physical activity interact and influence health outcomes. Within a 24 hour day, any change in time spent in one of these movement behaviours leads to an increase or reduction of time spent in one of the other movement behaviours with a resultant impact on health outcomes (Ross et al., 2020). The Canadian 24 Hour Movement Guidelines were release in 2016 for Children and Youth (5-17 years), 2017 for the Early Years (0-4 years), and in 2020 for Adults (18-64 years) and Older Adults (65 years and older).

The Canadian 24-Hour Movement Guidelines for Adults continue to recommend an accumulation of at least 150 minutes of moderate to vigorous intensity aerobic physical activity per week and muscle and bone strengthening activities that use major muscle groups, at least two days per week. Notable updates for physical activity recommendations include the removal of the requirement that accumulation of moderate to vigorous physical activity be acquired in bouts of 10 minutes or more; an emphasize that some physical activity and/or more is better; the recommendation for several hours of light physical activity per day, reflecting a growing body of research and evidence for health benefits associated with light intensity activity (such as quiet standing and activities of daily living); and replacing sedentary behaviour with additional physical activity and trading light physical activity for more moderate to vigorous physical activity, while preserving sufficient sleep, for greater health benefits (Ross et al., 2020).

National physical activity guidelines have been developed with the intent the primary target audience is health professionals and policy makers, although they can be useful for general public as well. As a resource, national physical activity guidelines help health professionals bring awareness to the health benefits of being physically activity and facilitate exercise prescriptions and increasing activity levels of the population to improve health and longevity. (Piercy et al., 2018; Physical Activity Guidelines Advisory Committee, 2018; Ross et al., 2020)

Though the beneficial effects of physical activity on health are well known and firmly established, Canadians continue to be inactive and few are achieving recommended levels of physical activity. The intricacies of optimizing the physical activity dimensions of frequency, intensity, time and type with any special considerations for different age groups or specific populations can make physical activity advisement difficult. There is no simple one prescription fits all approach. Certainly, national physical activity guidelines have been a useful tool to bring awareness to physical activity for health, but effective exercise prescription can be challenging when trying to change a complex behaviour such as physical activity.

Exercise is Medicine and the Role of Physicians

Health promotion efforts that target behavioural factors such as physical activity can have a significant impact to health and well-being of the population. The healthcare

sector has begun to recognize they can play a role in helping with physical activity promotion for the purpose of primordial, primary, secondary and tertiary prevention. In 2007 the ACSM in partnership with the AMA launched the EIM initiative in an effort to advocate to make physical activity assessment and prescription a standard part of disease prevention and treatment paradigm for all patients, through the use of evidence based strategies that elevate the status of physical activity in the healthcare systems (http://www.exerciseismedicine.org/). Robert Sallis (2011) urges physical activity be considered a vital sign in every patient visit; physicians should treat exercise like any other vital sign and that exercise should become one of the most potent prescriptions a physician can give to prevent and manage a number of diseases. The initial EIM initiative has grown since 2007 and has spread to over 40 countries. In 2012 the global initiative expanded to include Canada, among many other global partners (http://www.exerciseismedicine.org/).

As part of EIM's mission to provide national leadership in promoting physical activity as a chronic disease prevention and management strategy to improve the health of all, the initiative has a number of goals, including: increasing the number of health care professionals who are assessing, prescribing, and counseling patients in physical activity; increasing the number of individuals meeting national physical activity guidelines; and encouraging the referral of patients to appropriate physical activity resources, including qualified exercise professionals in the prevention and treatment of chronic disease. The focus is on encouraging physicians and other health care providers to include physical activity when designing prevention and treatment plans for patients and referring their patients to qualified exercise professionals in an effort to combat the public health issue of physical inactivity (http://www.exerciseismedicine.org/).

With the growth of EIM, there is an increasing interest for physicians to promote physical activity and advise patients about healthy lifestyles as a method for improving public health (Pandya & Marino, 2018). Physicians have a key role to play in addressing the prevalence of physical inactivity and its impact on chronic disease by counseling patients to adopt physical activity and improve their lifestyles (Hebert et al., 2012; Joy et al., 2013). Many behind the EIM initiative feel physicians have a morale and professional obligation to inform their patients of the risk of inactivity and to advise their patients about the benefits of being active by counselling them in the clinical setting (Joy et al., 2013; Sallis et al., 2014). As advice given by physicians is highly regarded by patients,

physicians can influence the dissemination of physical activity guidelines and recommendations to a broader segment of the population (Radenkovic et al., 2019).

Over 80% of the population visit their physician every year and prefer to get health information directly from their family physician, suggesting these annual visits provide an opportune time for the encouragement of behaviour change (Lobelo et al., 2009; Petrella et al., 2007; Radenkovic et al., 2019; Thornton et al., 2016). Physicians have repeatedly stated physical activity knowledge and lifestyle counselling is important for their work, but the level of physical activity counselling by physicians is suboptimal (Buffart et al., 2009; Gnanendran et al., 2011; Hebert et al., 2012; Joy et al., 2013; Kennedy & Meeuwisse, 2003; Vallance et al., 2008). Even though physical activity is a crucial intervention for chronic disease, unfortunately most physicians do not regularly assess or prescribe physical activity as part of their routine care and even when discussed, few provide specific recommendations for their patients (Belanger et al., 2015; Buffart et al., 2009; Gnanendran et al., 2011; Thornton et al., 2016; Petrella et al., 2007).

Buffart et al. (2009) invited all general practitioners in New South Wales to participate in the third survey in a series of surveys from 1997 to 2007 regarding general practitioners perceptions and practice of physical activity counselling. Across the 10 year period the survey was provided to 796 in 1997, 1,404 in 2000, and 1,624 in 2007. Respondents and response rates were: 511 and 64% in 1997, 747 and 53% in 2000 and 646 and 40% in 2007. The majority (58%) of the participants were male and on average they had been in practice for over 21 years. This repeated cross sectional study surveyed general practitioners knowledge, confidence, and role perception regarding promoting physical activity to their patients. The majority felt confident in giving general physical activity advice (92%) and saw it as their role to do so (98%), however, only 70% felt confident in providing specific physical activity programs and less than half actually discussed physical activity with their patients. Over time the findings demonstrated small increases in knowledge, confidence, and practice from 1997 to 2000 but then remained the same since 2000 (Buffart et al., 2009).

On a larger scale, Hebert et al. (2012) conducted a systematic literature review through 2011 of primary care providers and their attitudes and perceptions pertaining to physical activity counselling. After identifying a potential 110 articles through screening,

19 met the inclusion criteria. All studies were cross sectional and the majority were quantitative studies that used questionnaires. Five of the studies were from the United Sates, and the others were conducted in Canada, Europe, and Australia. The findings from the studies suggested that most primary care providers believe physical activity counselling is important and they have a role in promoting physical activity among their patients. This review also suggested that primary care providers were more likely to counsel patients about physical activity if they were active themselves. However, the literature also demonstrated they felt uncomfortable providing detailed advice about physical activity and cited a lack of time, training, and reimbursement as barriers (Hebert et al., 2012).

Physicians report low confidence and low frequency in providing detailed exercise prescriptions to patients (Belanger et al., 2015; Petrella, Koval, Cunningham, & Paterson, 2003; Petrella et al., 2007). Generalized statements such as mentioning patients need to be more active are more common and specific physical activity counselling is less common (Granendran et al., 2011; Kennedy & Meeuwisse, 2003; Petrella et al., 2007; Solmundson et al., 2016). Evidence has shown detailed exercise prescription is more effective than general encouragement alone to increase the uptake of active lifestyles and physicians can improve fitness and physical activity confidence in their patients through tailored exercise prescriptions (Petrella et al., 2003). Providing written prescriptions can represent a signal to patients their physician is serious about their recommendations and are more effective than verbal (Petrella et al., 2003), but despite this, physicians are not prescribing physical activity in health care due to a lack of knowledge and training (Belanger et al., 2015; Hebert et al., 2012; Kennedy & Meeuwisse, 2003; Lobelo et al., 2009; Petrella et al., 2007). Improving the quality of physical activity counselling by physicians is an important avenue and cost-effective approach to increase physical activity levels of the general population and decrease the prevalence of disease and premature death (Pedersen & Saltin, 2015; Petrella et al., 2007).

Petrella et al. (2007) summarized findings from the College of Family Physicians of Canada National Family Physician Workforce Survey, specifically questions related to physical activity counselling. Of the more than 27,000 potential primary care physicians identifed, 13,166 Canadian primary care physicians provided responses for a response rate of 51.2%. Respondents were primarily male (61.1%) with a mean age of 46.6 years.

They found 85.2% of Canadian primary care physicians reported asking their patients about their physical activity levels, but only 26.2% assess patient fitness as part of their health care visit and merely 10% referred patients to others for a fitness assessment. Most of these physicians (69.8%) reported verbal counselling to promote physical activity, but only 15.8% use written prescriptions to guide their patients to becoming more active (Petrella et al., 2007). Furthermore, Kennedy and Meeuwisse (2003) conducted a cross-sectional study in which a random sample of 330 (61.1% response rate) Canadian physicians returned a completed questionnaire related to physical activity counselling practices. Respondents were 63.8% male and 68.9% were over the age of 40. Only 42.4% of Canadian physicians felt moderately knowledgeable and 41.3% believed they are moderately qualified to counsel their patients about physical activity. While 43.3% of these physicians thought they should counsel their patients about physical activity, only 11.8% actually did (Kennedy & Meeuwisse, 2003). So while there is a high rate of asking patients about their physical activity levels, this in itself is not enough, as is it not being paralleled with the trends in inactivity levels, and/or the ongoing development of chronic disease. Simply asking about physical activity levels is not enough, as opposed to prescribing physical activity, yet Canadian physicians do not feel confident nor competent to do so (Kennedy & Meeuwisse, 2003; Petrella et al., 2007).

There is consistent and repeated evidence physicians who are active themselves have more positive attitudes towards physical activity and are more likely to provide better preventive medicine counseling to their patients (Abramson et al., 2000; Frank et al., 2008; Granendran et al., 2011; Green et al., 2018; Lobelo et al., 2009; Lobelo & Garcia de Quevedo, 2014; Stanford et al., 2014). And active physicians are seen as good role models, being more credible, and more likely to motivate their patients to adopt or maintain a healthy lifestyle (Frank et al., 2003; Lobelo & Garcia de Quevedo, 2014; Petrella et al., 2007; Stanford et al., 2014).

For instance, Abramson et al. (2000) mailed a cross-sectional survey to physicians in the United States to obtain detailed information on their personal exercise habits and their exercise counselling practices. A random sample of 1,200 primary care physicians was generated from the American Medical Association for invitation. Nearly 300 physicians (25% response rate) completed the survey. The average age of the physicians surveyed was 50 years and 43% had been in practice for more than 15

years. The results indicated that physicians who performed exercise themselves were more likely to counsel their patients on the benefits of physical activity (Abramson et al., 2000).

In 2014, Lobelo and Garcia de Quevedo summarized the literature on the association between a health care provider's personal physical activity habits and their related physical activity counselling practices. Close to 200 studies were screened and a snowball search strategy resulted in 47 articles for inclusion from 1979 – 2012, with the majority (n=33) of the studies published after 2000. Most of the studies were from the United States (n=33), with others conducted in the United Kingdom, Canada, Spain, India, Columbia, and the Netherlands, and all but one were cross-sectional survey approaches. The majority (n=34) of the studies were published after 2000. Most studies reported a significant positive association between health care providers' physical activity habits and counselling frequency. This body of evidence supports the idea that physically active physicians are more likely to provide physical activity counselling to their patients, suggesting physicians personal habits are a correlate or predictor of counselling behaviours and influential role models (Lobelo & Garcia de Quevedo, 2014).

Even those physicians who have good intentions of counseling their patients on healthy lifestyles report barriers to their success. Barriers include inadequate knowledge, low self-efficacy, office time constraints, lack of reimbursements, and poor personal habits (Abramson et al., 2000; Hebert et al., 2012; Kennedy & Meeuwisse, 2003; Lobelo & Garcia de Quevdeo, 2014). Research has shown most physicians feel they do not receive enough formal education in physical activity including awareness and knowledge of physical activity recommendations for health, as well as how to counsel patients about becoming more physically active. (Cardinal et al., 2015; Dunlop et al., 2013; Radenkovic et al., 2019; Weiler et al., 2012). Initiatives such as EIM can provide insight and support to reducing these barriers, including continuing medical education programs, improving physician wellness, and improving the lifestyle medicine and health promotion curriculums in medical and health sciences schools globally (Joy et al., 2013; Lobelo, Stoutenberg, & Hutber, 2014). These efforts may be of benefit to the physicians' health as well as an avenue to increase the frequency and quality of counseling to patients of the general population. Overall, the EIM solution can be seen as an additional and relevant piece of the global public health solution to cutting back on medication

prescriptions and replacing it with the promotion of physical activity and lifestyle change more widely and effectively.

With such convincing evidence that physicians report a lack of knowledge, training, and confidence to provide physical activity advice and counselling to their patients, it seems prudent to review the medical school setting and the knowledge, skills and abilities of medical students, or future physicians in training, with regards to exercise medicine. Similar to the practicing physician population, there is compelling evidence medical students believe physical activity advice and prescription will be important to their future practice (Dacey et al., 2014; Frank et al., 2003, 2008; Holtz et al., 2013; Ng & Irwin, 2013; Solmundson et al., 2016; Vallance et al., 2008). In addition, it has been shown that those medical students who are more physically active themselves have more positive attitudes toward physical activity and subsequently see the benefit of prescribing physical activity to their future patients (Frank et al., 2003, 2008; Holtz et al., 2013; Ng & Irwin, 2013; Lobelo et al., 2009; Solmundson et al., 2016; Vallance et al., 2008).

While medical students agree physical activity counselling is important, they feel they are not competent at providing appropriate physical activity prescriptions to their future patients, nor are they confident about counselling their future patients about how to become more active (Dunlop & Murray, 2013; Gnanendran et al., 2011; Holtz et al., 2013; Radenkovic et al., 2019; Solmundson et al., 2016; Vallance et al., 2008). An important aspect of the lack of confidence in talking to patients about being physically active is that medical students are not aware of national guidelines for physical activity and are unable to identify the specific recommendations for health (Dunlop & Murray, 2013; Holtz et al., 2013; Radenkovic et al., 2019; Solmundson et al., 2016). This lack of knowledge is a barrier for physical activity prescription and lifestyle counselling. Medical students themselves recognize this deficiency in training and have overwhelmingly stated it would be valuable, and have expressed desire, for more education in physical activity knowledge and exercise prescription training (Dunlop & Murray, 2013; Frank et al., 2003; Gnanendran et al., 2011; Holtz et al., 2013; Pandya & Marino, 2018; Radenkovic et al., 2019; Solmundson et al., 2016; Vallance et al., 2008).

To explore this, Radenkovic et al. (2019) conducted a cross-sectional study to survey 1,356 final year medical students from seven United Kingdom medical schools

about their lifestyle medicine training. They received completed questionnaires from 158 respondents resulting in a response rate of 11.6%. Half (52%) of the participants were unaware of their respective national physical activity guidelines, 80% stated they had not received training in lifestyle medicine, 48.1% felt they were uninformed and not skilled with motivational interviewing, and 76% wanted more lifestyle medicine teaching in the medical school curriculum (Radenkovic et al., 2019).

In addition, Dunlop and Murray (2013) surveyed United Kingdom medical students' knowledge of national physical activity guidelines and/or their willingness to prescribe physical activity to patients. A questionnaire survey was sent to final year medical students in the four Scottish medical schools and two were willing to participate. There were 177 completed questionnaires for a response rate of 37%. Overall, 74% reported they had received teaching about the benefits of physical activity, 40% stated they were aware of current national guidelines, and 68% were able to correctly identify the physical activity guidelines for adults, however, only 52% stated they felt adequately trained to provide physical activity counselling to patients (Dunlop & Murray, 2013).

In the United States, Frank et al. (2003, 2006, 2008) have published a number of studies related to first year medical students from the class of 2003 at 17 medical schools, in which a survey was adminstered at three time periods: during the 1999 freshman orientation, orientation to wards, and senior year. The 17 schools reflected U.S. medical school characteristics, with appropriate geographical distribution and mix of educational institution size and focus. All freshmen were invited to participate. The overall response rate was 80% including 1,900 as freshmen, 1,600 at entry to wards, and 1,500 in their senior year. The majority (just over 50%) of participants were male across the three questionnaire time periods, and a freshmen median age of 23 years. The majority (79%) of freshmen believed it would be highly relevant to counsel patients about physical activity in their future practice and 64% complied with national physical activity recommendations themsleves. In addition, students who reported their families had good activity habits were more likely to comply with physical activity recommendations (Frank et al., 2003). In following up, 61% of participants continued to meet national physical activity guidelines suggesting stable activity levels over time. A number of items correlated with being physically active such as positive attitudes towards their medical school and classmates. In addition, the positive relationship between personal physical activity habits and counselling patients about physical activity

continued, adding to the evidence that frequency of exercise counselling may be predicted by medical students'/physicians' personal physical activity levels as this relationship is present throughout medical training (Frank et al., 2008).

Surprisingly, given their busy schedules and intensive medical program while attending medical school, the majority of medical students globally meet national physical activity guidelines and thus are more physically active than their age matched peers (Frank et al., 2008; Holtz et al., 2013; Vallance et al., 2008). This suggests medical students are already active prior to medical school, rather than being established during medical school through physical activity related curricula (Frank et al., 2008; Ng & Irwin, 2013). In addition, Gnanendran (2011) found in a sample of 131 Australian medical students, those who were more active as children were more likely to have positive attitudes towards physical activity counselling as professionals. What's more, medical students believe medical schools have a responsibility to encourage and support students to have a healthy lifestyle (Gnanendran et al., 2011; Holtz et al., 2013; Solmundson et al., 2016). It seems maintaining and promoting adequate physical activity levels or time for healthy lifestyles during medical education is an important step in enabling physical activity counselling for future physicians.

Vallance et al. (2008) administered and received online surveys related to perceived confidence and importance of patient centred physical activity prescription from 246 (27% response rate) medical students across all four years of the medical program from two large Universities in Western Canada. The majority (53%) of respondents were female with a mean age of 25 years. They found Canadian medical students perceived physical activity prescription to be important yet they also perceived only moderate competence at conducting physical activity related prescription. Furthermore, those students who were active and meeting Canadian Physical Activity Guidelines considered themselves more competent to provide physical activity prescriptions than those who were not as active (Vallance et al., 2008). In a similar study, Ng and Irwin (2013) administered an online survey to determine the percentage of Canadian medical students meeting the Canadian physical activity recommendations and their self reported perception of relevance and frequency of physical activity counselling during patient encounters. Medical students enrolled in 2010 and part of graduating classes of 2011 to 2015 at 17 Canadian medical schools were invited to participate. Eleven of the 17 medical schools participated representing over 6,900

students. Nearly 1,700 medical students responded for a response rate of 24%. The findings indicated that most medical students (80%) believe physicians should adhere to a healthy lifestyle and encourage their patients to do so, and 90% believed their credibility is increased if they stay fit themselves. Sixty-four percent of this sample were meeting Canadian Physical Activity Guidelines and despite the importance put on physical activity, only 25% discussed physical activity with patients (Ng & Irwin, 2013).

When exploring UBC medical students, Holtz et al. (2013) surveyed fourth year medical students from 2007-2010. Five hundred and fifty of nearly 900 UBC medical students participated for a response rate of 62%. The majority (58.2%) of respondents were female and the mean age was 27.8 years. They reported fourth year medical students who engaged in more strenuous physical activity were more likely to have positive attitudes towards healthy living, were more likely to perceive physical activity counselling to be highly relevant to their clinical practice, and they could provide better counselling if they adhered to a healthy lifestyle. Overall 69% of the students perceived physical activity counselling to be highly relevant to clincal practice but 86% thought their training in this area was less than extensive and they felt they were not prepared to provide physical activity counselling to their patients (Holtz et al., 2013).

Another study by Solmundson et al. (2016) investigated exercise medicine and exercise prescription in medical education via an online cross sectional survey completed by 319 of 394 (80% response rate) UBC family medicine residents (incoming first years, graduating second years, and residents midway). The majority (64.9%) of respondents were female and the mean age was 30 years. The residents indicated exercise interventions and prescribing physical activity are highly important (95.6%) in their practice and they had highly positive attitudes and beliefs regarding physical activity. These residents also believed they would be able to provide more credible and effective counselling if they are personally active themselves. Students had low (33.7%) familiarity with Canadian Physical Activity Guidelines and low self competence in their abilities, and only 14.9% perceived their training as adequate. Nearly all (95.9%) believed their medical school should encourage and support them to be active, and 91% indicated they wanted more training in exercise medicine (Solmundson et al., 2016).

Overall, research has demonstrated medical students enter medical school being more active than the average population and believing physical activity prescription and

counselling is important to their future work (Frank et al., 2003, 2008; Vallance et al., 2008) but yet upon completing medical school, graduates lack the knowledge and training, and report being ill prepared to discuss and provide physical activity guidance to their patients (Dunlop & Murray, 2013; Gnanendran et al., 2011; Holtz et al., 2013; Radenkovic et al., 2019; Solmundson et al., 2016). This lack of awareness and knowledge is concerning given the ongoing prevalence of non-communicable disease in Canada. Being active is an effective evidence-based medicine (Green et al., 2018). In order to better forge efforts to provide the emerging and much desired exercise is medicine curriculum and approach, there is a need to identify how physical activity training is being delivered in medical schools.

Exercise is Medicine in Medical Education

Given that EIM is a growing endeaveur, it's more important than ever to enable medical students to be trained, engaged, and excited about prevention and upstream exercise medicine for their patients. Connaughton et al. (2001) invited 128 schools of medicine in the United States to complete a survey about the importance of physical activity and exercise topics, and their perceptions about the graduating medical students to perform fundamental skills related to exercise prescription. Seventy-two schools evenly distributed geographically across the Northeast, Midwest, and Southern regions, with fewer schools from the West, participated, resulting in a response rate of 56%. They found that 51% of deans and director of U.S. medical schools reported physical activity related topics were covered in their medical education curriculum, including 6% offering core curriculum in physical activity guidelines, but not as a primary focus of a core course, and only 44% felt their medical school curriculum dedicates sufficient curricular time to exercise and physical activity content. When comparing graduating competencies, only 10% said their graduates could design a physical activity program. They felt graduates would not be successful in providing physical activity counselling to their patients as general advice such as "get some exercise" is not effective, and the graduates do not have the necessary physical activity content knowledge to provide individualized exercise prescription that addresses frequency, intensity, and duration of physical activity, as well as any instructions, contraindications, and proper progression. This suggests that despite deans and directors viewing this competence as important,

graduating students lack sufficient training in order to provide physical activity advice to their patients (Connaughton et al., 2001).

At around the same period of time, another survey study found only 12.7% of 102 participating U.S. medical schools reported including physical activity instruction in their curriculum (Garry et al., 2002). Upon further investigation, it was noted this physical activity content was delivered through an average of 11 hours across the four years of education. Notwithstanding this minimal exposure, 64% of medical schools felt it was their responsibility to educate students about physical activity, but yet 76% stated they had no plans to introduce this type of curriculum, and only 24% felt their graduates were prepared to counsel patients about physical activity. These deficiencies in health promotion and prevention education, paralleled the population inactivity rates, which lead to ongoing disease and costs in health care (Garry et al., 2002).

A decade later, and after these findings, Cardinal et al. (2015) reviewed accessible online web-based information of 170 accreditated U.S. medical schools and found 51.7% of physicians trained in the United States do not receive formal education in the area of physical activity. And those institutions that did offer curriculum, the topics were primarily biophysical focussed with little attention to behavioural counselling, lifestyle or preventive medicine, and the average delivery was 8.1 hours across the medical programs (Cardinal et al., 2015). In another study at the time, Stoutenberg et al. (2015) contacted 171 U.S. medical schools to interview program leaders who oversaw the medical curricula. Structured interviews were conducted with program leaders from 74 medical education programs (43.3% participation); 41 through phone or in-person interviews and 33 through submission of responses to the interview questions. They found 78.4% of medical schools reported physical activity training as part of their curriculum, mostly biophysiological content such as 61.4% to national aerobic guidelines and 43.9% to strength training guidelines, with less curriculum related to counselling skills. Over 90% said it was their responsibility of the institution to provide training in physical activity yet only 56.4% felt they had a sufficient level of training for successful counselling of patients in the future. On average there was 8.1 hours of mandatory physical activity training offered, and up to 17.7 hours in total with elective educational opportunities (Stoutenberg et al., 2015).

In other countries, medical education curricula delivery of exercise medicine is also not abundant. Weiler et al (2012) surveyed 31 medical schools (100% response rate) in the United Kingdom with a questionnaire related to key aspects of education on physical activity teaching content in the curricula. They found 83.9% of medical schools stated they provided physical activity education, and while there was variation from school to school, the content was only present in an average of 4.2 hours of instruction time. In this curricular allotment, 56% only teach to national guidelines for physical activity, undoubtedly an insufficient breadth of knowledge to promote physical activity and follow numerous clinical guidelines (Weiler et al., 2012).

Comparably in Australia, Strong et al (2017) reviewed the online website information for 19 Australian medical schools and invited program leaders to participate in interviews regarding medical education curricula. 17 of the medical schools participated in interviews; 6 surveys were conducted via phone interview and 11 were completed via online survey for a response rate of 89%. Eight - eight percent of program leaders of medical schools reported providing specific physical activity training in medical school curriculum, including 86.7% teaching to national aerobic guidelines, 46.7% taught national strength training recommendations, and 43% provided training to prepare medical students to properly counsel patients (Strong et al., 2017). All felt it was the responsibility of the institution to educate medical students on physical activity, however, the time spent on these topics was identified as 6.6 hours across curriculum for the four year programs. Only 42.9% of these schools felt it was adequate for their medical students and while 41.2% reported no barriers to implementing msore physical activity content into the curriculum, 60% had no plans to increase time. Some of the barriers to physical activity curriculum delivery identified by these medical schools were lack of champion, time, and a lack of specialized instructors (Strong et al., 2017).

Overwhelmingly medical schools reported that physical activity content is important for medical students, and they feel it is the responsibility of the institution to deliver this education to their medical students. Yet they also recognize they do not dedicate sufficient curricular time to exercise medicine and feel their graduates are not capable of advising their future patients with respect to physical activity. It appears where content is present, the focus is on the what, and to some extent why, but certainly not the how, which is counter to the needs of the medical community.

Summary

Population physical activity levels continue to be insufficient despite undeniable evidence regarding the fatal and economically detrimental costs of being inactive over the outweighing financial and health benefits of being active. Global and national efforts to condense the physical activity and health relationship evidence in the form of physical activity guidelines with the intent to disseminate instrumental physical activity messaging has been ongoing. One avenue for tackling the challenge of population inactivity levels is health promotion strategies to target the complex physical activity behaviour in the health care sector, recognizing the role physicians can play in motivating and supporting their patients to become more active and improving public health. This is the impetus behind the EIM movement in which physicians treat physical activity as a vital sign by promoting, assessing, and prescribing physical activity to their patients to prevent and manage chronic disease and premature death.Tannahill's (1985) health promotion model of overlapping components of health education, prevention, and health protection can be used to describe the EIM health promotion initiaitve to enhance well-being and reduce ill-health. Health education activity includes increasing awareness and education of the benefits of being active for good health and to influence knowledge, attitudes and behaviours of physicians and the community as a whole. Prevention comprises early detection and risk reduction through physical activity assessment, promotion, and prescription in clinical practice. And health protection involves regulatory bodies implementing policies and practices that would encourage and accept physical activity as a treatment to enhance well-being and reduce ill-health of the population.

While physicians are in a powerful position to distribute physical activity guidelines and recommendations to the population, many do not feel they have the knowledge, training, and confidence to provide physical activity advice to their patients. Physicians, and medical students alike, recognize the importance and relevance for exercise medicine in the clinical setting, however they feel their education and training is insufficient. Compelling evidence demonstrates that those physicians (and medical students) who are more active themselves and/or have positive attitudes towards physical activity are more likely to promote and prescribe physical activity to their patients. And overwhelmingly, both practicing physicians and physicians in training have

articulated their desire for physical activity related content in their medical education curriculum.

Gaps in medical education programs have been identified and medical schools acknowledge insufficient curricular content and time dedicated to training in exercise medicine, despite their recognition of its' importance. The research demonstrates that the call for better prepared physicians has been decades long with some modest improvements over the past years. But is it enough? Surely the desire is there. Medical students, physicians, and medical schools all see the significance, and the role they can play through education and training in exercise medicine, to increase the frequency and effectiveness of patient consultation leading to better health outcomes for all.

With the Tannahill (1985) health promotion framework in mind, and the literature background demonstrating that those physicians who are exposed to physical activity education, have positive attitudes about physical activity in the field of medicine, and/or are physically active themselves, are more likely to counsel their patients about the importance of physcial activity, , the aim of this study was to profile the UBC MD students' physical activity knowledge, attitudes, and own personal preferences for an active lifestyle to help identify "who" our future physicians are and identify whether they are interested and receptive to EIM in the health care setting.

Chapter 3:

Methodology

Method Approach Selected: Survey Research

Epidemiology is the study of the distribution and determinants of disease, injury, and other health outcomes in human populations (Atkinson, 2012). Unlike clinical medicine which focusses on improving the health of one individual at a time, the goal of epidemiological research and analysis is to improve the health of the population (or a subgroup of the population) as a whole. Self report or subjective methods are frequently used in epidemiological research due to their practicality, low cost, low participation burden, and general acceptance to collect information, but there can be issues with reliability, validity and sensitivity (Prince et al., 2008). While these methods are more practical for population level research, they can be less accurate due to recall and response biases resulting in the need for considerations of design and interpretation (Pereira et al., 1997).

Subjective methods have a vulnerability for response bias associated with social desirability in which respondents deliberately over report admirable attitudes and behaviours and under report those that are not socially respected (Krosnick, 1999; Nolte, Shauver, & Chung, 2015; Passmore, Dobbie, Parachman, & Tysinger, 2002). In addition, subjective methods have a tendency to have recall bias from inaccurate memories, comprehension issues, language barriers, or problems with interpretation of questions (Atkinson, 2012; Hendrik, Helmerhorst, Warren, Besson, & Ekelund, 2012; Passmore et al., 2002; Sallis & Saelens, 2000; Sternfeld & Goldman-Rosas, 2012). Despite the challenges, Epidemiologists argue that population data from subjective self reporting, such as surveys, can describe and quantify characteristics and determinants of the population (Atkinson, 2012).

Survey methods are among the most widely applied research methodologies (Nolte et al., 2015; Sallis & Saelens, 2000). They are becoming increasingly prominent in health care settings and advances in technology have made them progressively more common (Evans & Mathur, 2005; Kelley, Clark, Brown, & Sitzia, 2003; Nolte et al., 2015; Shephard, 2003). In 2011 approximately 17% of publications added to MEDLINE

contained the keyword “survey” and survey research was published in 83% of medical research journals (Bennett et al., 2010; Nolte et al., 2015). In addition, this review of literature related to exercise medicine or physical activity education of medical students in training and practicing physicians as well as medical school curriculum delivery utilized predominantly survey research as the method of choice, providing further rationale for this study’s methodological approach.

Population level studies have typically used subjective surveys because of their practicality, including reasonable costs and participant convenience, applicability to suit the population, and accuracy based on reported reliability and validity scores (Hendrik et al., 2012; Pereira et al., 1997). Estimates obtained via surveys are valuable in relative terms and to rank individuals/groups or investigate and compare to parameters and outcomes (Pereira et al., 1997).

A survey approach involves a sample from a population for the purpose of understanding the larger population from which the sample was selected. It includes a relatively small amount of data, in a standard form, in order to make some inference about the wider population (Babbie, 1990; Kelley et al., 2003; Nolte et al., 2015). Surveys in a questionnaire format can be an inexpensive, quick, and an easy way to collect data on participants’ demographics, personal history, knowledge, attitudes and behaviours (Passmore et al., 2002). Surveys are standardized by asking the same question in the same manner to generate comparable and quantifiable data across a large number of individuals, lending to reliability and validity (Atkinson, 2012).

Not only cost effective, self report surveys reach a large geographic distribution of respondents and have high anonymity (Atkinson, 2012). Surveys can occur in various forms including mailed, online, telephone, or in-person. Online surveys do not require paper or postage, are convenient and time efficient for data collating, tabulation, and analysis as compared to mail out surveys (Evans & Mathur, 2005). Telephone surveys are still quite cost effective with decent geographic reach and higher response rates but it can be hard to reach participants by phone (Evans & Mathur, 2005). In person interviews have the advantage of personal interaction and connection and higher response rates, but like telephone surveys they are at risk of administrator influence and time restrictions as well as higher costs (Atkinson, 2012; Evans & Mathur, 2005). Interviews are oriented towards maximizing differences and variability on respondent’s

answers to generate a deeper knowledge base about the topic of interest, and are practical for a relatively small group of respondents, but interviewer bias and respondent's reaction to the interviewer can lead to questions about consistency and reliability (Atkinson, 2012).

Survey approaches can vary in complexity. They may ask single item questions or multiple questions about a topic over a range of time frames (Pereira et al., 1997). In general, longer and more detailed questionnaires are expected to have lower respondent cooperation and response rates but be more valid than shorter counterparts (Mader, Martin, Schutz, & Marti, 2006). There are some reports that the validity of shorter questionnaires can be acceptable (Mader, et al, 2006; Shephard, 2003). Surveys with short time frames (one to seven day recall) result in more accurate estimates and are more likely to validate against objective methods, however, they are less likely to reflect usual behaviour due to seasonal influence. Longer time frames (months or a year recall) are more vulnerable to recall bias (Pereira et al., 1997). If possible, it may be best to include assessments of both short and long time period assessment.

Self report surveys have been widely used for over 40 years (Shephard, 2003). There is no perfect self report method and they are not without their challenges. Making an informed selection of a self report method and instrument involves consideration of the primary aim of the research, outcomes of interest, study design, variables, number of participants and the population under study, and logistical constraints (Pereira et al., 1997; Sternfeld & Goldman-Rosas, 2012; van Poppel, Chinapaw, Mokkink, van Mechelen, & Terwee, 2010). Using an adapted or validated survey saves time and expense and improves the likelihood that the study results will be validated and reproducible in other settings (Passmore et al, 2002). When conducted properly, subjective self report survey research methods are a powerful and efficient strategy for population level data collection and a practical method for surveillance efforts.

Overview and Purpose of the Study

The purpose of this study was to investigate whether the UBC MD students have the physical activity related knowledge, attitudes, and health behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their

patients and whether the knowledge, attitudes, and behaviours differs between the four years of medical school preparation and training.

Central Research Questions

1. What knowledge do UBC MD students have with regards to physical activity recommendations, prescription and programming?
2. What are the attitudes of UBC MD students for incorporating physical activity into the design of prevention and treatment plans for their patients? Do they see it as their role?
3. What are the personal health practices of UBC MD students with respect to physical activity? Are they role models?

Research Study Design

Given the purpose and proposed questions, this research study incorporated a quantitative research paradigm to describe the UBC MD student population and to examine variables between cohort groups (or years of the medical program). A cross sectional design was employed to collect data from the UBC MD student population across all years of the undergraduate medical program at the same time. A self-report quantitative closed-ended 75 question online survey was administered at one point in time, with a short window of response, for the advantage of capturing the context in which the survey is administered (Atkinson, 2012).

Participants

All (~1150) students in the UBC MD undergraduate program were invited to participate in this research study. This included students participating at the collaborative locations of the Vancouver-Fraser, Southern, Northern, and Island Medical Programs. There were no exclusion criteria. All enrolled students were eligible to participate. Typically, Canadian medical students are young adults, and compared to Canadian Census data are less likely to identify as black, Aboriginal, or have grown up in a rural area. They are also likely to have higher socioeconomic status, indicated by parental education, occupation, and income (Khan, Apramian, Kang, Gustafson, & Sibbald, 2020). It can also be predicted that participants have an acceptance for their education to be provided in the English language, as well as an ability to persist through a lengthy

and expensive program, with a disposition for healthy lifestyles, and a desire to help others.

Recruitment and Consent Process

The UBC MD Office of Student Affairs contacted prospective participants by email on behalf of the researcher inviting them to volunteer to participate in this research study. The email invitation (Appendix A) included a participant information sheet (Appendix B) and instructions of consent (Appendix C). By completing the online survey, participants confirmed consent and agreement to participate and they understood the research study.

Participation was completely voluntary. Participants could withdraw at any time without any explanation or any negative consequences to their education, employment or other services which they were entitled to or were receiving. If they withdrew part way through the process, any data collected continued to be used in the analysis. Any identifiers were removed and at no time was personal information linked to individual responses.

Volunteers were asked to dedicate approximately 15 minutes of their time to participate in this research study. This was the maximum amount of time required to read the email invitation, review participation information, as well as the time to respond to the online survey questionnaire.

Instrument and Data Collection

A hybrid questionnaire package (Appendix D) consisting of questions taken from previous peer reviewed studies (primarily guided by Erica Frank's questionnaires), Canadian Community Health Survey, and the standardized Godin - Shephard Leisure Time Exercise Questionnaire (Godin & Shephard, 1985) were used to survey participants in a single stage format. A breakdown of the source(s) for the survey questions can be found in Appendix E. The aspects of these standardized instruments were chosen because the content was directly related to the data to be collected to address the research questions of this study, because they had been validated previously, and have been used to assess Canadian and United States medical

students' physical activity knowledge, attitudes, and health behaviours. This would allow for ease of comparison to previous literature and findings.

The online survey included 75 questions related to participant demographics and characteristics, and general health, as well as their knowledge and attitudes about the role of physical activity and/or exercise in the field of medicine. Participants did not need to answer any questions they were not comfortable answering.

Question formats included simple yes/no, numeric answers, drop down menus, and Likert-type scale of items. Likert-type items had response ratings on 5-point scales from strongly disagree (1) to strongly agree (5), and 4-point scales for poor (1) to excellent (4). These simple one click response options were purposefully used to facilitate ease of survey completion by the participants. The online survey was pilot tested with a committee of five to ensure the survey could be completed within 15 minutes as well as to clean up any typos and/or errors that may have occurred during the development phase of moving content to the online Survey Monkey format.

The online survey was delivered via email on September 19, 2018, with a response deadline of 12 weeks after the invitation to participate. A reminder was sent at 8 weeks (November 13, 2018) following the initial invitation and survey dissemination. As an incentive to participate in this research study, participants had a chance at a prize in a draw for one of five $100 gift cards to Mountain Equipment Coop. Participation in the draw was not contingent on participation in the research, and if participants chose to withdraw from the research study, they still had the opportunity to be included in the draw. The prize draw contact information was kept separate from the completed surveys so that no identifiers were linked to the individual survey responses to ensure this did not compromise confidentiality.

Specific data collected included participant demographics (age, sex, height, weight, ethnicity, relationship status, education level, medical program site, and medical specialty area of interest), knowledge and attitudes about the role of physical activity and/or exercise in the field of medicine through various knowledge and belief statements, as well as participants' general health and personal health practices (physical activity levels, sedentary behaviour, sleep duration, fruit and vegetable consumption, smoking, drug, and alcohol use, and ability to manage stress).

Ethics and the Handling of Data

The Simon Fraser University Office of Research Ethics and the UBC Medicine Research Access Committee provided their approval and agreement for this research study. The questionnaire was provided as an online survey run by Survey Monkey and met internal privacy standards. All data were hosted in Canada. Confidentiality and the confidentiality of information was respected. Ethical considerations and procedures were upheld to ensure proper care and security of data such as stripping personal identifiers from the data prior to analysis, reporting of data at a group level and for intended purposes only, and safeguarding proper storage and destruction of data.

Raw data from the online survey were exported into Microsoft Excel. Data were reviewed for any erroneous entry and erroneous data were removed from the data set. Data were assigned numerical scores for corresponding responses. For example, yes = 1 and no =2, or strongly disagree = 1 to strongly agree = 5. Some drop down menu options included an uncapped option. For example, with the question, “on average, how long is each exercise episode?”, the drop down menu was in increments with the highest option being 120+ (or more than 120 minutes). In all cases these uncapped data were coded as their numeric value (120+ was coded as 120). Most survey questions had a small percentage of missing responses. This was because either: 1) questions were not mandatory and there was opportunity for participants to leave some of the questions unanswered, or 2) the removal of erroneous responses. However as initially planned, if a participant withdrew part way through the process, any data collected continued to be used in the analysis, and tallys were based on respondent values.

Grouping the Data into Cohorts and Data Analysis

Initially participant data were placed into four groupings based on the participant’s current year of the medical program: 1st year, 2nd year, 3rd year, and 4th year. At the time of the survey dissemination, the 1st year student cohort represented those students just starting the medical program whereas participants categorized as 4th year student cohort represented students beginning the fourth year of the medical program. Within the UBC medical school programming, the medical education curriculum is delivered with 1st and 2nd year students focussing on foundations of medicine, and 3rd and 4th year students focussing on clinical clerkships and practice.

Based on this curriculum delivery structure, and the fewer number of participants in the latter two years of the medical program, participant data were reconfigured into three groups for data analysis: 1st year, 2nd year, and a combined group of 3rd and 4th year students.

Statistical Analysis

Descriptive statistical analysis using Microsoft Excel involved examining frequency distributions and measures of central tendency for each of the variables concerning the research questions. Continuous data is reported as means and standard deviations while categorical data is reported as percentages. R Studio software was employed to run inferential statistics. One way analysis of variance and subsequent t-Test: Two sample assuming equal variances were used for continuous data to assess if there were significant differences of means between groups. While the Likert-type scale ordinal data could be analyzed similarly, the majority of responses were overwhelmingly categorized as strongly agree and agree or strongly disagree and disagree, leading to observations the data was skewed and the decision to use medians, rather than means. Consequently the Mood's Median test was used to assess if there were significant differences of medians between groups for Likert-type data. Inferential statistics were not used for proportional data. No mathematical corrections were made for multiple comparisons. Significance for all statistical analyses were set at alpha ≤ 0.05.

Chapter 4:

Findings

The purpose of this study was to investigate whether the UBC MD students have the physical activity related knowledge, attitudes, and health behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their patients and whether the knowledge, attitudes, and behaviours differs between the four years of medical school preparation and training.

The study incorporated a quantitative research paradigm to describe the UBC MD student population and to examine variables between cohort groups. A cross sectional design was employed, and a self-report quantitative closed-ended 75 question online survey was administered at one point in time.

Presentation of the findings begins with outlining the participant demographics and characteristics, and then the remaining quantitative data obtained via the online survey are presented by addressing the central research questions:

1. What knowledge do UBC MD students have with regards to physical activity recommendations, prescription and programming?
2. What are the attitudes of UBC MD students for incorporating physical activity into the design of prevention and treatment plans for their patients? Do they see it as their role?
3. What are the personal health practices of UBC MD students with respect to physical activity? Are they role models?

Distribution of Participants and Response Rates

From the ~1150 UBC MD students invited to participate in the study, 153 (response rate of 13.2%) proceeded to respond to the online survey after the initial invitation and another 65 participated after the reminder to participate and prior to the survey window closing, for a total of 217 participants and a response rate of 18.9%. Of the 217 participants, 192 declared their medical program year and 25 left the answer

blank. The participants were initially categorized into four groups based on their year of the medical program. The distribution and associated response rates of participants by year of medical program are shown in Table 1.

Table 1. Distribution of Participants

Year of Medical Program	Number of participants (n)	Percentage (%)	Response rate (%)
First year	80	41.7	27.8
Second year	47	24.5	16.3
Third year	42	21.9	14.6
Fourth year	23	12.0	8.0

Year 1 cohort students represented the highest proportion of participants, and each subsequent cohort year of the medical program had fewer participants than the previous medical program year cohort. Based on the cohort based curriculum delivery structure, and the fewer number of participants in the latter years of the medical program, the groupings were reconfigured into three groups for comparing variables between groups: Year 1 (n=80; 41.7%), Year 2 (n=47; 24.5%), and Year 3+ (n=65; 33.9%) which combined Year 3 and Year 4 participants. For the presentation of data tables, because there are minimal statistically significant differences between groups, the data is presented as All participants first, followed by Year 1, Year 2, and Year 3+ cohort data.

Characteristics of Participants

Table 2 summarizes the participant characteristics by group. The mean (SD) age of the sample was 25.5 (3.9) years. The mean age increased approximately one year from Year 1 (24.5 years) to Year 3+ (26.6 years) and the Year 3+ participants were significantly (P=0.0028) older than the Year 1 participants. The sample population mean height (171.8 cm), weight (70.0 kg), and calculated body mass index (BMI) (23.6 kg/m^2) were not significantly different between groups and were classified as normal or healthy (BMI of 18.5 to 24.9 kg/m^2).

The majority of participants were female (60.7%), white (58.1%), single (72.9%), and without children (95.8%). The proportion of participants who reported being single in Year 1 (78.8%) was higher than the participants in Year 3+ (59.4%) with corresponding shifts in married and common law status from Year 1 (18.8%) to Year 3+ (40.6%).

The majority (90.6%) of the sample had an undergraduate or graduate degree and the majority (61.1%) of participants were from the Vancouver Fraser medical program site. Participants were asked to select their medical specialty of interest at the time of the survey. While there were over 10 areas of medical specialty to choose from, only those specialties with more than 10% response selection are reported in Table 2. The most frequently selected medical specialties of interest were family medicine (29.5%), internal medicine (13.5%), and surgery (13.5%). The frequency of distribution for family medicine was similar across program years. Notably, the number of participants who selected “undecided” decreased in frequency from Year 1 (16.3%) to Year 3+ (3.1%).

Table 2. Charatcteristics of Participants

	All	Yr 1	Yr 2	Yr 3+	P Value
N	192	80	47	65	
Descriptive statistics					
Sex (female) - n (%)	116 (60.7)	43 (54.4)	32 (68.1)	41 (63.1)	
Age (yrs) - mean (SD)	25.5 (3.9)	24.5 (3.9)*	25.8 (4.9)	26.6 (2.5)*	0.0028
Height (cm) - mean (SD)	171.8 (11.0)	173.2 (12.2)	172.0 (10.4)	170.0 (9.8)	0.1778
Weight (kg) - mean (SD)	70.0 (18.0)	72.0 (20.1)	67.9 (12.9)	69.2 (18.6)	0.4382
BMI (kg/m^2) - mean (SD)	23.6 (7.9)	23.7 (11.0)	22.8 (2.9)	23.9 (5.6)	0.7537
Ethnicity, n (%)					
Aboriginal	3 (1.6)	2 (2.6)	1 (2.1)	0 (0.0)	
Arab	2 (1.0)	2 (2.6)	0 (0.0)	0 (0.0)	
Asian	53 (27.7)	21 (26.9)	15 (31.9)	16 (24.6)	
Latin American	2 (1.0)	0 (0.0)	1 (2.1)	1 (1.5)	
White	111 (58.1)	44 (56.4)	26 (55.3)	41 (63.1)	

	All	Yr 1	Yr 2	Yr 3+	P Value
Relationship status, n (%)					
Living common law	25 (13.0)	9 (11.3)	1 (2.1)	15 (23.4)	
Married	24 (12.5)	6 (7.5)	7 (14.9)	11 (17.2)	
Single	140 (72.9)	63 (78.8)	38 (80.9)	38 (59.4)	
Have children, n (%)	8 (4.2)	3 (3.8)	2 (4.3)	3 (4.7)	
Highest level education,n (%)					
Graduate degree	31 (16.1)	12 (15.0)	7 (14.9)	12 (18.5)	
Undergraduate degree	143 (74.5)	55 (68.8)	39 (83.0)	49 (75.4)	
Some post-secondary	15 (7.8)	11 (13.8)	1 (2.1)	3 (4.6)	
High school graduate	3 (1.6)	2 (2.5)	0 (0.0)	1 (1.5)	
UBC medical program, n (%)					
Island	24 (12.6)	7 (8.9)	6 (13.0)	11 (16.9)	
Northern	28 (14.7)	12 (15.2)	7 (15.2)	9 (13.8)	
Southern	22 (11.6)	10 (12.7)	5 (10.9)	7 (10.8)	
Vancouver Fraser	116 (61.1)	50 (63.3)	28 (60.9)	38 (58.5)	
Specialty of Interest, n (%)					
Internal medicine	26 (13.5)	7 (8.8)	10 (21.3)	9 (13.9)	
Family medicine	57 (29.5)	22 (27.5)	13 (27.7)	22 (33.8)	
Surgery	26 (13.5)	12 (15.0)	6 (12.8)	7 (10.8)	
Undecided	19 (9.8)	13 (16.3)	4 (8.5)	2 (3.1)	

*Indicates statistical significance between Year 1 and Year 3 participants, p = 0.000153, two tailed.

Participants' Awareness, Knowledge, and Understanding of Physical Activity in the Field of Medicine

One of the central research questions of this study was to investigate what knowledge UBC MD students have with regards to physical activity recommendations,

prescription, and programming, and whether the physical activity knowledge differs between years of the medical program.

Table 3 presents the findings about the participants' awareness and knowledge of the suite of Canadian Physical Activity Guidelines. Participants' awareness of Canadian age specific physical activity guidelines was greatest (90.3%) for the adult guidelines, 71.6% for children and youth, 25.3% for older adults, and lowest (10.7%) for the early years. Of those participants who said they were aware of the age specific physical activity guidelines, being able to correctly identify the required level of physical activity was highest for older adult (96.4%) and adult (90.3%) guidelines, 72.1% for children and youth, and lowest (9.5%) for the early years guidelines.

Table 3. Participants' Awareness of, and Knowledge related to Canadian Physical Activity Guidelines (CPAG)

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)
N	217	80	47	65
Aware of CPAG for Adults (18-64 years)	196 (90.3)	68 (85.0)	45 (95.7)	60 (92.3)
Correctly identified CPAG recommendations as 150 minutes/week	177 (90.3)	58 (85.3)	42 (93.3)	57 (95.0)
Aware of CPAG for Older Adults (65 years +)	55 (25.3)	15 (18.8)	14 (29.8)	17 (26.2)
Correctly identified CPAG recommendations as 150 minutes/week	53 (96.4)	14 (93.3)	14 (100.0)	17 (100.0)
Aware of CPAG for Children and Youth (5-17 years)	154 (71.6)	47 (58.8)	43 (91.5)	51 (78.5)
Correctly identified CPAG recommendations as 60 minutes/day	111 (72.1)	26 (55.3)	39 (90.7)	38 (74.5)
Aware of CPAG for the Early Years (0-4 years)	23 (10.7)	5 (6.3)	10 (21.3)	7 (10.8)
Correctly identified CPAG recommendations as 180 minutes/day	2 (9.5)	1 (20.0)	1 (10.0)	0 (0.0)

In addition to the questions specific to Canadian Physical Activity Guidelines, participants were provided with questions/statements to investigate their knowledge and understanding of physical activity/exercise for health. Participants rated their level of agreement for each of the knowledge statements on a 5-point scale, namely strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4) and strongly agree (5). Table 4 summarizes the distribution of responses and medians by program year.

The majority (88.4%) of participants identified moderate intensity as the minimum intensity of physical activity for health benefits. However, when asked for their agreement to a number of other physical activity related knowledge-based statements, the participants responses were dispersed and there were no significant differences between groups. The most frequent response to each knowledge statement was: 47.4% agreed that taking the stairs and generally being more active each day is enough physical activity to improve health; 48.1% disagreed that half an hour a day of walking on most days is all that is needed for good health; 51.9% disagreed that exercise that is good for health must make you huff and puff; and 56.0% agreed that several short walks of ten minutes a day is better than a round of golf per week for good health.

Table 4. Participants' Knowledge and Understanding of Physical Activity/Exercise for Health

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
N	216	80	47	65	
To the best of your knowledge, what is the recommended (minimum) intensity of physical activity for health benefits?					
Light	20 (9.3)	6 (7.5)	8 (17.0)	3 (4.6)	
Moderate	191 (88.4)	72 (90.0)	39 (83.0)	62 (95.4)	
Vigorous	5 (2.3)	2 (2.5)	0 (0.0)	0 (0.0)	
Taking the stairs and generally being more active each day is enough physical activity to improve health (True)					
Strongly Agree	22 (10.2)	7 (8.8)	6 (12.8)	4 (6.3)	
Agree	102 (47.4)	43 (53.8)	25 (53.2)	28 (43.8)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Neither Agree nor Disagree	31 (14.4)	11 (13.8)	5 (10.6)	10 (15.6)	
Disagree	53 (24.7)	18 (22.5)	10 (21.3)	18 (28.1)	
Strongly Disagree	7 (3.3)	1 (1.3)	1 (2.1)	4 (6.3)	
Median	4.0	4.0	4.0	3.5	0.4909
Half an hour a day of walking on most days is all the exercise that is needed for good health (True)					
Strongly Agree	7 (3.2)	2 (2.5)	1 (2.1)	2 (3.1)	
Agree	54 (25.0)	24 (30.0)	9 (19.1)	16 (24.6)	
Neither Agree nor Disagree	38 (17.6)	16 (20.0)	6 (12.8)	11 (16.9)	
Disagree	104 (48.1)	35 (43.8)	24 (51.1)	34 (52.3)	
Strongly Disagree	13 (6.0)	3 (3.8)	7 (14.9)	2 (3.1)	
Median	2.0	3.0	2.0	2.0	0.1294
Exercise that is good for health must make you puff and pant (True)					
Strongly Agree	8 (3.7)	2 (2.5)	1 (2.1)	4 (6.2)	
Agree	46 (21.3)	13 (16.3)	15 (31.9)	11 (16.9)	
Neither Agree nor Disagree	40 (18.5)	15 (18.8)	7 (14.9)	11 (16.9)	
Disagree	112 (51.9)	44 (55.0)	20 (42.6)	39 (60.0)	
Strongly Disagree	10 (4.6)	6 (7.5)	4 (8.5)	9 (0.0)	
Median	2.0	2.0	2.0	2.0	0.4377

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Several short walks of 10 minutes on most days is better than a round of golf per week for good health (True)					
Strongly Agree	51 (23.6)	13 (16.3)	15 (31.9)	19 (29.2)	
Agree	121 (56.0)	49 (61.3)	24 (51.1)	35 (53.8)	
Neither Agree nor Disagree	33 (15.3)	15 (18.8)	7 (14.9)	7 (10.8)	
Disagree	10 (4.6)	3 (3.8)	1 (2.1)	3 (4.6)	
Strongly Disagree	1 (0.5)	0 (0.0)	0 (0.0)	1 (1.5)	
Median	4	4	4	4	0.0769

In order to investigate physical activity education provision, it was also relevant to ask participants how much time they spent in medical school discussing the topics of physical activity, exercise, and how to talk to their patients about it, and whether or not they would like more time spent on these topics. Table 5 summarizes the responses by program year.

The majority of participants recalled seven hours or less time spent discussing physical activity and/or exercise (78.8%) and how to talk to their patients about it (94.2%). Year 1 participants had the highest proportion of respondents who reported seven hours or less for both questions related to total time spent discussing the topics.

When asked whether they would like more time spent on the topic of physical activity and exercise, the majority (60.9%) of participants said yes, and an even greater proportion of participants would like to see more time dedicated to learning how to talk to their patients about it (74.4%). In both instances, the frequency of affirmation for more time spent on these topics was highest for Year 1 participants.

Table 5. Participants' Recall of Program Curriculum Delivery related to the Topic of Physical Activity/Exercise

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)
N	207	80	47	65
Total time spent discussing the topics of physical activity and exercise				
0 to 3 hours	90 (43.5)	57 (72.2)	12 (25.5)	14 (21.9)
4 to 7 hours	73 (35.3)	21 (26.6)	20 (42.6)	27 (40.6)
8 to 11 hours	24 (11.6)	1 (1.3)	9 (19.1)	12 (18.8)
12 or more hours	20 (9.7)	0 (0.0)	6 (12.8)	12 (18.8)
Would like more time	126 (60.9)	61 (77.2)	22 (46.8)	33 (51.6)
Total time spent learning how to talk to patients about physical activity and exercise				
0 to 3 hours	156 (75.4)	75 (94.9)	31 (66.0)	40 (61.5)
4 to 7 hours	39 (18.8)	4 (5.1)	13 (27.7)	18 (27.7)
8 to 11 hours	8 (3.9)	0 (0.0)	2 (4.3)	4 (6.2)
12 or more hours	4 (1.9)	0 (0.0)	1 (2.1)	3 (4.6)
Would like more time	154 (74.4)	71 (89.9)	34 (72.3)	38 (58.5)

Participants' Attitudes about Physical Activity in the Field of Medicine

Another central research question was to investigate the attitudes of UBC MD students, whether they believe it is their role to include physical activity (and/or healthy living) advice and intervention when talking to their patients, and whether the attitudes differ between years of the medical program. Participants were provided with a number of belief/opinion statements and asked to indicate their level of agreement on the 5-point scale from strongly disagree (1) to strongly agree (5). Table 6 and 7 present the distribution of responses and medians by program year.

With no significant differences between groups, the majority of participants strongly agreed or agreed that: physical activity or exercise counselling is important (98.0%); talking to patients about exercise will be important in practice (95.0%); I have sufficient knowledge to advise patients about physical activity (57.0%); I am confident in talking to patients about being physically active (61.8%); in order to effectively encourage patient adherence to a healthy lifestyle, physicians must adhere to one themselves (74.1%); I will be able to provide more credible and effective counselling if I live a healthy lifestyle (94.0%); and, patients are more likely to adopt healthier lifestyles if physicians counsel them to do so (85.6%).

While not statistically significant, there were fewer participants who chose to strongly agree or agree in the Year 1 group compared to Year 2 and Year 3+ groups for the statements related to having sufficient knowledge to advise patients about physical activity (P = 0.1524; Year 1 - 31.3%, Year 2 – 74.5%, Year 3+ – 71.9%), and confidence to talk to patients about being physically active (P = 0.2162; Year 1 – 45.1%, Year 2 – 68.1%, Year 3+ - 73.5%).

Only 36.6% of the sample strongly agreed or agreed they were confident in suggesting specific physical activity programs for their patients. And there was a significant (P = 0.0045) difference between Year 1 (22.5%) and Year 3+ (48.4%) groups indicating more confidence in Year 3+ participants, but still less than a majority with an agreement tendency.

The majority (55.9%) of participants neither agreed nor disagreed that allied health professionals should perform healthy lifestyle counselling more than physicians. There were no significant differences among groups.

Table 6. Participants' Attitudes about Physical Activity/Exercise in the Field of Medicine

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
N	202	80	47	65	
I believe that physical activity or exercise counselling is important					
Strongly Agree	135 (66.8)	49 (61.3)	34 (72.3)	47 (73.4)	
Agree	63 (31.2)	27 (33.8)	13 (27.7)	17 (26.6)	
Neither Agree nor Disagree	4 (2.0)	4 (5.0)	0 (0.0)	0 (0.0)	
Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	5.0	5.0	5.0	5.0	0.0139
I believe that talking to patients about exercise will be important in my practice					
Strongly Agree	118 (58.7)	51 (63.8)	28 (59.6)	34 (54.0)	
Agree	73 (36.3)	24 (30.0)	19 (40.4)	24 (38.1)	
Neither Agree nor Disagree	7 (3.5)	4 (5.0)	0 (0.0)	3 (4.8)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Disagree	3 (1.5)	1 (1.3)	0 (0.0)	2 (3.2)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	5.0	5.0	5.0	5.0	0.0136
I have sufficient knowledge to advise patients about physical activity					
Strongly Agree	26 (12.9)	5 (6.3)	7 (14.9)	10 (15.6)	
Agree	89 (44.1)	20 (25.0)	28 (59.6)	36 (56.3)	
Neither Agree nor Disagree	39 (19.3)	19 (23.8)	6 (12.8)	13 (20.3)	
Disagree	44 (21.8)	33 (41.3)	6 (12.8)	4 (6.3)	
Strongly Disagree	4 (2.0)	3 (3.8)	0 (0.0)	1 (1.6)	
Median	4.0	3.0	4.0	4.0	0.1524
I am confident in talking to patients about being physically active					
Strongly Agree	33 (16.3)	9 (11.3)	7 (14.9)	14 (21.9)	
Agree	92 (45.5)	27 (33.8)	25 (53.2)	33 (51.6)	
Neither Agree nor Disagree	48 (23.8)	23 (28.8)	11 (23.4)	13 (20.3)	
Disagree	29 (14.4)	21 (26.3)	4 (8.5)	4 (6.3)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	4.0	3.0	4.0	4.0	0.2162
I feel confident in suggesting specific physical activity programs for my patients					
Strongly Agree	18 (8.9)	2 (2.5)	4 (8.5)	10 (15.6)	
Agree	56 (27.7)	16 (20.0)	14 (29.8)	21 (32.8)	
Neither Agree nor Disagree	44 (21.7)	18 (22.5)	10 (21.3)	15 (23.4)	
Disagree	74 (36.6)	38 (47.5)	17 (36.2)	17 (26.6)	
Strongly Disagree	10 (5.0)	6 (7.5)	2 (4.3)	1 (1.6)	
Median	3.0	2.0*	3.0	3.0*	0.0045
In order to effectively encourage patient adherence to a healthy lifestyle, physician must adhere to one themselves					
Strongly Agree	38 (18.9)	14 (17.5)	8 (17.4)	15 (23.4)	
Agree	111 (55.2)	45 (56.3)	22 (47.8)	37 (57.8)	
Neither Agree nor Disagree	38 (18.9)	18 (22.5)	10 (21.7)	7 (10.9)	
Disagree	11 (5.5)	2 (2.5)	6 (13.0)	3 (4.7)	
Strongly Disagree	3 (1.5)	1 (1.3)	0 (0.0)	2 (3.1)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Median	4.0	4.0	4.0	4.0	0.6166
I will be able to provide more credible and effective physical activity counselling if I live a healthy lifestyle					
Strongly Agree	83 (41.3)	31 (39.2)	19 (40.4)	32 (50.0)	
Agree	106 (52.7)	44 (55.7)	23 (48.9)	30 (46.9)	
Neither Agree nor Disagree	9 (4.5)	3 (3.8)	3 (6.4)	2 (3.1)	
Disagree	3 (1.5)	1 (1.3)	2 (4.3)	0 (0.0)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	4.0	4.0	4.0	4.5	0.3948
Patients are more likely to adopt healthier lifestyles if physicians counsel them to do so					
Strongly Agree	46 (22.9)	17 (21.5)	8 (17.0)	18 (28.1)	
Agree	126 (62.7)	49 (62.0)	32 (68.1)	39 (60.9)	
Neither Agree nor Disagree	27 (13.4)	11 (13.9)	7 (14.9)	7 (10.9)	
Disagree	2 (1.0)	2 (2.5)	0 (0.0)	0 (0.0)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	4.0	4.0	4.0	4.0	0.3672

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Allied health professionals (e.g. nurses, kinesiologists) should perform healthy lifestyle counselling more than physicians					
Strongly Agree	5 (2.5)	1 (1.3)	0 (0.0)	4 (6.3)	
Agree	29 (14.4)	13 (16.3)	5 (10.6)	6 (9.4)	
Neither Agree nor Disagree	113 (55.9)	46 (57.5)	28 (59.6)	39 (56.3)	
Disagree	52 (25.7)	19 (23.8)	12 (25.5)	18 (28.1)	
Strongly Disagree	3 (1.5)	1 (1.3)	2 (4.3)	0 (0.0)	
Median	3.0	3.0	3.0	3.0	0.5778

*Indicates statistical significance between Year 1 and Year 3+ participants, p = 0.0011, pairwiseMedian test

The participants were also asked to respond to statements related to the medical school itself. The majority of participants strongly agreed or agreed, without any significant differences between groups, that: medical schools should encourage students to practice healthy lifestyles (96.0%); medical schools should create an environment that facilitates and enables students to practice a healthy lifestyle (96.5%); medical school does encourage me to lead a healthy lifestyle (58.4%); and medical school curriculum gives good understanding of how exercise can prevent/manage disease (59.9%).

Upon greater observation of the statement, “my medical school curriculum gives good understanding of how exercise can prevent/manage disease”, the frequency of distribution for strongly agree or agree was lower for the Year 1 (35.1%) group compared to the Year 2 (76.6%) and Year 3+ (78.1%) groups. This is offset by a higher number of participants in the Year 1 (48.8%) group selecting neither agree nor disagree

compared to the Year 2 (8.5%) and Year 3+ (12.5%) groups. However, it was not statistically significant.

Only 49.0% of participants strongly agreed or agreed their medical school created a health promoting environment, and only 48.0% of participants strongly agreed or agreed medical school faculty are good role models for healthy lifestyles. This was similar among groups.

Another area for difference was that 68.8% of the participants strongly agreed or agreed medical school faculty members should set a good example for students by practicing a healthy lifestyle, and this was significantly (P=0.0448) greater for the Year 3+ (76.6%) participants compared to both the Year 1 (68.8%) and Year 2 (55.3%) groups.

Table 7. Participants' Attitudes about Physical Activity/Exercise in the Field of Medicine: The Medical School

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
N	202	80	47	65	
Medical school faculty members should set a good example for medical students by practicing a healthy lifestyle					
Strongly Agree	42 (20.8)	13 (16.3)	7 (14.9)	20 (31.3)	
Agree	97 (48)	42 (52.5)	19 (40.4)	29 (45.3)	
Neither Agree nor Disagree	53 (26.2)	21 (26.3)	18 (38.3)	13 (20.3)	
Disagree	6 (3.0)	2 (2.5)	2 (4.3)	1 (1.6)	
Strongly Disagree	4 (2.0)	2 (2.5)	1 (2.1)	1 (1.6)	
Median	4.0	4.0[#]	4.0^	4.0[#]^	0.0448

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Medical schools should encourage their students to practice healthy lifestyles					
Strongly Agree	95 (47.0)	36 (45.0)	21 (44.7)	35 (54.7)	
Agree	99 (49.0)	38 (47.5)	25 (53.2)	29 (45.3)	
Neither Agree nor Disagree	8 (4.0)	6 (7.5)	1 (2.1)	0 (0.0)	
Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	4.0	4.0	4.0	5.0	0.4404
Medical schools should create an environment that facilitates and enables medical students to practice a healthy lifestyle					
Strongly Agree	132 (65.7)	46 (57.5)	33 (71.7)	49 (76.6)	
Agree	62 (30.8)	31 (38.8)	11 (23.9)	14 (21.9)	
Neither Agree nor Disagree	6 (3.0)	2 (2.5)	2 (4.3)	1 (1.6)	
Disagree	1 (0.5)	1 (1.3)	0 (0.0)	0 (0.0)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	5.0	5.0	5.0	5.0	0.0104
My medical school faculty are good role models for healthy lifestyles					

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Strongly Agree	11 (5.4)	8 (10.0)	2 (4.3)	1 (1.6)	
Agree	86 (42.6)	38 (47.5)	15 (31.9)	29 (45.3)	
Neither Agree nor Disagree	96 (47.5)	33 (41.3)	27 (57.4)	29 (45.3)	
Disagree	9 (4.5)	1 (1.3)	3 (6.4)	5 (7.8)	
Strongly Disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	3.0	4.0	3.0	3.0	0.0633
My medical school does encourage me to lead a healthy lifestyle					
Strongly Agree	17 (8.4)	9 (11.3)	5 (10.6)	3 (4.7)	
Agree	102 (50.0)	43 (53.8)	19 (40.4)	35 (54.7)	
Neither Agree nor Disagree	55 (27.2)	21 (26.3)	15 (31.9)	17 (26.6)	
Disagree	25 (12.4)	6 (7.5)	8 (17.0)	7 (10.9)	
Strongly Disagree	3 (1.5)	1 (1.3)	0 (0.0)	2 (3.1)	
Median	4.0	4.0	4.0	4.0	0.3463
My medical school creates a health-promoting environment					
Strongly Agree	17 (8.4)	10 (12.5)	3 (6.4)	2 (3.1)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P value
Agree	82 (40.6)	36 (45.0)	20 (42.6)	24 (37.5)	
Neither Agree nor Disagree	71 (35.1)	26 (32.5)	21 (44.7)	22 (34.4)	
Disagree	30 (14.9)	7 (8.8)	3 (6.4)	15 (23.4)	
Strongly Disagree	2 (1.0)	1 (1.3)	0 (0.0)	1 (1.6)	
Median	3.0	4.0	3.0	3.0	0.1309
My medical school curriculum gives good understanding of how physical activity can prevent/manage disease					
Strongly Agree	25 (12.4)	7 (8.8)	7 (14.9)	10 (15.6)	
Agree	96 (47.5)	21 (26.3)	29 (61.7)	40 (62.5)	
Neither Agree nor Disagree	54 (26.7)	39 (48.8)	4 (8.5)	8 (12.5)	
Disagree	26 (12.9)	12 (15.0)	7 (14.9)	6 (9.4)	
Strongly Disagree	1 (0.5)	1 (1.3)	0 (0.0)	0 (0.0)	
Median	4.0	3.0	4.0	4.0	0.3991

*Indicates statistical significance between Year 1 and Year 3+ participants, p = 0.0340, pairwiseMedian test; ^ indicates statistical significance between Year 2 and Year 3+ participants, p = 0.0482, pairwiseMedian test.

As a follow up to the belief statement that “allied health professionals should perform healthy lifestyle counselling more than physicians”, participants were asked whether they feel it is their role (as physicians) to prescribe physical activity and exercise to their patients, why or why not, and what other allied health professionals they would refer their patients to for physical activity/exercise advice. Table 8 summarizes the distribution of responses by program year.

Ninety-five percent of participants indicated that as future physicians it is their role to prescribe physical activity to their patients. Participants could select from a list of reasons as to why it is their role to prescribe physical activity to their patients, and they could choose all that apply. The most frequently chosen reasons were chronic disease prevention (100.0%), general health maintenance (98.4%), and psychological benefit (95.8%), while the least frequently chosen reasons were social interaction (76.0%) and physical appearance (62.0%). For the small number of participants who indicated it is not their role to prescribe physical activity to their patients, the reasons indicated were lack of time (58.8%) and lack of success in changing patient’s behaviour (41.2%).

Participants were also asked to indicate which allied health professionals they would refer their patients to for exercise prescription advice. The greatest proportion selected physiotherapists (87.0%) and exercise physiologists/kinesiologists (85.4%).

Table 8. Participants' Opinions of Role, Barriers, Facilitators and Referral Networks to Prescribing Physical Activity/Exercise

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)
N	202	80	47	65
Do you see it as your role to prescribe physical activity and exercise to your patients? (Yes)	191 (95.0)	78 (97.5)	47 (100.0)	59 (90.8)
If no, why not?				
Lack of time	10 (58.8)	0 (0.0)	2 (100.0)	3 (42.9)

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)
Lack of knowledge and training	5 (29.4)	2 (33.3)	0 (0.0)	1 (14.3)
Lack of success in changing patients' behaviour	7 (41.2)	1 (16.7)	1 (50.0)	5 (71.4)
Physical activity counselling is not a priority/not relevant	2 (11.8)	0 (0.0)	0 (0.0)	2 (28.6)
Lack of incentive/financial reimbursement	2 (11.8)	0 (0.0)	0 (0.0)	2 (28.6)
Lack of resources	2 (11.8)	0 (0.0)	0 (0.0)	2 (28.6)
Lack of evidence	1 (5.9)	0 (0.0)	0 (0.0)	0 (0.0)
Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
If yes, why?				
Chronic disease prevention	192 (100.0)	78 (100.0)	47 (100.0)	59 (100.0)
Chronic disease treatment	175 (91.1)	68 (87.2)	44 (93.6)	56 (94.9)
General health maintenance	189 (98.4)	77 (98.7)	47 (100.0)	59 (100.0)
Psychological benefit	184 (95.8)	75 (96.2)	46 (97.9)	56 (94.9)
Weight control	178 (92.7)	72 (92.3)	44 (93.6)	55 (93.2)
Physical appearance	119 (62.0)	52 (66.7)	30 (63.8)	32 (54.2)
Social interaction	146 (76.0)	60 (76.9)	40 (85.1)	40 (67.8)

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)
Other	14 (7.3)	4 (5.1)	4 (8.5)	5 (8.5)
Would you refer a patient to an allied health professional for physical activity/exercise prescription, and if so, to who?				
Athletic Trainer	123 (64.1)	49 (62.8)	29 (64.4)	41 (69.5)
Exercise Physiologist/Kinesiologist	164 (85.4)	68 (87.2)	40 (88.9)	49 (83.1)
Nurse	22 (11.5)	9 (11.5)	6 (13.3)	5 (8.5)
Physiotherapist	167 (87.0)	69 (88.5)	38 (84.4)	53 (89.8)
Other	13 (6.8)	4 (5.1)	2 (4.4)	7 (11.9)

General Health and Personal Health Practices of the Participants

The final central research question was to investigate the personal health practices of UBC MD students, whether they were role models for healthy active living, and whether the personal health practices differ between years of the medical program. Table 9, 10, and 11 present a summary of findings and respective means and medians by program year.

The majority (89.8%) of participants reported their health as excellent or good. There were no significant differences between groups. When asked to identify if they have had, or currently have any health conditions, the majority (62.0%) of participants had none of the 10 health conditions listed. Notable was the number of participants identified as having mental health concerns (29.5%) and this was similar across groups.

Table 9. Participants' General Health

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P Value
N	194	80	47	65	
In general, your health is?, n (%)					
Excellent	55 (28.1)	19 (23.8)	3 (34.0)	20 (30.8)	
Good	121 (61.7)	53 (66.3)	28 (59.6)	37 (56.9)	
Fair	18 (9.2)	6 (7.5)	16 (6.4)	8 (12.3)	
Poor	2 (1.0)	2 (2.5)	0 (0.0)	0 (0.0)	
Median	3.0	3.0	3.0	3.0	0.4166
Any health conditions, n (%)					
Mental health	49 (29.5)	19 (28.4)	11 (29.7)	17 (28.3)	
None	103 (62.0)	45 (67.2)	19 (51.4)	37 (61.7)	

Participants were asked to report how much they participated in physical activity in terms of frequency and duration of exercise bouts at light, moderate, and vigorous levels of intensity on average per week during leisure time. Mean (SD) for each were as follows: light intensity at a frequency of 3.9 (2.7) times for 24.5 (13.5) minutes each episode per week; moderate intensity at a frequency of 3.4 (2.2) times for 33.2 (17.5) minutes each episode per week; and vigorous intensity at a frequency of 3.2 (2.0) times for 44.3 (19.5) minutes each episode per week. This information was used to calculate the percentage of participants who were meeting the Canadian Physical Activity

Guidelines for Adults and produce a Godin Leisure Time Exercise Score. The majority (76.8%) of participants were meeting 150 minutes of moderate-vigorous intensity physical activity per week and this was similar between groups. The mean (SD) Godin Leisure Time Exercise Score was 55.6 (25.4) which is a classification of Active. There were no significant differences between groups.

Participants were also asked to report the number of times per week they spend being sedentary for more than 15 minutes at a time, and the duration of each sedentary episode. The mean (SD) frequency was 10.0 (3.6) times per week and the mean (SD) duration was 81.0 (33.0) minutes per episode. There was a significant (P=0.0009) difference as the Year 2 (95.1 (28.2)) group was more sedentary than both the Year 1 (79.8 (34.8)) and Year 3+ (71.9 (30.9)) groups.

And for the final movement behaviour, participants reported sleeping a mean (SD) of 7.0 (1.0) hours per night. There were no significant differences between groups.

Table 10. Participants' Personal Health Behaviours: Movement Behaviours

	All n (%)	**Year 1 n (%)**	**Year 2 n (%)**	**Year 3+ n (%)**	**P Value**
N	194	80	47	65	
Physical activity, *mean (SD)*					
Light frequency per week	3.9 (2.7)	5.1 (3.9)	4.2 (3.6)	4.4 (3.6)	
Light minutes per episode	24.5 (13.5)	26.8 (20.5)	24.8 (14.5)	26.3 (18.0)	
Moderate frequency per week	3.4 (2.2)	3.9 (3.1)	3.6 (2.3)	3.3 (2.5)	
Moderate minutes per episode	33.2 (17.5)	33.0 (17.4)	37.0 (20.4)	33.4 (21.7)	
Vigorous frquency per week	3.2 (2.0)	3.0 (1.9)	3.6 (2.2)	3.2 (1.2)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P Value
Vigorous minutes per episode	44.3 (19.5)	41.1 (19.0)	48.1 (18.0)	45.3 (20.1)	
Meeting Canadian Physical Activity Guidelines, n (%)	149 (76.8)	58 (72.5)	38 (80.9)	49 (77.8)	
Godin Leisure Time Exercise Score, >24 = active, mean (SD)	55.6 (25.4)	54.2 (25.0)	59.8 (26.8)	54.6 (25.4)	0.4513
Sedentary behaviour, *mean (SD)*					
Frequency per week	10.0 (3.6)	10.3 (3.6)	10.1 (3.7)	9.9 (3.6)	0.8072
Minutes per episode	81.0 (33.0)	79.8 (34.8)~	95.1 (28.2)*~	71.9 (30.9)*	0.0009
Hours of sleep per night, m*ean (SD)*	7.0 (1.0)	6.9 (0.9)	7.1 (0.9)	7.0 (1.1)	0.3233

~Indicates statistical significance between Year 1 and Year 2 participants, p = 0.01132, two tailed; * indicates statistical significance between Year 2 and Year 3+ participants, p = 9.2E-05, two tailed.

Participants reported eating fruit a mean (SD) of 2.1 (1.3) times a day and 12.0 (8.1) times per week. Similarly, they reported eating vegetables a mean (SD) of 2.7 (1.4) times per day and 16.1 (8.5) times per week. There were no significant differences between groups.

The majority of participants reported no cigarette or tobacco product use (96.4%), no drug use (86.7%), drinking a glass/bottle/can of alcohol less frequently than once a week (61.0%), and a mean (SD) of 0.7 (1.2) times in a month for drinking more than five drinks on one occasion, with no significant differences between groups.

And finally, the majority of participants felt their ability to handle unexpected/difficult situations was excellent or good (78.6%) as well as their ability to

handle day to day demands was excellent or good (84.2%). There were no significant differences between groups.

Table 11. Participants' Personal Health Behaviours: Nutrition, Smoking and Substance Use, and Stress Management

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P Value
N	194	80	47	65	
Fruit and vegetable consumption, mean (SD)					
Fruit per day	2.1 (1.3)	2.0 (1.2)	2.4 (1.3)	2.1 (1.4)	0.1712
Fruit per week	12.2 (8.6)	11.6 (8.0)	14.6 (9.6)	11.9 (8.3)	0.1315
Vegetables per day	2.7 (1.4)	2.5 (1.3)	2.9 (1.3)	2.8 (1.5)	0.2133
Vegetables per week	16.2 (8.9)	15.7 (9.5)	17.9 (7.8)	16.4 (8.5)	0.4126
Smoke cigarettes or use other tobacco products, n (%)					
Daily	1 (0.5)	1 (1.3)	0 (0.0)	0 (0.0)	
Occasional	6 (3.1)	2 (2.5)	2 (4.3)	2 (3.1)	
Not at all	188 (96.4)	76 (96.2)	45 (95.7)	63 (96.9)	
Drug use, n (%)					
Daily	1 (0.5)	1 (1.3)	0 (0.0)	0 (0.0)	
Occasional	25 (12.8)	8 (10.0)	10 (21.3)	6 (9.2)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P Value
Not at all	170 (86.7)	71 (88.8)	37 (78.7)	59 (90.8)	
Drink a glass/bottle/can of alcoholic beverages, n (%)					
Every day	4 (2.1)	1 (1.3)	1 (2.1)	2 (3.1)	
4 to 6 times per week	9 (4.6)	3 (3.8)	4 (8.5)	2 (3.1)	
2 to 3 times a week	32 (16.4)	9 (11.3)	9 (19.1)	13 (20.3)	
Once a week	31 (15.9)	8 (10.0)	11 (23.4)	12 (18.8)	
2 to 3 times per month	38 (19.5)	17 (21.3)	6 (12.8)	14 (21.9)	
Once a month	25 (12.8)	14 (17.5)	4 (8.5)	6 (9.4)	
Less than once a month	56 (28.7)	28 (35.0)	12 (25.5)	15 (23.4)	
More than 5 drinks on one occasion, *mean (SD)*	0.9 (1.6)	0.7 (1.3)	1.0 (1.7)	0.9 (1.8)	0.5848
Ability to handle unexpected and difficult problems, n (%)					
Excellent	39 (19.9)	12 (15.0)	11 (23.4)	14 (21.5)	
Good	115 (58.7)	49 (61.3)	27 (57.4)	38 (58.5)	
Fair	35 (17.9)	16 (20.0)	8 (17.0)	10 (15.4)	
Poor	7 (3.6)	3 (3.8)	1 (2.1)	3 (4.6)	

	All n (%)	Year 1 n (%)	Year 2 n (%)	Year 3+ n (%)	P Value
Median	3.0	3.0	3.0	3.0	0.4341
Ability to handle the day to day demands in your life, n (%)					
Excellent	39 (19.9)	13 (16.3)	3 (27.7)	12 (18.5)	
Good	126 (64.3)	56 (70.0)	28 (59.6)	39 (60.0)	
Fair	31 (15.8)	11 (13.8)	6 (12.8)	14 (21.5)	
Poor	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Median	3.0	3.0	3.0	3.0	0.2812

Summary

Descriptive and inferential statistics were employed to examine participant responses to the 75 online survey questions designed to address the central research questions of this study. Results included summaries of participant demographics and characteristics, as well as their physical activity related knowledge, attitudes, and personal health behaviours as it relates to physical activity and exercise in the field of medicine.

The greatest proportion of participants were in the first year of the UBC MD program, associated with the Vancouver Fraser medical program, and had interests in the medical specialities of family medicine, internal medicine, and surgery. The majority were female, white, single, with an undergraduate degree. The mean age was 25.5 years, with normal or healthy BMI based on self reported height and weight.

The participants' awareness and knowledge of the suite of Canadian Physical Activity Guidelines was highest for the guidelines specific to the Adult population (18-64 years). There were varied responses related to the understanding of the required physical activity level for health benefits. With regards to physical activity education, the majority of participants recalled spending seven or fewer hours discussing the topic of physical activity and/or how to talk to patients about physical activity in the medical program. And the majority of participants indicated they would like more time to be spent on these topics.

Participants' responses to a number of belief or attitudinal statements about the importance of physical activity and exercise in the field of medicine were positively skewed as strongly agreeing or agreeing that it is important. Statements about how the participants feel their knowledge and confidence to provide physical activity/exercise advice in the field of medicine were not as positively skewed. With regards to the medical school setting itself, the majority of participants strongly agreed or agreed their medical program should create an environment for healthy lifestyles, but the distribution was less positively skewed when participants were asked whether they feel their medical school does provide a healthy lifestyle environment.

The majority of participants agreed it will be their role to prescribe physical activity to their future patients. They reported many health-related reasons as to why this is important in their future clinical practice and few barriers were identified. Participants also indicated their confidence to refer to other allied health professionals to assist their patients with healthy lifestyle choices.

Participants reported their general health as excellent or good, but concerning was the proportion of participants who identified as suffering from mental health challenges. The majority of participants reported being physically active but sedentary, and had other healthy habits such as getting a good duration of sleep, eating healthy, non-smoking, nominal use of tobacco, drugs, and alcohol, and reported their ability to manage stress as excellent or good.

There were minimal significant differences between groups for variables of the study. Significant differences occurred in the following: Year 3+ group was significantly older than Year 1 group; Year 3+ group felt more confident in suggesting specific

physical activity programs for their patients, compared to Year 1 group; Year 3+ group felt more strongly that medical school faculty members should set a good example for students by practicing a healthy lifestyle, compared to both the Year 1 and Year 2 groups; and the Year 2 group was more sedentary than both the Year 1 and Year 3+ groups.

Chapter 5:

Discussion, Recommendations, and Conclusions

The negative health outcomes and costs associated with physical inactivity are well documented (Janssen, 2012; Lee et al., 2012). Conversely, there is compelling evidence for the benefits of physical activity to prevent and manage an abundance of chronic conditions and all-cause mortality rates (Pedersen & Saltin, 2015). Despite this, the majority of the population are insufficiently active and not meeting recommended levels of physical activity (Colley et al., 2011; Hallal et al., 2012). Efforts to increase physical activity levels and achieve national physical activity guidelines can help improve the health and well-being of the population and reduce costs to the health care system (Lee et al., 2012).

Health Benefits of Physical Activity (https://www.healthlinkbc.ca/physical-activity/health-benefits)

- Reduces the amount of fat stored in body
- Increases energy
- Improves weight management
- Increases good cholesterol and decreases bad cholesterol
- Improves blood glucose balance and your body's ability to use insulin
- Reduces blood pressure
- Improves heart function and blood flow
- Strengthens muscles, bones, and joints
- Enhances coordination and balance
- Improves brain function
- Improves self esteem
- Improves psychological well-being (less stress, anxiety and depression)

Physicians acknowledge the powerful role they play in counseling patients to adopt physical activity and improve their lifestyles (Hebert et al., 2012; Sallis, 2011). It has been consistently shown that physicians, and medical students alike, believe physical activity and healthy lifestyle counselling is important and relevant to their clinical practice (Buffart et al., 2009; Frank et al., 2003, 2008; Hebert et al., 2012; Holtz et al., 2013; Ng & Irwin, 2013; Solmundson et al., 2016; Vallance et al., 2008). Substantial literature has demonstrated physicians who have more physical activity knowledge, positive attitudes, and are physically active themselves, are more likely to counsel patients regarding physical activity (Frank et al., 2008; Lobelo et al., 2009; Stanford et al., 2014).

Even though physicians are in an influential role to be able to help increase physical activity levels and health of the population, many do not provide physical activity advise and specific exercise prescriptions to their patients (Buffart et al., 2009; Gnanendran et al., 2011; Kennedy & Meeuwisee, 2003; Petrella, et al., 2007) due to feeling ill prepared reporting a lack of knowledge, training, confidence, and tools/resources (Hebert et al., 2012; Kennedy & Meeuwisse, 2003; Lobelo & Garcia de Quevedo, 2014). Over the years there has been an increasing interest and desire by physicians and physicians in training for better and more education and training in exercise medicine in order to play prominent and successful roles in supporting global health promotion and public health initiatives such as EIM (Pandya & Marino, 2018; Radenkovic et al., 2019; Vallance et al., 2008).

Learning more about the profile of UBC MD students' physical activity related knowledge, attitudes, and their own health behaviours will help identify "who" our future physicians are and whether they are interested and receptive to EIM in the health care setting. In addition, the research will provide recommendations for medical school curriculum and health care system policy and practice, with a focus on reducing barriers and facilitating an EIM approach to increasing physical activity levels and better health outcomes for all.

The purpose of this study was to investigate whether the UBC MD students have the physical activity related knowledge, attitudes, and health behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their patients and whether the knowledge, attitudes, and behaviours differ between years of medical school preparation and training. Central research questions were:

1. What knowledge do UBC MD students have with regards to physical activity recommendations, prescription and programming?
2. What are the attitudes of UBC MD students for incorporating physical activity into the design of prevention and treatment plans for their patients? Do they see it as their role?
3. What are the personal health practices of the UBC MD students with respect to physical activity? Are they role models?

A cross sectional design was used to administer a self-report quantitative closed-ended online survey to UBC MD students to examine variables between groups (years of medical program). Variables included participant demographics and characteristics

(age, sex, height, weight, ethnicity, relationship status, education level, medical program site, and medical specialty area of interest), knowledge and attitudes about the role of physical activity and/or exercise in the field of medicine, as well as participants' general health and personal health practices (physical activity, sedentary behaviour, sleep duration, fruit and vegetable consumption, smoking, drug, and alcohol use, and ability to manage stress).

The findings are discussed with consideration for how the results add, expand, and further understanding of the current body of literature related to medical students' physical activity related knowledge, attitudes, and health behaviours in the field of medicine, as well as recommendations for the education and health care sectors, and future research considerations.

Response Rate

All ~1150 UBC MD students were invited to participate in this study. Two hundred and seventeen participants responded to various questions in the online survey for a response rate of 18.9%. Previous studies regarding similar research topics in medical student populations have shown response rates of lower than 15% (Hughes, Azzi, Gregory, Ramnanan, & Khamisa, 2017; Radenkovic et al., 2019), in the range of 15-25% (Connor, Cialdella-Kam, & Harris, 2015; Ng & Irwin, 2013; Vallance et al., 2008) and above 25% (Dunlop & Murray, 2013; Frank, Carrera, Elon, & Hertzberg, 2006; Holtz et al., 2013; Solmundson et al., 2016). Both Holtz et al. (2013) and Solmundson et al. (2016) surveyed their "classmates" which may have led to higher response rates for these UBC MD cohorts as fellow students were supporting each others' projects and research interests.

Participation was highest in the Year 1 cohort and the number of respondents decreased for each subsequent cohort year. Connor et al. (2017) also found first year students to have the highest response rate and fourth year students to have the lowest participation rates. This is not surprising given the demands of the medical program and the clinical nature of the latter two years of the medical program involving outreach delivery, possibly resulting in these students feeling less engaged and not as invested to participate as they are closer to the end of their educational program and may view their participation as having less direct impact on their own journey.

The low response rate can be a reflection of lack of time from the busy schedule kept by medical students, irrelevance or disinterest in the survey topic, as well as survey fatigue from the large number of requests medical students receive to participate in research endeavours (Hughes et al., 2017). Taylor and Scott (2019) reported overall physician response rates have been declining over the past years and are usually 10-13% lower than the general population and response rates below 40% are not unusual. Reasons provided include working time accounted for by core medical tasks, gatekeepers (receptionists) prevent survey from reaching physicians, surveys percevied as irrelevant, survey fatigue, office policy does not allow surveys, privacy concerns, and payment systems do not provide renumeration for survey participation (Taylor & Scott, 2019).

To recognize the load of solicitation on medical students, the UBC Medical School has a formal approval process for medical education research and scholarship requests in an attempt to balance the commitment to advancing research while ensuring learners are not burdened by requests for data. And even those whose requests are approved to proceed, it is acknowledged these students are heavily petitioned by survey type research and concede that participation rates will be low.

Having an understanding of the immense demands placed on medical students, being aware of response rates of medical students in previous studies and accepting the declining levels of participation in this population, the response rate of 18.9% is satisfactory.

Characteristics of Participants

The mean age of the study sample was 25.5 years. The Year 3+ participants (26.6 years) were significantly older than the Year 1 participants (24.5 years) which is aligned with a two year time span between first and third year students. The majority of the participants were female (60.7%), white (58.1%), and single (72.9%), with an undergraduate or graduate degree (90.6%). The higher frequency (13.8%) of participants without a degree in Year 1 is reflective of a policy change to admit candidates into the UBC medical school without an undergraduate degree for their intake year, in combination with the Year 1 group having the highest proportion of participants. Otherwise, these characteristics were similar across groups and consistent

with the age of post secondary education students attending medical school and the UBC MD data for admissions from 2016 to 2019 as presented in Table 12. (https://www.mdprogram.med.ubc.ca/admissions/admissions-statistics/).

Table 12. UBC MD Statistical Data on Admissions

	2016	2017	2018	2019
Age (21-26 yrs)	77.0%	84.0%	81.0%	82.0%
Female	53.8%	45.5%	49.7%	58.3%
Degree	88.2%	92.0%	87.5%	92.4%

Previous studies involving UBC MD students (and a similar research topic) found comparable characteristics. Holtz et al. (2013) surveyed fourth-year medical students and found a mean age of 27.8 years, 58.2% female, 63.4% white, and 60.5% single. And Solmundson et al. (2016) found UBC MD family medical residents to have a mean age of 30 and 64% of participants were female. The mean ages of Holtz et al. (2013) and Solmundson et al. (2016) were older but this is indicative of advanced age of fourth year students and residents (years five, six, and seven of medical school), respectively, compared to this study in which the majority of students were first year students just beginning the medical program.

Across Canada, medical student participant characteristics of similar age, sex, relationship status, ethnicity, and/or educational background were found by Hughes et al. (2017), Ng and Irwin (2013), and Vallance et al. (2008). This trend is also found in the United Kingdom and the United States, medical student participants of research were also of like age, and the majority female, white and single (Connor et al., 2015; Frank et al., 2003, 2006; Stanford et al., 2012).

In all cases the proportion of female participants were higher than the percentages indicated by the UBC MD admissions data (range of 45.5% to 58.3% from 2016 to 2019). The slightly higher percentage of female participants could be related to females having an increased interest in the topic of physical activity and exercise in the field or medicine, or reflective that females are more likely to participate in research (Cull, O'Connor, Sharp, & Tang, 2005).

When asked about a medical area of specialty, participants most frequently selected family medicine (29.5%), internal medicine (13.5%), and surgery (13.5%). Pleasingly, the number of participants who selected “undecided” decreased in occurrence from the Year 1 cohort to the Year 3+ cohort indicating a commitment to a medical area of specialty as students gained exposure and experience with progression through the medical program.

Participants’ indication of medical specialty were not different from Holtz et al. (2013) whose participants also selected family medicine (35.2%), surgery (14.5%) and internal medicine (13.0%). Similarly, Hughes et al. (2017) found 27% of medical students interested in family medicine and 16% internal medicine.

Overall, the age, sex, ethnicity, relationship status, educational background, and medical area of interest in this study were similar to previous research that demonstrated the majority of medical school participants to be in their twenties, female, white, and single, with at least an undergraduate degree, and interest primarily in family medicine.

Representative Sample

The participant characteristics (age, sex, ethnicity, relationship status, and educational background) and medical interests were aligned with the UBC MD admission statistics from 2016-2019 and not unlike previous studies of UBC MD students (Holtz et al., 2013; Solmundson et al., 2016) or other studies surveying medical students on same research topics (Connor et al., 2015; Frank et al., 2003, 2006; Hughes et al., 2017; Ng & Irwin, 2013; Radenkovic et al., 2019; Stanford et al., 2012; Vallance et al., 2008).

In addition, the geographical distribution of participants was also representative of the UBC medical program. The distribution of participants was as follows: 61.1% Vancouver Fraser, 14.7% Northern, 12.6% Island, and 11.6% Southern Medical Program sites. This is aligned with the UBC medical program in which there are four geographically distinct academic sites, with two thirds of the annual student population intake at Vancouver Fraser Medical Program site and approximately 11% at each of Northern, Island, and Southern Medical Program locations.

Despite a response rate of 18.9% and lower participation rates in Year 3+, the participant characteristics and medical program indicators are consistent with UBC MD admissions data, geographical distribution, and previous studies of UBC MD students, providing confidence that this is a representative sample of the UBC MD student population.

Participant Bias

As in any research solicitation for volunteers there is a chance this sample is biased and has an interest in physical activity, exercise and the concept of exercise is medicine. Since participation in the survey was completely voluntary, no inferences can be made about non-responders. Without having contact with nonrespondents it is unknown as to why they did not participate. Reasons for non-participation could be a lack of interest in the topic, consideration it is insignificant to their medical area of specialty, general survey fatigue, and/or a lack of time due to school or clinical environment demands (Hughes et al., 2017).

Without knowing reasons for non-responders, less understood is participant bias and whether self selection to the survey topic of physical activity, exercise, and/or exercise as medicine has led to an overestimation in results. However, if there is a participant bias, this demonstrates a greater concern for the lack of physical activity interest, knowledge and/or positive attitudes for physical activity in the field of medicine for non-responders who may have reported even less physical activity interest, knowledge, and poorer attitudes towards exercise medicine. Positively, Cunningham et al. (2015) suggested response bias may be less of an issue with physicians as they are a fairly homogeneous population in terms of training and employment. The impact of any response and non-response biases are partially reduced because of the confidence that the data are a representative sample of all UBC medical students.

UBC MD Undergraduate Medical Education Curriculum Sessions, Abstracts, and Objectives

In an effort to be able to interpret the findings related to the UBC MD physical activity education curriculum, the UBC MD undergraduate medical program Curriculum Management Unit provided a curriculum search document, using the keywords physical

activity and exercise. The document was then reviewed and irrelevant content was removed to ensure the remaining curriculum session titles, abstracts, and objectives where aligned with the purposes of this study (Appendix F).

Upon review, there are approximately 10 sessions totalling 670 minutes, or just over 11 hours of curriculum delivery across the four years of undergraduate medical education total instruction time in which the sole focus of the sessions are: physical activity as a vital sign; recommendations for exercise; motivational interviewing; the role of physical activity in the prevention and management of most health conditions; the role of physical activity in the health and wellbeing of children and adolescents; and the role of the physician in promoting physical activity across the lifespan. In each of these 10 sessions, most, if not all of the session learning objectives are related to the primary topic of physical activity or exercise. Some of the session objectives include: the benefits of being physically active; Canadian Physical Activity Guidelines for Adults and 24 Hour Movement Guidelines for Children and Youth; barriers and facilitators for physical activity promotion and behaviour change management to becoming more active; the role of physical activity as a non-pharmacological and lifestyle intervention for health; the role of physical activity for the prevention of management of the major non-communicable diseases; the role of the physician to promote physical activity; and creating exercise prescriptions to help patients meet physical activity guidelines. While it is difficult to quantify, the majority of these session objectives are topics about physical activity and exercise and only one of these sessions highlight one or two objectives related to motivational interviewing techniques and how to talk to patients regarding physical activity and exercise.

There are another 25 sessions in which only one, sometimes two, session objectives mention physical activity or exercise, in association with the promotion of physical activity as a modifiable/lifestyle/nonpharmacological intervention in the prevention and management of chronic diseases. Because these minimal one or two session objectives, in a session with multiple other objectives, are an insignificant component to the total session, it is difficult to measure the amount of time physical activity content is included in each of these sessions.

Finally, there were instances in which physical activity or exercise were identified as “themes” or “tagged” but not mentioned in the session title, abstract, or objectives,

making it impossible to know if physical activity or exercise is discussed or incorporated into these sessions. And of interest were sessions whereby curriculum covered topics such as referral networks, the role of other health care professionals and allied health professions, as well as interprofessional approaches to patient care.

This allotment of approximately 11 hours of UBC MD curricula time dedicated to a primary focus on topics related to physical activity and exercise is at the upper end compared to other studies. Weiler et al. (2012) demonstrated that United Kingdom medical schools spent 4.2 hours of time to cover such topics as physical activity guidelines and physical activity promotion, mostly an emphasis on what and why of physical activity, and minimal time devoted to how to counsel patients to be more active. In the United States, medical schools reported 8.1 hours of physical activity education with mostly biophysiological content including physical activity guidelines with less curriculum related to counselling skills (Stoutenberg et al., 2015). And Strong et al. (2017) demonstrated that Australian medical schools spend 6.6 hours of time mostly teach to national physical activity guidelines and less training to prepare medical students to properly counsel patients. In comparison, UBC MD physical activity education and curricula allotment is more than that provided in other countries.

Participants' Awareness, Knowledge, and Understanding of Physical Activity in the Field of Medicine

Canada has physical activity guidelines and recommendations specific to a number of age groups including adults (18-64 years), older adults (65 years +), children and youth (5-17 years), and the early years (0-4 years). These evidence-based guidelines and best practice resources can be useful tools for physicians and medical schools as an information source related to physical activity recommendations for health. A central research question of this study was to investigate if UBC MD students have the physical activity related knowledge to provide physical activity advice to their patients, and whether the knowledge differs between years of the medical program.

Participant awareness of Canadian age specific physical activity guidelines was greatest for the adult population guidelines (90.3%), modest for children and youth (71.6%), poor for older adults (25.3%), and even less for the early years (10.7%). Of those participants who were aware of the age specific physical activity guidelines,

accuracy of the information was highest for older adult (96.4%) and adult (90.3%), modest for children and youth (72.1%), and poor for the early years (9.5%). For each of the population specific guidelines, the Year 1 participants had the lowest proportion of awareness and knowledge, suggesting some exposure to physical activity education in subsequent years of the medical program.

The higher level of knowledge related to physical activity guidelines and recommendations associated with the adult population, and to some extent, children and youth, is reflective of physical activity education related content that is delivered as identified in the UBC MD undergraduate medical education curriculum document. Key sessions include the role of physical activity in the prevention and management of most health conditions; the role of physical activity in the health and wellbeing of children and adolescents; and the role of the physician in promoting physical activity across the lifespan. Specifically, these session objectives cover the Canadian Physical Activity Guidelines for Adults and the 24 Hour Movement Guidelines for Children and Youth. This content is identified in at least 400 minutes, or over three hours of curriculum time attributed to the overall physical activity and/or exercise content. With competing priorities for inclusion in medical school curriculum, there may be a conscious decision to include education on the majority general adult population and incorporate children and youth because of the concerns related to rising sedentary behaviour, inactivity, and obesity rates in this population (Tremblay, 2012). However, this leaves a gap in preventive care for all. With the mounting evidence for the benefits of physical activity to improve quality of life and for the prevention and management of lifelong morbidity and mortality, it would be prudent to ensure medical students receive education and training for the suite of Canadian Physical Activity Guidelines.

Despite some awareness of Canadian Physical Activity Guidelines, participants did not consistently demonstrate an understanding of the information or how they might articulate this information when providing advice to their patients. While the majority (88.4%) of participants identified moderate intensity as the minimum intensity of physical activity for health benefits, subsequent questions and statements used to identify understanding of physical activity content and how to prescribe physical activity to their patients, had varied responses and less common responses by participants. The most frequent responses to each statement about how to appropriately prescribe physical activity ranged from a minority of 47.4% to a mere majority of 56.0% across such

statements like: taking the stairs daily is beneficial; half and hour of walking a day is beneficial; physical activity must make you huff and puff; and several 10 minutes bouts of physical activity is better than one session of several hours per week.

Certainly these low frequency distributions for all groups represent a lack of clarity for knowledge related to frequency, intensity, duration (time), and type of physical activity for some, versus substantial, health benefits. In particular there is discrepancy between the evidence-based thresholds to optimize health versus public health messaging that may be important when talking to patients about changing their behaviour. For example, the Canadian Physical Activity Guidelines for Adults recommend an accumulation of 150 minutes of moderate-vigorous physical activity per week for significant health benefits, compared to the benefits of starting and participating in any physical activity below this threshold (either less than 150 minutes per week or light level physical activity) with the message that more is better, or some is better than no physical activity at all. This suggests the UBC medical curriculum may only allot time to present the actual physical activity guidelines, but lack any additional time to discuss what this means for understanding the physical activity content how to use this information when counselling patients about physical activity.

Changing health behaviours such as physical activity can be complicated. Just being aware of national physical activity guidelines is not enough, albeit a first step (Petrella et al., 2003, 2007). Appropriate and effective physical activity advice requires a solid understanding of physical activity education and counselling skills in order to prescribe a useful combination of frequency, intensity, time and type. There is no simple template for exercise prescriptions and physical activity advisement can be difficult requiring sufficient time and content (to better understand what and how) in medical education curricula that reflects the current evidence and evolving physical activity guidelines.

While it is possible Likert-type questionnaire responses do not allow for a participant to explain or justify their response, and/or does not allow for more detail related to the complexity of physical activity behaviour and thresholds, this inconsistency and lack of knowledge will impact the ability to provide effective and specific physical activity recommendations or programming to patients.

In an earlier study, Solmundson et al. (2016) found 52.2% of UBC family medicine residents were able to correctly identify the adult physical activity guidelines of 150 minutes of moderate to vigorous activity and only 23.4% correctly identified 60 minutes per day for children and youth. She also reported generalized statements such as “physical activity is good for you” were more common, and specific physical activity counselling and detailed prescription to be less common. The results from this study suggest that there has been an increase in UBC MD students’ awareness and knowledge of Canadian Physical Activity Guidelines for Adults and Children and Youth since this work published in 2016, suggesting some improvement in physical activity education and/or learning at UBC medical school over the past years and/or perhaps generational differences related to younger individuals being more health conscious.

Despite a recent increase in physical activity awareness and knowledge, specific exercise prescription detail continues to be insufficient as evidenced by the inconsistent and poor understanding of how to apply the physical activity knowledge, leaving these physicians in training ill-prepared to promote and advice their patients regarding physical activity. An ongoing lack of dedicated and adequate teaching time regarding physical activity is not giving medical students the knowledge and skills they are asking for to be able to provide physical activity advice to their future patients.

Similar to UBC, research in the United Kingdom found medical students to have unsatisfactory levels of knowledge about their respective national physical activity guidelines. Dunlop and Murray (2013) found 40% awareness of adult physical activity guidelines and Radenkovic et al. (2019) found this increased to 48% awareness in 2019. Canada seems to be doing well compared to the United Kingdom.

Even with this improvement in awareness, it’s more than just being aware and knowing the Canadian Physical Activity Guidelines, it’s about being able to interpret, understand, and provide specific physical activity advice patients to patients. With the importance of physical activity for the prevention and management of chronic disease, medical students should have the depth in education and training to be able to feel confident to counsel and advice their patients about physical activity effectively. Any less than all medical students having the appropriate knowledge and understanding to discuss physical activity with their diverse patient population is a concern and definitely a stimulus for medical education curriculum boosting.

Participants' Perception of Time Spent Discussing the Topics of Physical Activity/ Exercise

Participants were aware of, and knowledgeable, about the Canadian Physical Activity Guidelines for Adults, but less so for the Physical Activity Guidelines for Children and Youth, Older Adults, and the Early Years. However, their ability to demonstrate an understanding of this information was poor. For example, the participants could not consistenly agree on what combinations of frequency, intenisty, and/or duration of physical activity would be required to achieve optimal health benefits. This may be reflective of the limited amount of time spent learning about physical activity, exercise, and its role in preventive medicine and treatment of many chronic diseases and conditions. With a growing commitment for exercise medicine approaches, it was pertinent to ask participants for their perceptions about how much time they spend in medical school discussing the topics of physical activity and exercise, and learning how to counsel their patients regarding physical activity.

The majority of participants reported spending seven hours or less during instruction discussing physical activity content (78.8%), and how to talk to their patients about it (94.2%) in UBC's medical program. Given that the majority of respondents in this study were first year students and reporting less than seven hours of time spent discussing the topics of physical activity, it could be speculated that by the end of four years of medical school, students could have received the approximate (minimum) 11 hours of physical activity education detailed in the UBC curriculum search documents. And while not a majority, over 30% of both Year 2 and Year 3+ participants indicated more than eight hours of time spent discussing the topics of physical activity and exercise. This proportional increase was not seen for content related to how to talk to patients about physical activity and exercise.

Participants strongly agreed/agreed they would like to receive more time to discuss physical activity content (60.9%) as well as even more time dedicated to learning how to talk to their patients about it (74.4%). Year 1 participants had the greatest frequency of interest for more physical activity related education which is aligned with the indicators that they have less knowledge and understanding of physical activity compared to the Year 3+ participants who have received more education, training, and experiences with their advanced years in the medical program.

Regardless, with an increasing focus on EIM and its possible impacts on reducing the prevalence of chronic disease in Canada, the perception of seven hours or less in four years of programming is unsettling. No doubt there are competing priorities in medical education curricula with a focus on injury, disease, and abnormal function, finding time for much needed upstream prevention education can be a challenge and should be addressed.

Previous research of UBC MD student cohorts found students thought their training was insufficient and a desire by students for more time spent on physical activity education and counselling skills. Holtz et al. (2013) found 86% her fourth-year medical student peers rated their training to provide physical activity counselling as less than extensive and the majority felt they needed more training in preventive care. Likewise, Solmundson et al. (2016) reported 85.1% of her family medicine residency peers perceived their training in exercise medicine as inadequate and 91% had a desire for additional training in physical activity and exercise prescription.

This discovery of not providing enough of the basic knowledge required to effectively advise patients with respect to physical activity is not unique to Canada. When comparing these findings to other countries, Dunlop and Murray (2013) found 74% of United Kingdom medical students reported they had received teaching about the benefits of physical activity, however, 52% felt insufficiently trained to advise patients on the subject. Similarly, Radenkovic et al. (2019) found that most (75%) medical students stated they had not received training in lifestyle medicine over the past 2 years and 48.1% were unacquainted with motivational interviewing counselling approaches for behaviour change, while 76% wanted more lifestyle medicine teaching incorporated in the curriculum. In Australia, Gnanendran et al. (2011) reported medical students had a good understanding of physical activity (75%) and were confident in exercise training (65%) but only 26% think the medical school training was adequate. This theme for insufficient education paired with a request for more training is also supported by other research (Ng & Irwin, 2013; Pandya & Marino, 2018; Vallance et al., 2008).

Despite an improvement in the ability to recognize and/or identify Canadian Physical Activity Guidelines and recommendations, the ability to utilize this information towards counselling patients is still poor. Given the inconsistencies in knowledge and understanding, it would seem that more time is needed on these important topics. And

the participants are expressing a desire for more training in physical activity content and counselling. Any lack in education and training leaves medical students unprepared to prescribe physical activity, reducing probability that they would provide them in clinical settings.

Participants' Attitudes about Physical Activity in the Field of Medicine

Another central research question was to investigate the attitudes of UBC MD students, whether they believe it is their role to include physical activity (or healthy living) advice and intervention when talking to their patients, and whether the attitudes are different between years of the medical program.

Participants overwhelmingly strongly agreed or agreed physical activity or exercise counselling is important (98.0%), and talking to their patients about it in practice will be important (95.0%), they would be more credible and effective counsellors if they are healthy themselves (94.0%), and patients are more likely to adopt healthier lifestyles if physicians counsel them to do so (85.6%). Without a doubt the participants believe physical activity or exercise counselling is important and talking to their patients about physical activity and exercise will be important in their practice.

Of concern is only 57.0% of participants strongly agreed or agreed they have sufficient knowledge to talk to their patients about physical activity, and only 61.8% feel confident to talk to their patients about being physically active. And even more concerning is only 36.6% of participants strongly agreed or agreed they felt confident in suggesting specific physical activity programs for their patients. Although, this level of confidence was significantly higher in the Year 3+ cohort compared to the Year 1 cohort likely due to more experience, exposure time, and years in the medial program. Nevertheless, this is still less than a majority with only 48.4% of Year 3+ participants having the confidence to provide specific prescription and programming to their patients.

Overall the frequency of distribution for knowledge and confidence in physical activity education and counselling was lowest in Year 1 participants, suggesting some exposure and experience in the subsequent years of medical school contributing to more knowledge and confidence related to physical activity education. However, these

findings demonstrate a disconnect between the beliefs and attitudes of the medical students and their knowledge, skills, and abilities achieved through their education and training. While the medical students overwhelmingly believe that physical activity knowledge and counselling is important to their work, they do not feel they have obtained the knowledge or confidence to talk to their patients about being physically active and certainly not how to be active.

With regards to the medical school itself, participants in all groups overwhelmingly strongly agreed or agreed medical schools should encourage (96.0%) as well as enable and facilitate (96.5%) their students to practice (and maintain) healthy lifestyles. However, only about half of the participants strongly agreed or agreed that their medical school creates (49.0%) or encourages (58.4%) a health promoting environment, or provides the curriculum to understand how exercise can prevent/manage disease (59.9%). So while the participants think medical schools should encourage and support their medical students to lead healthy lifestyles, they do not feel that they actually do.

Of interest was the dissimilarity as to whether medical school faculty should set a good example for students by practicing a healthy lifestyle. Year 3+ participants had a significantly higher proportion of agreement (76.6%) compared to the Year 1 (68.8%) and Year 2 (55.3%) participants. This may be the result of the exposure that Year 3 and Year 4 students have during their clinical clerkships and first-hand experiences that faculty/physicians who lead healthy lifestyles have a greater impact on their patients' health/lifestyle in clinical practice. Regardless of this difference that faculty should be good examples, unfortunately only 48.0% of participants felt their faculty are good role models for healthy lifestyles, and this was similar across all groups.

Previous studies of UBC MD students demonstrated similar positive beliefs and attitudes about the role of physical activity in the field of medicine. Holtz et al. (2013) reported fourth-year medical students agreed it was highly relevant to talk to patients about exercise in their practice as 69.3% placed a high value on exercise counselling, 85.3% believed that to effectively encourage patient adherence to a healthy lifestyle, a physician must adhere to one themselves, and 94.4% felt they would be able to provide more credible and effective counselling if they exercised and stayed fit themselves. A few years later, Solmundson et al. (2016) found 95.6% of family medicine residents

indicated exercise prescription will be important in their future practice, 96.6% felt physical activity is integral to their patients' health, 94.9% believed they will be able to provide more credible and effective counselling if they personally exercised and stayed fit, and 95.9% believed their academic programs should encourage them to lead physically active lifestyles. However, 50.0% felt there was a lack of exercise related supports from their medical program.

Comparably, Vallance et al. (2008) surveyed medical students from Western Canada and reported respondents perceived physical activity related prescription as important, but they perceived they were only moderate competence at conducting physical activity related prescription. And similarly, another study of medical students in Canada reiterated the belief of importance and relevance for physical activity education, 80% believed physicians should adhere to a healthy lifestyle to effectively encourage their patients to do so, and 90% felt their credibility increased if they stayed fit themselves (Ng & Irwin, 2013). This investigation found that as medical students progressed in their years of training, the perception of relevance for exercise counselling during patient encounters increased, with a rationale that this is due to increased opportunities for patient interaction during clinical clerkship (Ng & Irwin, 2013).

These findings from Canadian medical students are not dissimilar to medical students from other countries in which they strongly believe physical activity counselling is highly relevant to their future practice (Dacey et al., 2014; Frank et al., 2003; Gnanendran et al., 2011), many feel they are not prepared to give physical activity advice to the general population (Dunlop & Murray, 2013), and their medical school has a responsibility to encourage students to exercise and stay physically active (Gnanendran et al., 2011). Interestingly, Frank et al. (2008) found students perceived physical activity counselling to be highly relevant to their intended practice at entry to medical school, but less so than in their senior year and they attributed this to the negative experience when they were working as clinicians as they did not feel competent providing physical activity counselling.

The participants demonstrated positively skewed attitudes for the importance and relevance of physical activity in the field of medicine, suggesting these beliefs may be brought to medical school and hold strong across their education and training. Unfortunately they do not feel they have the knowledge and confidence to counsel their

patients regarding physical activity, and beyond general knowledge, they do not feel they are prepared to provide specific exercise programs to their patients. They also feel strongly medical schools should enable and support a healthy environment for their students and faculty should role model healthy lifestyles, but they feel they do not. The participants beliefs and attitudes are strong. They are interested and receptive. Medical schools have a captive audience and should provide the support to maintain and bolster their skillset and confidence for an exercise medicine approach in healthcare.

Referring to Allied Health Professionals

Participants overwhelmingly (95.0%) felt as future physicians it is their role to prescribe physical activity to their patients. Reasons identified were numerous and related to preventative health and chronic disease management with few barriers identified. As students who are not yet practicing, they may not be aware of barriers to being able to provide this level of support for patients.

Physicians have often identified a lack of knowledge, confidence, training, incentive, time, and resources to be able to provide appropriate and effective physical activity advice and counselling to their patients (Belanger et al., 2015). Likewise, medical students feel they lack the knowledge, confidence, and/or competence to prescribe specific physical activity programs for their patients (Holtz et al., 2013; Solmundson et al., 2016; Vallance et al., 2008). In order to address some of these challenges, the EIM approach suggests physical activity professionals can serve as an extension of the health care team. These qualified individuals have specialized skillsets to be able to provide customized physical activity programs for patients. When asked about referring patients to allied health professionals for exercise prescription advice, participants indicated a preference for physiotherapists (87.0%) and exercise physiologists/kinesiologists (85.4%), with modest support for athletic trainers (64.1%), but minimal endorsement for nurses (11.5%).

Partnerships between the health care sector and community resources can work towards collaborative patient care. If there continues to be a lack of confidence, competence, and time for physicians to effectively prescribe physical activity to their patients, learning about other professionals, their scope of practice, and specialised skill

may address the current gap for specific and effective exercise programming for patients.

General Health and Personal Health Practices of the Participants

The final central research question was to investigate the personal health practices of UBC MD students and whether they are role models for healthy active living. The majority (89.8%) of participants reported their health as good to excellent with no (62.0%) health concerns. These general health indicators were the same across all groups. This is not unexpected for a population with a mean age of 25.5 years and is similar to that found by Frank et al. (2006). Notably, and concerning, over a quarter of the participants identified as having mental health concerns which is representative of the awareness, disclosures, and diagnoses for mental health conditions such as anxiety, mood, addiction, and stress related disorders that have been increasingly present across higher education campuses (Giamos, Young Soo Lee, Sulieman, Stuart, & Chen, 2017).

The self reported mean height (171.8 cm), weight (70.0 kg), and subsequent calculated body mass index (23.6 kg/m^2) of the sample population was classified as normal or healthy and similar across all groups. These characteristics were comparable to those reported in previous UBC MD student cohorts (Holtz et al., 2013; Solmundson et al., 2016), across Canada (Hughes et al., 2017), in Brazil (Peleias et al., 2017), the United Kingdom (Radenkovic et al., 2019), and the United States (Connor et al., 2015; Frank et al., 2006; Stanford et al., 2012, 2014) demonstrating the homogeneic characteristics among medical school populations.

The majority (76.8%) of participants reported meeting 150 minutes of moderate-vigorous intensity physical activity and the mean Godin Leisure Time Exercise Score was 55.6 which is a classification of Active. This is more active than the average Canadian adult population in which 52.5% self reported meeting the Canadian Physical Activity Guidelines in 2009 (Colley et al., 2011) and age matched population 64.3% in 2018 (https://www.doi.org/10.25318/1310009601-eng).

In comparison, Holtz et al. (2013) found 64% of UBC fourth year medical students to be meeting Canadian Physical Activity Guidelines and a mean Godin Leisure

Time Exercise Score of 51. In addition, Solmundson et al. (2016) reported 51.9% of UBC family medicine residents to be meeting Canadian Physical Activity Guidelines but unfortunately they reported being less active than prior to medial training.

In other cohorts of Canadian medical students, one study found only 40% met Canadian Physical Activity Guidelines (Vallance et al., 2008) while another study found 64% of Canadian medical students were meeting Canadian Physical Activity Guidelines and this was the same across medical school years (Ng & Irwin, 2013). These results from Canadian medical students are comparable to the physical activity levels of medical students from other countries. Frank et al. (2003, 2008) found 61-64%, Gnanendran et al. (2019) found 70%, and Stanford et al. (2012) found 78% of medical students to have met their respective national physical activity guidelines.

This study demonstrated the UBC MD students were more active than the average Canadian adult population and other medical student cohorts (Frank et al., 2008; Gnanendran et al., 2011; Holtz et al., 2013). Like other research, there were no differences in physical activity levels between groups, suggesting medical students are already sufficiently active prior to attending medical school (Frank et al., 2008; Ng & Irwin, 2013; Peleias et al., 2017). This is important as the evidence suggests the more active a medical student (or physician) is, the more likely they are to promote physical activity with their patients in their clinical practice (Abramson et al., 2000; Frank et al., 2008; Gnanendran et al., 2011; Green et al., 2018; Holtz et al., 2013; Lobelo et al., 2009; Stanford et al., 2014). However, a few studies reported medical students being less active since attending medical school (Gnanendran et al., 2011; Solmundson et al., 2016). This is cause for concern and emphasizes medical schools need to look for ways to facilitate and support their students to maintain sufficient physical activity levels while attending their medical programs.

While the participants were a physically active population, they were also a sedentary population with a mean of 810 minutes of sedentary time per week and significantly more in the Year 2 cohort, possibly due to the particular demands of their curriculum as this sedentary time is likely associated with the amount of time they spend in learning environments and studying. Frequent and lengthy periods of sedentary behaviour are expected in populations in learning environments, suggesting a need to practice healthy ways to break up this sedentary time such as alternating sit-stand time

and stretch/walking breaks throughout the day. Rounding out the movement behaviours spectrum, the participants reported a mean of 7.0 hours of sleep per night, which meets healthy recommendations for sleep duration (Ross et al., 2020).

Other personal health practices for participants included eating fruit a mean of 2.1 times a day and 12.0 times per week, eating vegetables a mean of 2.7 times per day and 16.1 times per week, no cigarette or tobacco product use (96.4%), no drug use (86.7%), drinking a glass/bottle/can of alcohol less frequently than once a week (61.0%), a mean (SD) of 0.7 (1.2) times in a month for drinking more than five drinks on one occasion, and the majority of participants felt their ability to handle unexpected/difficult situations is excellent or good (78.6%) as well as their ability to handle day to day demands is excellent or good (84.2%). These indicators of healthy habits and practices were similar across all groups and comparable to previous research (Frank et al., 2006; Radenkovic et al., 2019; Solmundson et al., 2016).

Overall the participants seemed to be healthy and have healthy habits and behaviours, including being more physically active than the general population and UBC MD student cohorts before them. And these personal health practices were stable between groups suggesting the behaviours are brought to medical school rather than established during medical training. The higher proportion of participants achieving Canadian Physical Activity Guidelines demonstrates an increasing recognition for the benefits of being physically active to maintain physical health and well-being, as well as the belief that their credibility and influence has an impact on their patients' health.

Summary

The primary purpose of the discussion was to respond to the research questions that aimed to describe the UBC MD students' physical activity knowledge, attitudes, and own personal preferences for a healthy lifestyle with comparison to previous cohorts, the literature, as well as providing interpretation of the findings.

Participants were a representative sample of the UBC MD student cohort based on their demographics and characteristics. The proportion of females was higher and needs to be acknowledged, however, this was similar to previous studies. Response rates were justifiable and findings can be generalized to the UBC MD student population.

Participants' awareness and knowledge was greatest for Canadian Physical Activity Guidelines for Adults and moderate for Children and Youth, but insufficient for other populations. This level of awareness for adults and children and youth has increased compared to similar research of UBC MD cohorts over the past 10 years. This is likely due to more dedicated and targeted content and time being incorporated into the UBC medical education curriculum as evidenced in the curriculum session abstracts and objectives. However, participants had a lack of understanding of how to apply the physical activity content to be able to advise patients on specific exercise prescriptions for health. There continues to be a need for more and better education if physicians are going to be successfully assessing and prescribing physical activity in an EIM approach to increase population health.

Participants perceived having spent seven or less hours of time discussing physical activity content and how to talk to their patients about it. This is likely a good projection given the UBC documents detail 11 hours of time primarily dedicated to these topics. Participants were interested in spending more time in medical school talking about physical activity and this desire was even greater for more time spent learning how to talk to their patients about physical activity. Again, this is aligned with the greater proportion of time dedicated to physical activity content in the UBC curriculum documents compared to the lesser time dedicated to motivational interviewing or patient counselling techniques. These findings are similar to previous UBC MD cohorts and medical students from other countries. Overall there continues to be a lack of education and training being offered, but a strong desire from medical students to receive more physical activity education to feel confident and competent to provide physical activity advice and prescriptions to their patients.

Participants, encouragingly, had positively skewed responses for the importance and relevance for physical activity education and counselling for future clinical practice. Not as positive were the participants perceived knowledge and confidence to be able to provide appropriate and effective physical activity advice in the field of medicine. In addition, the participants felt strongly the medical school and its faculty should encourage, support, and model healthy lifestyles, but they do not feel this is the situation. The findings are not unlike former UBC MD student populations or medical students from other countries. Medical students overwhelmingly feel physical activity

education and healthy lifestyles are important, but they do not feel they are getting the training or support needed to be leaders themselves in exercise medicine.

Almost all participants believed it is their role to provide physical activity counselling for their patients, but a recognition for a lack of education, confidence, time, and resources, suggests they may consider an EIM approach in which they utilize qualified health professionals in the community to assist with providing custom physical activity prescriptions for their patients, especially since detailed prescriptions are more effective than general encouragement to be more active. In order for this to be successful it would be important to incorporate education about who these qualified professionals are into their medical education curriculum so medical students have a better idea of who their allies are, what their scope of practice is, and what skill sets they can provide in the care plans for the patients.

Generally participants reported their health as excellent or good with healthy lifestyle behaviours, including meeting Canadian Physical Activity Guidelines. The participants had better health habits than the general population, previous UBC MD students, and medical students from other countries. Troubling was the proportion of participants who reported mental health concerns and this is representative of todays post secondary education students who seem to be carrying much more stress and anxiety. Opportunities for medical students to continue to be active and practice healthy lifestyle in their learning environments will help them cope with the day to day challenges as well as leading them to be more likely to provide physical activity advice to their patients in the future.

The findings demonstrated that knowledge and confidence increased in frequency after the first year of medical school indicating some improvement with experience and exposure in the UBC medical program. But even with the increases seen after the first year, there continues to be insufficient education and training related to exercise medicine and students are asking for more. In addition, while it is encouraging the participants were physically active with good personal health practices, it seems these behaviours are brought to medical school rather than instituted during medical school, and participants perceived the medical school environment to be unsupportive of maintaining their healthy lifestyles. Because of the abundance of evidence physical activity and healthy lifestyles, and positive attitudes towards physical

activity, consistently influence the likelihood of counselling patients regarding physical activity, having a medical school environment that encourages and supports medial students to be active and live healthy is important and will likely have a positive impact on the health of their future patients.

Limitations of the Study

There are limitations to this study including the cross-sectional design. Cross sectional approaches to research do not allow for comparisons as the data are only representative of that point in time so definitive conclusions cannot be made about causal relationships, nor is it possible to determine if participants changed their physical activity related knowledge, attitudes, and/or health practices as they progress through their medical training. However, the study was not investigating an intervention or change over time, so the design was appropriate for the purpose of this study and important conclusions can be drawn about the data collected by participant responses in different years of the medical program.

Another limitation is selection bias that those who are interested in the topics of physical activity and exercise in the field or medicine and perhaps those more physically active with healthy lifestyles volunteered for the study, leading to over reporting of physical activity and indicators of health which are not representative of the entire UBC MD student population. Without having any contact with nonresponders it is not possible to know if there is participant bias in this sample. It should also be acknowledged the higher number of females may also be a source for bias. However, the participants demographics were representative of the UBC MD medical program geographical distribution and participant characteristics were similar to UBC MD admission data and that of former cohorts, resulting in confidence that the sample was representation of the UBC MD student population.

The small sample size can limit generalizability of the results beyond the UBC MD population. However, the purpose of the study was not meant to be used to generalize or describe a larger population, it was limited only to describe UBC MD students to provide feedback and recommendations regarding the UBC MD medical program, while contributing to the growing body of literature for physical activity and exercise in the field of medicine and medical education. However, because the

participant characteristics were similar to prior studies of medical students across Canada and in other countries this suggests some contribution to the broader literature.

Other limitations were related to the survey instrument itself. Self reporting introduces the concept of social desirability bias which has the potential to lead to inaccurate responses through over or under reporting. In this study, social desirability would lead to overestimating of physical activity levels and/or indicators of health as they are perceived as admirable attributes and behaviours. Self reporting can also lead to less accuracy due to recall issues as well as subjective response variations. While the use of close ended questions assisted in keeping subjectivity to a minimum and responses to be quick, it also resulted in possible interpretation issues and less in depth and contextual information being collected. These recall and response biases would also lead to over or under reporting which influences the findings and the generalizability of the research. In order to reduce these impacts, the survey incorporated a standard instrument and questions previously used to assess Canadian and United States medical students' physical activity knowledge, attitudes and health behaviours, but it is acknowledged it may impact the ability to confidently interpret the results and generalize findings.

Despite these limitations, the research to describe and quantify characteristics and determinants of the UBC MD student population can be useful information for future UBC MD student cohorts and for purposes of improving medical education and health care provision.

Recommendations

The EIM initiative advocates physicians make physical activity assessment and prescription a standard part of disease prevention and treatment paradigm for all patients (Sallis, 2009). Recognizing the role physicians can play in helping to increase physical activity levels and overall health and well-being of the population, there is a growing interest in EIM and it is more important than ever with significant inactivity levels and associated detrimental health outcomes and rising health care costs (Janssen, 2012; Lee et al., 2012). The evidence for physical activity advice in the promotion of the prevention and treatment of chronic disease is abundant (Pedersen & Saltin, 2015). On this basis of evidence, physicians have a moral, ethical, and professional obligation to

inform patients of the risks of being inactive and provide them with a proper physical activity prescription to get active, be more active (Joy et al., 2013; Sallis et al., 2014). In addition, at a global level, exercise medicine has been mandated as a prominent feature for medical curriculum and identified for inclusion in medical schools.

The findings from this study added to the previous body of literature related to medical students' physical activity related knowledge, attitudes, and health behaviours in the field of medicine and provided information about improvements to physical activity education in UBC's MD medical program over the past years. There have been tremendous improvements in the medical curriculum as evidenced by the greater awareness and knowledge related to the topics of physical activity and increased physical activity levels of the participants. However, UBC MD students continue to feel they have insufficient knowledge and understanding of physical activity content and how to talk to their patients regarding physical activity. The UBC MD students acknowledge their education and training is lacking and they are asking for more time to be spent on these topics to better prepare them for future clinical practice. Encouragingly, the UBC MD students have overwhelmingly positive attitudes about the importance and relevance of physical activity and their role to prescribe physical activity to their patients in their future practice. In addition, the majority of the UBC MD students are physically active and have healthy habits, providing a solid foundation for counselling their patients regarding physical activity. These students are interested and receptive to further education and training in exercise medicine. The time is right.

Not only is it important to look for ways to enhance the physical activity education in UBC's medical curriculum but also to incorporate ways to create and support medical students to be physical activity and live healthy lifestyles as part of their time spent in medical school. In addition, the medical school faculty can play instrumental leadership roles in influencing the healthcare sector to influence policy and practice for their graduates so that as practicing physicians they will have reduced barriers and incentives to take an EIM approach in their day to day clinical practice. The experiences shared by the participants have informed several recommendations for the UBC MD medical school and curriculum design as well as healthcare policy and practice.

Recommendations for UBC Medical Education: Curriculum Revision, Design, and Environment

While there has been increased awareness and knowledge of physical activity content over the past years, it seems education and training is still insufficient for medical students to be able to provide, and feel confident about providing physical activity prescriptions for patients. Effective prescriptions are specific, not general, and include a successful combination of physical activity details about frequency, intensity, time/duration and type, as well as consideration for specific activity instructions, contraindications, and progressions for the patient. This level of prescription requires in depth and breadth of physical activity content understanding.

Advising a patient on physical activity is complex. Not only is the information detailed and specific but also important is how to counsel a patient through behaviour change. And as with medication prescriptions, the combinations, interactions, and specific details need to be understood, same is true for physical activity prescription. Physical activity guidelines, much like clinical practice guidelines for diseases and conditions are just that, guidelines, however, there are certain intricacies that are required for the best recommendation for each patient.

- Because of this level of sophistication, and because the medical community is calling for better and more physical activity education in order to provide an EIM approach in health care, a recommendation is for UBC to find ways to include more physical activity related sessions that add depth and detail into the physical activity education components of the medical curriculum. This could be incorporating time for various examples, case studies, and practice scenarios in order to have exposure to rehearse developing exercise prescriptions for a variety of patient situations. It may also incorporate more time for motivational interviewing techniques through role playing, mock situations, and practical opportunities for patient counselling. This added curriculum should be integrated across the four years such as lifestyle-based curriculum, not just in a block session covered at one point in time.

- While it’s recognized there has been improvements in physical activity knowledge related to Canadian Physical Activity Guidelines for Adults, and

somewhat for Children and Youth, likely the result of inclusion in the medical education curriculum objectives, a recommnedation is to also incorporate the physical activity recommendations for Older Adults and the Early Years and update the curriculum to include the recently released 24 Hour Movement Guidelines for all four population groups as well.

- Given that physical activity is a leading modifiable risk factor globally, making it a priority for inclusion seems imperative. However, because many curriculum revisions are often approached from the perspective that the curriculum is “full” and that adding one thing will mean taking something away, and because this may not be possible with so many competing priorities, another option would be to look for ways to incorporate the information in other ways. From the UBC medical education curriculum documents it seems they have already begun to find ways to incorporate physical activity content through the use of “themes” which means that as other topics are discussed, physical activity may be something considered as an option, factor, or consideration by integrating into current courses or clinical experiences, ensuring that physical activity as a vital sign is assessed in every themed case or scenario. Other means of adding this much needed physical activity education and counselling content outside of the formal curriculum delivery model is through online modules and elective coursework to close the gap on knowledge and skills. Delivery of topics such as physical activity prescription courses, and personal health promotion courses that teach medical students how to maintain their own well being with physical activity, nutrition, other personal health practices, time management, and coping strategies would be impactful.

- Regardless of the amount of additional physical activity education and training that could be incorporated at UBC MD medical school, it is acknowledged physicians report other barriers to being able to effectively provide physical activity advice to their patients, including a lack of time and incentive for discussing physical activity with patients. Even if medical students and future physicians gain adequate knowledge and confidence to talk to their patients regarding physical activity these barriers may remain in the healthcare setting, so it may be prudent for UBC to look at expanding on the EIM approach by exposing medical students to the expertise and scope of practice of allied health

professionals such as exercise physiologists, kinesiologists, physiotherapists, and counsellors who can assist in providing patients with specific and effective physical activity prescriptions and behaviour change strategies when physicians do not have the time or supportive policies to be able to. Providing medical students with education from and about these professionals will help them develop and understand their physical activity related referral networks for the future when they are in clinical practice.

- Another area of recommendation is for medical schools to look for ways to provide a healthy learning environment in which medical students are physically active, and other personal health practices are encouraged and supported while attending medical school. A physicians' health matters and it has been demonstrated that their physical activity practices influence the likelihood that they will provide physical activity advice to patients in the healthcare setting. These associations are already present at the beginning of medical training so its important the medical school environment is supportive for those wishing to adopt and maintain regular physical activity to enhance their frequency and relevancy of physical activity counselling for patients. Perhaps there are interventions or ways to include opportunities for medical students to undergo their own behaviour change to becoming more physically active such as exercise classes, intramurals, team sports, walking meetings, providing them with their own personal trainer, access to fitness facilities, and inhouse wellness programs that are incorporated into their day of learning in medical school. These personal health behaviours will carry forward into their future lives as practicing physicians.

- Certainly having a champion lead these changes will be key. Having someone from UBC who is well respected and knowledgeable in exercise medicine or physical activity education to bring other medical faculty and physical activity experts together for curriculum revision, design, and implementation. Perhaps medical faculty do not feel they have the expertise to teach this content and thus look for partnerships with exercise physiology, kinesiology, and/or sports medicine experts to help develop and deliver curriculum in an environment medical students feel is important and are seeking as part of their education and training. In addition, it seems important faculty lead healthy lifestyles and role

model the values they want to instil in their students. Facilitating and expecting faculty to be physically active and supporting students to lead healthy lifestyles will be noticed, appreciated, and influential. These are significant components to preparing future physicians to effectively prescribe physical activity to their patients with a considerable impact on the prevention and management of chronic disease and associated health care costs.

Recommendations for Health Care: Education, Policy, and Practice

EIM is an initiative that promotes physical activity counselling and prescriptions within healthcare as part of patients' routine visits. The initiative has put forward a number of ideas, strategies, tools and resources to assist physicians in their health promotion for the purpose of chronic disease prevention and management to improve the health of all. There is a need to move beyond providing information only. Finding ways to increase physicians counselling behaviours may include continuing education as well as system and structural changes in policy and practice systems.

- Ongoing educational opportunities for physicians may assist in improving physical activity counselling. Ways for providing a boost in knowledge, confidence, and competence for physical activity education in practicing physicians would be ongoing continuing educational opportunities such as online modules, workshops, hospital rounds, and lunch hour lectures. These sessions need to be valued, beneficial, and incentivized such as earning continuing medical education credits for licensure and paid time to be able to attend and complete educational opportunities.

- When physicians' occupational demands and patients loads are too large, and schedules are too busy, opportunities to educate and connect physicians with referral networks of allied health professions and the fitness industry to provide physical activity prescriptions can be invaluable. Providing opportunities for physicians to learn about their community partners and build relationships are critical ways to ease the burden on physicians and incorporate highly skilled professionals to contribute to patients care. Physicians would have the responsibility to assess and recommend physical activity for their patients and provide referrals to physical activity

professionals and counsellors to assist with healthy lifestyle changes. The use of referral networks and multi- and inter-disciplinary teams can have effective outcomes in remote areas of the province in which physicians' loads are stretched and working with community partners is beneficial. Physicians can leverage their credibility, expertise, relationships, and professional networks to increase the promotion of physical activity to patients, colleagues, and communities.

- Healthcare systems need to shift payment and billing schedules to place value on population health. If physicians were provided with incentives or billing systems that recognize and promote physical activity, it would facilitate this upstream care with long term effects for reducing health care costs. Much education needs to occur with regulatory bodies who dictate what services physicians can provide for reimbursement. Currently preventative services are not on billing schedules making it difficult for physicians to be reimbursed. If EIM approaches are supported by the profession, the regulatory bodies need to find ways to include the physical activity vital sign on annual visits and associated treatment (physical activity prescriptions) to be billable services in health care. UBC medical school faculty can play a role in advocating for these changes through their professional bodies and other avenues to impact health care system in the province.

- In today's technological age, there are many ways to look to ease physicians' workloads. The use of apps, phones, web-based resources as well as office-based resources such as Canadian Physical Activity Guidelines pamphlets, and (EIM) exercise prescription pads can be helpful for patients' advisement and counselling sessions. Bringing awareness to physicians about what these resources are and how they work, can assist in medical office health promotion efforts. With high levels of physical inactivity and chronic disease, physicians' role to promote physical activity to improve quality of life for all populations is important.

Recommendations for Further Research

- The findings from this study have led to a number of recommendations for future research. Given the baseline results provided by these cohorts of UBC MD students, one recommendation would be to follow these students longitudinally through their medical program and into their future practice to be able to track and measure their physical activity related knowledge, attitudes, and health behaviours as well as whether they prescribe and counsel their patients about physical activity in the clinical setting. It would also be interesting to investigate the impact of future changes in the medical curriculum, and/or any physical activity education they may receive as part of their medical specialty residency training over time, as that was not included in this study.

- Another avenue for research is to provide an experimental, or quasi-experimental approach by implementing an intervention of some kind, perhaps a dedicated and detailed specific physical activity prescription course, additional training in motivational interviewing techniques, or a personal health course for the UBC MD students, and then measure any change in their physical activity related knowledge, attitudes, and personal health practices.

- Another recommendation for research would be to utilize a similar cross-sectional study design to investigate future UBC MD student cohorts following any changes to physical activity education in the UBC MD medical curriculum. And finally, this study design could be replicated to investigate other medical students and medical schools in Canada and beyond. Physicians, and physicians in training play a key role in health care and public health so its important to study their physical activity related attitudes, beliefs and health behaviours.

Conclusions

The UBC MD students strongly believe physical activity is important for their patients and their future practice, they have positive attitudes towards physical activity,

and they are physically active and have healthy habits. The UBC MD students are interested and receptive to tackling the physical inactivity public health crisis and believe it is their role to prescribe physical activity to their patients to increase physical activity levels and the overall health of the population, in an effort to reduce the risk of chronic disease in their patients and help decrease health care costs.

However, the UBC MD students are lacking awareness, knowledge, and understanding of physical activity, prescription provision, and how to talk to their patients about it. They feel their education, training, and support from the medical school is insufficient and they want more dedicated time and exercise medicine content to be confident and effective in their clinical practice.

This study was important because it provided insight into the UBC MD students' physical activity related knowledge, attitudes, and health behaviours and how this might impact their patients' health. It also added important data for curriculum development and design, suggesting more robust physical activity curriculum might equip medical students' with knowledge, skills, confidence, and abilities to increase frequency of effective counselling. Better education, training, and health care policies and practice guidelines that empowering physicians in physical activity prescription is critical in the help to fight the physical inactivity crisis.

References

Abramson, S., Stein, J., Schaufele, M., Frates, E., & Rogan, S. (2000). Personal exercise habits and counseling practices of primary care physicians: A national survey. *Clinical Journal of Sport Medicine, 10*(1), 40-48.

Atkinson, M. (2012). *Key Concepts in Sport and Exercise Research Methods*. SAGE: Los Angeles, CA.

Babbie, E. R. (1990). *Survey Research Methods* (2nd Ed). Wadsworth Publishing Company: Belmont CA.

Belanger, M., Couturier, E., Dion, N., Girouard, V., Phillips, J., & Brunet, J. (2015). Family physicians' perceptions toward writing physical activity prescriptions: I tell patients it's like the super pill! *Quality in Primary Care, 23*(2), 113-121.

Bennett, C., Khangura, S., Brehaut, J. C., Graham, I. D., Moher, D., Potter, B. K., & Grimshaw, J. M. (2010). Reporting guidelines for survey research: an analysis of published guidance and reporting practices. *Plos Medicine, 8*(8), e1001069.

Blair, S. N. (2009). Physical inactivity: the biggest public health problem of the 21st century. *British Journal of Sports Medicine, 43*(1), 1-2.

Bounajm, F., Dinh, T., & Theriault, L. (2014). Moving ahead: The economic impact of reducing physical inactivity and sedentary behaviour. *The Conference Board of Canada*. http://www.conferenceboard.ca/e-library/abstract.aspx?did=6436

Buffart, L. M., van der Ploeg, H. P., Smith, B. J., Kurko, J., King, L., & Bauman, A. E. (2009). General practitioners' perceptions and practices of physical activity counselling: changes over the past 10 years. *British Journal of Sports Medicine, 43*(14), 1149-1153.

Cardinal, B. J., Park, E. A., Kim, M., & Cardinal, M. K. (2015). If exercise is medicine, where is the exercise in medicine? Review of U. S. medical education curricula for physical activity related content. *Journal of Physical Activity and Health, 12*(9), 1336-1343.

Caspersen, C. J., Powell, K. E., & Christ, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126-131.

Colley, R. C., Garriguet, D., Janssen, I., Craig, C. L., Clarke, J., & Tremblay, M. S. (2011). Physical activity of Canadian adults: Accelerometer results from 2007 to 2009 Canadian Health Measures Survey. *Health Reports, 22*(10), 1-8.

Connaughton, A. V., Weiler, R. M., & Connaughton, D. P. (2001). Graduating medical students' exercise prescription competence as perceived by deans and directors of medical education in the United States: Implications for Healthy People 2010. *Public Health Reports, 116*(3), 226-234.

Connor, R., Cialdella-Kam, L., & Harris, S. R. (2015). A survey of medical student's use of nutritional resources and perceived competency in providing basic nutrition education. *Journal of Biomedical Education*, doi:10.1155/2015/181502

Cull, W. L., O'Connor, K. G., Sharp, S., & Tang, S. F. (2005). Response rates and response bias for 50 surveys of pediatricians. *Health Services Research, 40*(1), 213-226.

Cunningham, C. T., Quan, H., Hemmelgam, B., Noseworthy, T., Beck, C. A., Dixon, E., Samual, S., Ghali, W. A., Sykes, L. L., & Jette, N. (2015). Exploring physician specialist response rates to web based surveys. *Biomedical Central Medical Research Methodology, 15*(32), doi:10.1186/s12874-015-0016-z

Dacey, M. L., Kennedy, M. A., Polak, R., & Phillips, E. M. (2014). Physical activity counselling in medical school education: A systematic review. *Medical Education Online, 19*(1), doi:10.3402/meo.v19.24325

Dunlop, M., & Murray, A. D. (2013). Major limitations in knowledge of physical activity guidelines among U. K. medical students revealed: implications for the undergraduate medical curriculum. *British Journal of Sports Medicine, 47*(11), 718-720.

Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet Research, 15*(2), 195-219.

Frank, E., Carrera, J. S., Elon, L., & Hertzberg, V. S. (2006). Basic demographics, health practices, and health status of U. S. medical students. *American Journal of Preventive Medicine, 31*(6), 499-505.

Frank, E., Galuska, D. A., Elon, L. K., & Wright. (2003). Personal and clinical exercise related attitudes and behaviors of freshmen U. S. medical students. *Research Quarterly for Exercise and Sport, 75*(2), 112-121.

Frank, E., & Segura, C. (2009). Health practices of Canadian physicians. *Canadian Family Physician, 55,* 810-811.e1-7

Frank, E., Tong, E., Lobelo, F., Carrera, J., & Duperly, J. (2008). Physical activity levels and counseling practices of U. S. medical students. *Medicine and Science in Sports and Exercise, 40*(3), 413-421.

Frank, E., Wright, E., Serdula, M., & Elon, L. K. (2003). Exercise counseling and personal exercise habits of U. S. women physicians. *Journal of Womens Health, 58*(3), 178-184.

Garry, J. P., Diamond, J. J., & Whitley, T. W. (2002). Physical activity curricula in medical schools. *Academic Medicine, 77*(8), 818-820.

Giamos, D., Young Soo Lee, A., Suleman, A., Stuart, H., & Chen, S. (2017). Understanding campus culture and student coping strategies for mental health issues in five Canadian colleges and universities. *Canadian Journal of Higher Education, 47*(3), 120-135.

Gnanendran, A., Pyne, D. B., Fallon, K. E., & Fricker, P. A. (2011). Attitudes of medical students, clinicians and sports scientists towards exercise counselling. *Journal of Sports Science and Medicine, 10*(2), 426-431.

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behaviour in the community. *Canadian Journal of Applied Sport Science, 10*(3), 141-146.

Green, A., Engstrom, C., & Friis, P. (2018). Exercise: An essential evidence-based medicine. *The Medical Journal of Australia, 208*(6), 242-243.

Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., & Ekelund, U. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *Lancet, 380*, 247-257.

Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., G. W., Thompson, P. D., & Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medicine and Science in Sports and Exercise, 39*(8), 1423-1434.

Hébert, E. T., Caughy, M. O., & Shuval, K. (2012). Primary care providers' perceptions of physical activity counselling in a clinical setting: A systematic review. *British Journal of Sports Medicine, 46*(9), 625-631.

Hendrik, J. F., Helmerhorst, S. B., Warren, J., Besson, H., & Ekelund, U. (2012). A systematic review of reliability and objective criterion-related validity of physical activity questionnaires. *International Journal of Behaviour Nutrition and Physical Activity, 9*(1), 103.

Holtz, K. A., Kokotilo, K. J., Fitzgerald, B. E., & Frank, E. (2013). Exercise behaviour and attitudes among fourth-year medical students at the University of British Columbia. *Canadian Family Physician, 59*(1), e26-e32.

Hughes, M. J. D., Azzi, E. R., Gregory, W., Ramnanan, C. J., & Khamisa, K. (2017). A survey of senior medical students' attitudes and awareness toward teaching and participation in a formal clinical teaching elective: A Canada perspective. *Medical Education Online, 22*(1), doi:10.11080/10872981.2016.1270022

Janssen, I. (2012). Health care costs of physical inactivity in Canadian adults. *Applied Physiology, Nutrition, and Metabolism, 37*(4), 803-806.

Joy, E., Blair, S. N., McBride, P., & Sallis, R. (2013). Physical activity counselling in sports medicine: A call to action. *British Journal of Sports Medicine, 47*(1), 49-53.

Katzmarzyk, P. T, Church, T. S., Craig, C. L. & Bouchard, C. (2009). Sitting time and mortality from all causes, cardiovascular disease, and cancer. *Medicine and Science in Sports and Exercise, 41*(5), 998-1005.

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care, 15*(3), 261-266.

Kennedy, M., & Meeuwisse, F. (2003). Exercise counselling by family physicians in Canada. *Preventive Medicine, 37*(3), 226-232.

Khan, R., Apramian, T., Kang, J. H., Gustafson, J., & Sibbald, S. (2020). Demographic and socioeconomic characteristics of Canadian medical students: a cross-sectional study. *BMC Medical Education, 20*:151

Krosnick, J.A. (1999). Survey research. *Annual Review of Psychology, 50*, 537-567.

Krueger, H., Turner, D., Krueger, J., & Ready, E. (2014). The economic benefits of risk factor reduction in Canada: Tobacco smoking, excess weight and physical inactivity. *Canadian Journal of Public Health, 105*(10), e69-e78.

Lee, I. M., & Sherrett, P. J. (2001). Physical activity and all cause mortality: What is the dose-response relation? *Medicine and Science in Sports and Exercise, 33*(Suppl 6), S459-S471.

Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet, 380*, 219-229.

Lobelo, F., Duperly, J., & Frank, E. (2009). Physical activity habits of doctors and medical students influence their counselling practices. *British Journal of Sports Medicine, 43*(2), 89-92.

Lobelo, F., & Garcia de Quevedo, I. (2014). The evidence in support of physicians and health care providers as physical activity role models. *American Journal of Lifestyle Medicine, 10*(1), 36-52.

Lobelo, F., Stoutenberg, M., & Hutber, A. (2014). The Exercise is Medicine global health initiative: A 2014 update. *British Journal of Sports Medicine, 48*(22), 1627-1633.

Mäder, U., Martin, B. W., Schutz, Y., & Marti, B. (2006). Validity of four short physical activity questionnaires in middle-aged persons. *Medicine and Science in Sports and Exercise, 38*(7), 1255-1266.

Morris, J. N., Heady, J. A., Raffle, P. A. B., Roberts, C. G., & Parks, J. W. (1953). Coronary heart disease and physical activity of work. *Lancet, 262*, 1053-1057.

Ng, V., & Irwin, J. D. (2013). Prescriptive medicine: The importance of preparing Canadian medical students to counsel patients towards physical activity. *Journal of Physical Activity and Health 10*(6), 889-899.

Nolte, M. T., Shauver, M. J., & Chung, K. C. (2015). Structure and establishing validity in survey research. *Plastic and Reconstructive Surgery, 135*(1), e216-e222.

Paffenbarger, R. S. Jr., Hyde, R. T., Wing, A. L., & Hsieh, C. C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. *New England Journal of Medicine, 314*(10), 605-613.

Pandya, T., & Marino, K. (2018). Embedding sports and exercise medicine into the medical curriculum: A call for inclusion. *Biomedical Central Medical Education, 18*(1), 306.

Passmore, C., Dobbie, A. E., Parachman, M., & Tysinger, J. (2002). Guidelines for constructing a survey. *Family Medicine, 34*(4), 281-286.

Pate, R. R., Pratt, M., & Blair, S. N. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *The Journal of the American Medical Association, 273*(5), 402-407.

Pedersen, B. K., & Saltin, B. (2015). Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scandinavian Journal of Medicine & Science in Sports, 25*(Suppl 3), 1-72.

Peleias, M., Tempski, P., Paro, H. B. M. S., Perotta, B., Mayer, F. B., Enns, S. C., Gannam, S., Pereira, M. A. D., Silveira, P. S., Santos, I. S., Carvalho, C. R. F., Martin, M. A. (2017). Leisure time physical activity and quality of life in medical students: Results from a multicentre study. *British Medical Journal Open Sport & Exercise Medicine, 3*(1), e000213.

Pereira, M. A., FitzerGerald, S. J., Gregg, E. W., Joswiak, M. L., Ryan, W. J., Suminski, R. R., Utter, A. C., & Zmuda, J. M. (1997). A collection of physical activity questionnaires for health-related research. *Medicine and Science in Sports and Exercise, 29*(Suppl 6), S1-S205.

Petrella, R. J., Koval, J. J., Cunningham, D. A., & Paterson, D. H. (2003). Can primary care doctors prescribe exercise to improve fitness? the Step Test Prescription (STEP) Project. *American Journal of Preventive Medicine, 24*(4), 316-322.

Petrella, R. J., Lattazzio, C.N., & Overend, T. J. (2007). Physical activity counselling and prescription among Canadian primary care physicians. *Archives of Internal Medicine, 167*(16), 1774-1781.

Physical Activity Guidelines Advisory Committee. (2008). *Physical Activity Guidelines Advisory Committee Report*. Washington, DC: U. S. Department of Health and Human Services. Retrieved from http://www.health.gov/paguidelines/report/

Physical Activity Guidelines Advisory Committee. (2018*). Physical Activity Guidelines Advisory Committee Scientific Report.* Washington, DC: U. S. Department of Health and Human Services. Retrieved from https://www.health.gov/our-work/physical-activity/current-guidelines/scientific-report

Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galusk, D. A., George, S. M., & Olson, R. D. (2018). The Physical Activity Guidelines for Americans. *Journal of the American Medical Association, 320*(19), 2020-2028.

Pratt, M., Norris, J., Lobelo, F., Roux, L., & Wang, G. (2014). The cost of physical inactivity: Moving into the 21st century. *British Journal of Sports Medicine, 48*, 171-173.

Prince, S. A., Adamo, K. B., Hamel, M. E., Hardt, J., Connor Gorber, S., & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 5*(1), 56.

Radenkovic, D., Aswani, R., Ahmad, I., Kreindler, J., & Robinson, R. (2019). Lifestyle medicine and physical activity knowledge of final year UK medical students. *British Medical Journal Open Sport & Exercise Medicine, 5*, doi:10.1136/bmjsem-2019-00518

Ross, R., Chaput, J. P., Giangregorio, L. M., Janssen, I., Saunders, T. J., Kho, M. E., Poitras, V. J., Tomasone, J. R., El-Kotob, R., McLaughlin, E. C., Duggan, M., Carrier, J., Carson, V., Chastin, S. F., Latimer-Cheung, A. E., Chulak-Bozzer, T., Faulkner, G., Flood, S. M., Gazendam, M. K., Healy, G. N., Katzmarzyk, P. T., Kennedy, W., Lane, K. N., Lorbergs, A., Maclaren, K., Marr, S., Powell, K. E., Rhodes, R. E. Ross-White, A., Welsh, F., Willumsen, J., & Tremblay, M. S. (2020). Canadian 24-Hour Movement Guidelines for Adults aged 18–64 years and Adults aged 65 years or older: An integration of physical activity, sedentary behaviour, and sleep. *Applied Physiology Nutrition and Metabolism, 45*(10 Suppl. 2), S57-S101.

Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: status, limitations, and future directions. *Research Quarterly for Exercise and Sport, 71*(2), 1-14.

Sallis, R. (2009). Exercise is medicine and physicians need to prescribe it! *British Journal of Sports Medicine, 43*(1), 3-4.

Sallis, R. (2011). Developing health care systems to support exercise: Exercise as a fifth vital sign. *British Journal of Sports Medicine, 45*(6), 473-474.

Sallis, R. (2015). Exercise is medicine: a call to action for physicians to assess and prescribe exercise. *The Physician and Sports Medicine, 43*(1), 22-26.

Sallis, R., Franklin, B., Joy, L., Ross, R., Sabgir, D., & Stone, J. (2014). Strategies for promoting physical activity in clinical practice. *Progress in Cardiovascular Disease, 57*(4), 375-386.

Sedentary Behaviour Research Network. (2012). Standardized use of the terms "sedentary" and "sedentary behaviours". *Applied Physiology, Nutrition and Metabolism, 37*(3), 540–542.

Shephard, R. (2003). Limits to the measurement of habitual physical activity by questionnaires. *British Journal of Sports Medicine, 37*(3), 197-206.

Solmundson, K., Koehle M., & McKenzie, D. (2016). Are we adequately preparing the next generation of physicians to prescribe exercise as prevention and treatment? Residents express the desire for more training in exercise prescription. *Canadian Medical Education Journal, 7*(2), e79-e96.

Stanford, F. C., Martin, W. D., Blair, S. N., Powell, C. K., Poston, M. B., & Stallworth, J. R. (2012). Determining levels of physical activity in attending physicians, resident and fellow physicians and medical students in the USA. *British Journal of Sports Medicine, 46*(5), 360-364.

Stanford, F. C., Martin, W. D., Stallworth, J. R., Powell, C. K., Poston, M. B., & Blair, S. N. (2014). Factors that influence physicians' and medical students' confidence in counselling patients about physical activity. *Journal of Primary Prevention, 35*, 193-201.

Statistics Canada. Table 13-10-0096-13 Physical activity, self reported, adult, by age group, https://www.doi.org/10.25318/1310009601-eng.

Sternfeld, B., & Goldman-Rosas, L. (2012). A systematic approach to selecting an appropriate measure of self reported physical activity or sedentary behaviour. *Journal of Physical Activity and Health, 9*(Suppl 1), S19-S28.

Stoutenberg, M., Stasi, S., Stamatakis, E., Danek, D., Dufour, T., Trilk, J. L., & Blair, S. N. (2015). Physical activity training in U. S. medical school: preparing future physicians to engage in primary prevention. *The Physician and Sportsmedicine, 43*(4), 388-394.

Strong, A., Stoutenberg, M., Hobson-Powell, A., Hargreaves, M., Beeler, H., & Stamatakis, E. (2017). An evaluation of physical activity training in Australian medical school curricula. *Journal of Science and Medicine in Sport, 20*(6), 534-538.

Tannahill, A. (1985). What is health promotion? *Health Education Journal, 44*(4), 167-168.

Taylor, T., & Scott, A. (2019). Do physicians prefer to complete online or mail surveys? Findings from a National Longitudinal Survey. *Evaluation and the Health Professions, 42*(1), 41-70.

Thornton, J. S., Fremont, P., Khan, K., Poirier, P., Fowles, J., Wells, G. D., & Frankovich, R. J. (2016). Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine. *British Journal of Sports Medicine, 50*(18), 1109-1114.

Tremblay, M.S. (2012). Major initiatives related to childhood obesity and physical inactivity in Canada: The year in review. *Canadian Journal of Public Health, 103*(3), 164-169.

Tremblay, M. S., Warburton, D. E. R., Janssen, I., Paterson, D. H., Latimer, A. E., Rhodes, R. E., Kho, M. E., Hicks, A., LeBlanc, A. G., Zehr, L., Murumets, K., & Duggan, M. (2011). New Canadian physical activity guidelines. *Applied Physiology, Nutrition and Metabolism, 36*(1), 36-46.

Vallance, J. K., Wylie, M., & MacDonald, R. (2008). Medical students' self-perceived competence and prescription of patient-centred physical activity. *Preventive Medicine, 48*(2), 164-166.

van Poppel, M. N. M., Chinapaw, M. J. M., Mokkink, L. B., van Mechelen, W. & Terwee, C. B. (2010). Physical activity questionnaires for adults: A systematic review of measurement properties. *Sports Medicine, 40*(7), 565-600.

Warburton, D. E. R., Charlesworth, S., Ivey, A., Nettlefold, L., & Bredin, S. S. D. (2010). A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. *International Journal of Behavioral Nutrition and Physical Activity, 7*(1), 39.

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal, 174*(6), 801-809.

Weiler, R., Chew, S., Coombs, N., Hamer, M., & Stamatakis, E. (2012). Physical activity education in the undergraduate curricula of all UK medical schools. Are tomorrow's doctors equipped to follow clinical guidelines? *British Journal of Sports Medicine, 46*(14), 1-3.

World Health Organization. (2009). *Global health risks: Mortality and burden of disease attributable to selected major risks.* Geneva, SU: WHO Press. Retrieved from http://www.who.int/healthinfo/global_burden_disease/global_health_risks/en/

Appendix A.

Email to Participants

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Subject line: Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, behaviours, and practices

You are being asked to participate in a research study entitled, "Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, behaviours, and practices". You are being asked to participate because you are a University of British Columbia (UBC) Doctor of Medicine (MD) undergraduate student.

The purpose of this study is to investigate whether UBC MD, MD/PhD undergraduate students have the knowledge, attitudes, and behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their patients and whether the knowledge, attitudes, and behaviours change across their four years of medical school preparation and training.

Your participation in this study is completely voluntary. If you decide to participate, you may still choose to withdraw at any time without any explanation or any negative consequences to the education, employment or other services which you are entitled or are presently receiving.

If you agree to voluntarily participate in this study, you will be asked to complete an online survey that will require up to 15 minutes of your time. The survey will include questions related to your general health as well as knowledge, attitudes, and opinions about the role of physical activity and/or exercise in the field of medicine. You do not need to answer questions that you are not comfortable answering.

Your confidentiality and the confidentiality of your information will be respected. You will not be identified by name in any reports of the completed study; the data collected will be reported at a group level.

The Principal Investigator of the study is Lori Zehr, Doctoral Candidate, EdD in the Faculty of Education at Simon Fraser University. This is research for a graduate degree and will be part of a doctoral dissertation.

Please find attached to this email an information letter about participating in the research. **Completing the survey confirms your agreement to participate and your understanding of the research.**

To access and begin the survey, please click here: UBC MD, MD/PhD Undergraduate Student Survey

You may contact Lori Zehr at […] should you have any questions about the research.

If you have any concerns about your rights as a research participant and/or your experiences while participating in this research, you may contact the Office of Research Ethics Board, attention Dr. Jeffrey Toward, Director, Office of Research Ethics […] or […].

Thank you for your participation. Remember that your responses will be kept confidential.

Sincerely,

Lori Zehr, Doctoral Candidate EdD, Faculty of Education, Simon Fraser University
Dr. Scott Lear, Professsor, Faculty of Health Sciences, Simon Fraser University

Appendix B.

Participant Information Sheet

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Participant Information Sheet

Research study title: Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, behaviours, and practices

Who is conducting the study?

Principal Investigator: Lori Zehr
Doctoral Candidate, EdD
Faculty of Education, Simon Fraser University
[...]
Note: This is research for a graduate degree and will be part of a doctoral dissertation.

Faculty Supervisor: Dr. Scott Lear
Faculty of Health Sciences, Simon Fraser University
[…]

Why are we doing this research study?
The purpose of this research is to investigate whether the University of British Columbia (UBC) Doctor of Medicine (MD) undergraduate students have the knowledge, attitudes, and behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their patients and whether the knowledge, skills, attitudes, and behaviours change across their four years of medical school preparation and training.

You are being asked to participate in this project because you are a UBC MD, MD/PhD student.

Your participation is voluntary
Your participation in this study is completely voluntary. If you decide to participate, you may still choose to withdraw at any time without any explanation or any negative consequences to the education, employment or other services which you are entitled or are presently receiving. If you do withdraw from the study your data will continue to be used in the analysis. However, at no time will your responses be linked to personal data.

What happens if you say "Yes, I want to be in the research study"?
If you agree to voluntarily participate in this study, you will be asked to complete an online survey. Volunteering to participate in this study will take up to 15 minutes of your time, including the time to review the email invitation letter, this participant information sheet, and complete the online survey.

Is there any way being in this research study could be bad for you?
Participation in this project may cause some inconvenience to you, including the time to complete the online survey. We do not think anything in this study could harm or be bad for you. Some of the

questions we ask might bother you. You can leave blank any question that you may feel uncomfortable answering. There are no foreseeable risks to you by participating in this research study.

What are the benefits of participating in this research study?
The potential benefits of your participation in this research study include: the increased awareness and education regarding the profiles of UBC MD, MD/PhD undergraduate students and their knowledge, attitude, and behaviours regarding being physically active and healthy living; increased awareness and education regarding the importance of physical activity/healthy living; and contributing to the understanding of the educational preparation and training of the medical profession which may help others in the future.

Will you be paid for your time/ taking part in this research study?
As an incentive to participate in this research study, you may have a chance at a prize in a draw for one of five $100 gift cards to Mountain Equipment Coop. Participation in the draw is not contingent on participation in the research, and if you choose to withdraw from the research study, you may still have the opportunity to be included in the draw. The prize draw contact information will be kept separate from the completed surveys so that no identifiers will be linked to your individual survey responses to ensure this does not compromise your confidentiality.

How will your identity and privacy be protected?
Your confidentiality and the confidentiality of your information will be respected. All hard copies of data will be kept in a locked filing cabinet in the locked office occupied solely by the investigator, and any electronic files of data will be coded and password protected on SFU's secure and private server. You will not be identified by name in any reports of the completed research study; the data collected will be reported at a group level.

This SFU/UBC online survey tool is run by Survey Monkey and has met internal privacy standards. All data will be hosted in Canada. As Survey Monkey is a US owned company, it and all data are subject to US laws including the US CLOUD Act and US Patriot Act. These laws allow government authorities to access the records of host services and internet service providers. If you choose to participate in the survey, you understand that your responses to the survey questions will be stored and potentially accessed in the US.

Data from this research study will be disposed of after five years by appropriately shredding all paper copies and destroying all electronic files using proper and secure methods.

It is possible that the data collected by this research study will be analyzed in the future for purposes other than that stated in this document.

What if I decide to withdraw my consent to participate?
You may stop participating in the research study at any time, for any reason, if you so decide, without any explanation. Your decision to stop participating, or to refuse to answer particular questions, will not have any negative consequences to the education, employment or other services which you are entitled or are presently receiving. If you do withdraw from the study your data will continue to be used in the analysis. However, at no time will your responses be linked to personal data.

Dissemination of results
The results of this research study will be reported in a graduate dissertation thesis. It is anticipated that the results of this research study will be shared with others in reports, published articles, and/or presentations at scholarly meetings.

Who can you contact if you have questions about the study?
You may contact Lori Zehr at […] should you have any inquiries concerning the procedures regarding this research study.

Who can you contact if you have complaints or concerns about the study?
If you have any concerns about your rights as a research participant and/or your experiences while participating in this research study, you may contact the Office of Research Ethics Board, attention Dr. Jeffrey Toward, Director, Office of Research Ethics […] or […].

Appendix C.

Participant Consent Form

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Participant Consent Form

Study title: Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, behaviours, and practices

Who is conducting the study?
Principal Investigator: Lori Zehr
Doctoral Candidate, EdD
Faculty of Education, Simon Fraser University
Note: This is research for a graduate degree and will be part of a doctoral dissertation.

Why are we doing this study?
The purpose of this study is to investigate whether the University of British Columbia (UBC) Doctor of Medicine (MD) undergraduate students have the knowledge, skills (competencies), attitudes, and behaviours to include physical activity (and healthy living) advice when prescribing treatment plans for their patients and whether the knowledge, skills, attitudes, and behaviours change across their four years of medical school preparation and training.

You are being asked to participate in this project because you are a UBC MD student.

Your participation is voluntary
Your participation in this study is completely voluntary. If you decide to participate, you may still choose to withdraw at any time without any explanation or any negative consequences to the education, employment or other services which you are entitled or are presently receiving. If you do withdraw from the study your data will continue to be used in the analysis. However, at no time will your responses be linked to personal data.

What happens if you say "Yes, I want to be in the study"?
If you agree to voluntarily participate in this study, you will be asked to complete an online survey. Volunteering to participate in this study will take up to 20 minutes of your time, including the time to review this consent form, provide consent, and complete the online survey.

Is there any way being in this study could be bad for you?
Participation in this project may cause some inconvenience to you, including the time to complete the online survey. We do not think anything in this study could harm or be bad for you. Some of the questions we ask might bother you. You can leave blank any question that you may feel uncomfortable answering. There are no foreseeable risks to you by participating in this study.

What are the benefits of participating?
The potential benefits of your participation in this study include the increased awareness and education regarding the profiles of UBC medical students and their knowledge, attitude, and behaviours regarding being physically active and healthy living.

How will your identity and privacy be protected?
Your confidentiality and the confidentiality of your information will be respected. All documents will be identified only by code number and kept in a locked filing cabinet in the locked office occupied solely by the investigator, and any electronic file data will be coded and password protected on SFU's secure and private server. You will not be identified by name in any reports of the completed study; the data collected will be reported at a group level.

Data from this study will be disposed of after five years by appropriately shredding all paper copies and destroying all electronic files using proper and secure methods.

It is possible that the data collected by this study will be analyzed in the future for purposes other than that stated in this document.

What if I decide to withdraw my consent to participate?
You may stop participating in the study at any time, for any reason, if you so decide, without any explanation. Your decision to stop participating, or to refuse to answer particular questions, will not have any negative consequences to the education, employment or other services which you are entitled or are presently receiving. If you do withdraw from the study your data will continue to be used in the analysis. However, at no time will your responses be linked to personal data.

Dissemination of results
The results of this study will be reported in a graduate dissertation thesis. It is anticipated that the results of this study will be shared with others in reports, published articles, and/or presentations at scholarly meetings.

Who can you contact if you have questions about the study?
You may contact Lori Zehr at […] should you have any inquiries concerning the procedures regarding this study.

Who can you contact if you have complaints or concerns about the study?
If you have any concerns about your rights as a study participant and/or your experiences while participating in this study, you may contact the Office of Research Ethics Board.

Your signature below indicates that you have received a copy of this consent form for your own records. Your signature indicates that you consent to participate in the study.

_____	_____	_____
Printed Name of Participant	*Participant Signature*	*Date(yy/mm/dd)*
_____	_____	_____
Email Address of Participant		

Appendix D.

Online Survey

Thank you for participating in the research study entitled, "Profiling the University of British Columbia Doctor of Medicine undergraduate students' physical activity knowledge, attitudes, behaviours, and practices". You have been asked to participate because you are a University of British Columbia (UBC) Doctor of Medicine (MD, MD/PhD) undergraduate student.

Your participation in this study is completely voluntary. You may choose to withdraw at any time without any explanation or any negative consequences to the education, employment or other services which you are entitled or are presently receiving.

As an incentive to participate in this research study, you will have a chance at a prize in a draw for one of five $100 gift cards to Mountain Equipment Co-op. Participation in the draw is not contingent on participation in the research, and if you choose to withdraw from the research study, you will still have the opportunity to be included in the draw. The prize draw contact information will be kept separate from the completed surveys so that no identifiers will be linked to your individual survey responses to ensure this does not compromise your confidentiality.

Your confidentiality and the confidentiality of your information will be respected. You will not be identified by name in any reports of the completed study; the data collected will be reported at a group level.

This SFU/UBC online survey tool is run by Survey Monkey and has met internal privacy standards. All data will be hosted in Canada. As Survey Monkey is a US owned company, it and all data are subject to US laws including the US CLOUD Act and US Patriot Act. These laws allow government authorities to access the records of host services and internet service providers. If you choose to participate in the survey, you understand that your responses to the survey questions will be stored and potentially accessed in the US. It should take approximately 15 minutes of your time.

The Principal Investigator of the study is Lori Zehr, Doctorial Candidate, EdD in the Faculty of Education at Simon Fraser University. This is research for a graduate degree and will be part of a doctoral dissertation.

Instructions: Please answer the questions to the best of your knowledge. If you choose not to answer any question, just leave it blank and move to the next question. We need the most complete information possible to include your input into our results. Once again we would like to remind you that you can leave blank any question that you may feel uncomfortable answering.

Thank you again for participating in the research study and we look forward to your input!

Knowledge, Attitudes, and Opinions:

<u>Knowledge, Attitudes, and Opinions:</u> This part of the questionnaire is intended to help us understand how much you know, and how you feel and/or what you believe about the role of physical activity and/or exercise in the field of medicine.

1. Are you aware of Canadian Physical Activity Guidelines for Adults (18-64 years)?

- ◯ Yes
- ◯ No

2. If yes, to the best of your knowledge, what is the minimum recommended amount of physical activity per week for adults?

3. Are you aware of Canadian Physical Activity Guidelines for Older Adults (65+ years)?

- ◯ Yes
- ◯ No

4. If yes, to the best of your knowledge, what is the minimum recommended amount of physical activity per week for older adults?

5. Are you aware of Canadian Physical Activity Guidelines for Children and Youth (5-17 years)?

- ◯ Yes
- ◯ No

6. If yes, to the best of your knowledge, what is the minimum recommended amount of physical activity per day for children and youth?

7. Are you aware of Canadian Physical Activity Guidelines for the Early Years (0-4 years)?

- ◯ Yes
- ◯ No

8. If yes, to the best of your knowledge, what is the minimum recommended amount of movement per day for children under the age of 5?

9. Are you aware of Canadian Physical Activity Guidelines for Women (all ages)?

- ◯ Yes
- ◯ No

10. If yes, to the best of your knowledge, what is the minimum recommended amount of physical activity per week for women?

11. To the best of your knowledge, what is the recommended (minimum) intensity of physical activity for health benefits?

- ◯ Light
- ◯ Moderate
- ◯ Vigorous

12. Why did you choose your answer?

For the following questions, please rate the following statements according to your level of agreement or disagreement.

13. Taking the stairs and generally being more active each day is enough physical activity to improve health.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly Disagree

14. Half an hour a day of walking on most days is all the exercise that is needed for good health.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

15. Exercise that is good for health must make you puff and pant.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

16. Several short walks of 10 minutes on most days is better than a round of golf per week for good health.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

Profiling the UBC MD students' physical activity knowledge, attitudes, behaviours, and practices

17. How much total time have you spent in medical school discussing the topics of physical activity and exercise?

18. Would you like more time in medical school to discuss the topics of physical activity and exercise?

- ◯ Yes
- ◯ No

19. Why or why not?

20. How much total time have you spent in medical school learning how to talk to patients about physical activity and exercise?

21. Would you like more time to learn about how to talk to patients about physical activity and exercise?

- ◯ Yes
- ◯ No

22. Why or why not?

Profiling the UBC MD students' physical activity knowledge, attitudes, behaviours, and practices

For the following questions, please rate the following statements according to your level of agreement or disagreement.

23. I believe that physical activity or exercise counselling is important.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

24. I believe that talking to patients about exercise will be important in my practice.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

25. I have sufficient knowledge to advise patients about physical activity.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

26. I am confident in talking to patients about being physically active.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

27. I feel confident in suggesting specific physical activity programs for my patients.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

28. In order to effectively encourage patient adherence to a healthy lifestyle, a physician must adhere to one him/herself.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

29. I will be able to provide more credible and effective physical activity counselling if I live a healthy lifestyle.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

30. Patients are more likely to adopt healthier lifestyles if physicians counsel them to do so.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

31. Allied health professionals (eg. nurses, kinesiologists) should perform healthy lifestyle counselling more than physicians.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

32. Medical school faculty members should set a good example for medical students by practicing a healthy lifestyle.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

33. Medical schools should encourage their students to practice healthy lifestyles.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

34. Medical schools should create an environment that facilitates and enables medical students to practice a healthy lifestyle.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

35. My medical school faculty are good role models for healthy lifestyles.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

36. My medical school does encourage me to lead a healthy lifestyle.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

37. My medical school creates a health promoting environment.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

38. My medical school school curriculum gives me a good understanding of how physical activity can prevent/manage disease.

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree nor disagree
- ◯ Disagree
- ◯ Strongly disagree

Profiling the UBC MD students' physical activity knowledge, attitudes, behaviours, and practices

39. Do you see it as your role to prescribe physical activity and exercise to your patients?

- ◯ Yes
- ◯ No

40. If no, why not? (check all that apply)

- [ ] Lack of time
- [ ] Lack of knowledge and training
- [ ] Lack of success in changing patients' behaviour
- [ ] Physical activity counselling is not a priority/not relevant
- [ ] Lack of incentive/financial reimbursement
- [ ] Lack of resources
- [ ] Lack of evidence
- [ ] Other (please specify)

41. If yes, why? (check all that apply)

- [ ] Chronic disease prevention
- [ ] Chronic disease treatment
- [ ] General health maintenance
- [ ] Psychological benefit
- [ ] Weight control
- [ ] Physical appearance
- [ ] Social interaction
- [ ] Other (please specify)

42. Would you refer a patient to an allied health professional for physical activity/exercise prescription, and if so, to who? (check all that apply)

- [ ] Athletic Trainer
- [ ] Exercise Physiologist/Kinesiologist
- [ ] Nurse
- [ ] Physiotherapist
- [ ] Other (please specify)

Behaviour

Behaviour: This part of the questionnaire is intended to help us understand how physically active you are. The Godin-Shephard Leisure Time Exercise Questionnaire asks you about your leisure time physical activity habits. Please answer each question even if you do not consider yourself to be an active person.

43. In an average week, how many times do you perform VIGOROUS exercise where your heart beats rapidly for more than 15 minutes during your free time (eg jogging, soccer, aerobics, vigorous swimming or biking):

44. On average, how long is each exercise episode?

45. In an average week, how many times do you perform MODERATE non-exhausting exercise for more than 15 minutes during your free time (eg fast walking, tennis, volleyball, dancing, easy swimming or biking):

46. On average, how long is each exercise episode?

47. In an average week, how many times do you perform LIGHT minimal exertive exercise for more than 15 minutes during your free time (eg easy walking, golf, bowling, yoga):

48. On average, how long is each exercise episode?

49. In an average week, how many times do you spend being sedentary for more than 15 minutes during your free time (eg watching tv, reading, computer time):

50. On average, how long is each sedentary episode?

Profiling the UBC MD students' physical activity knowledge, attitudes, behaviours, and practices

General Health

General Health Section: This section is intended to help us understand your general health and lifestyle.

51. Would you say that in general your health is:

- ◯ Excellent
- ◯ Good
- ◯ Fair
- ◯ Poor

52. Not counting juice, how often do you eat fruit, per DAY:

53. Not counting juice, how often do you eat fruit, per WEEK:

54. Not counting juice, how often do you eat vegetables, per DAY:

55. Not counting juice, how often do you eat vegetables, per WEEK:

56. How long do you usually spend sleeping each night (hours)?

57. Do you smoke cigarettes or use other tobacco products?

58. Do you use drugs?

59. How often do you drink a glass/bottle/can of alcoholic beverages?

60. How often in the past month did you have more than 5 drinks on one occasion?

61. How would you rate your ability to handle unexpected and difficult problems, for example, a family or personal crisis? Would you say your ability is:

- Excellent
- Good
- Fair
- Poor

62. How would you rate your ability to handle the day to day demands in your life, for example, handling school, family, and volunteer responsibilities? Would you say your ability is:

- Excellent
- Good
- Fair
- Poor

63. Do you now, or have you had, any of the following conditions (select all that apply)?

- [ ] Arthritis
- [ ] Cardiopulmonary disease or incident
- [ ] Cancer
- [ ] Diabetes
- [ ] Digestive Condition
- [ ] High cholesterol
- [ ] Hypertension
- [ ] Mental Health
- [ ] Neurological Conditions
- [ ] Obesity
- [ ] Osteoporosis
- [ ] None
- [ ] Other (please specify)

Profiling the UBC MD students' physical activity knowledge, attitudes, behaviours, and practices

Personal Characteristics

Personal Characteristics Section: This part of the questionnaire is intended to help us understand the characteristics of the people participating in the study.

64. What is your current age?

65. What is your gender?

- ( ) Female
- ( ) Male
- ( ) Other (please specify)

66. Which ethnic or cultural group do you identify with? (choose the category that best describes you)?

67. What is your marital status?

- Married
- Living Common Law
- Widowed
- Separated
- Divorced
- Single, never married

68. Do you have children?

- Yes
- No

69. If yes, how many children do you have?

70. How tall are you? (in centimeters)

71. How much do you weigh? (in kilograms)

72. What is the highest level of education you have completed?

73. How many years of the UBC undergraduate medical program have you completed?

- Just starting
- 1 year
- 2 years
- 3 years
- 4 years

74. At which UBC Medical School site are you located?

- ◯ Vancouver-Fraser
- ◯ Southern
- ◯ Northern
- ◯ Island

75. Choose the one (1) specialty you are now most interested in pursuing?

- ◯ Anasthesiology
- ◯ Emergency Medicine
- ◯ Family Medicine
- ◯ Internal Medicine
- ◯ Obstetrics/Gynecology
- ◯ Pathology
- ◯ Pediatrics
- ◯ Preventative Medicine/Public Health
- ◯ Psychiatry
- ◯ Radiology
- ◯ Surgery
- ◯ Undecided
- ◯ Other (please specify)

Profiling the UBC MD students' physical activity knowledge, attitudes, behaviours, and practices

This is the end of the questionnaire, thank you for participating.

Please provide your contact information for a chance at a prize in a draw for one of five $100 gift cards to Mountain Equipment Coop. Participation in the draw is not contingent on participation in the research, and if you choose to withdraw from the research study, you will have the opportunity to be included in the draw. The prize draw contact information will be kept separate from the completed surveys so that no identifiers will be linked to your individual survey responses to ensure this does not compromise your confidentiality.

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76. Please provide your name, phone number, and/or email address.

Name	
Phone Number	
Email Address	

Appendix E.

Breakdown of Source(s) for Online Survey

Please note that some of these references transparently acknowledge that their own survey instruments were also influenced by Erica Frank's work/questionnaires.

- Questions #1 – 10: awareness and knowledge of national Physical Activity Guidelines (Dunlop & Murray, 2013; Radenkovic et al., 2019; Solmundson et al., 2016)

- Questions #11 - 16: understanding of how much physical activity for health benefits (Buffart et al., 2009; Dunlop & Murray, 2013)

- Questions #17 – 22: perceptions about time spent in medical school discussing physical activity related topics and would like more time to be spent on the topics (Dunlop & Murray, 2013; Gnanendran et al., 2011; Holtz, et al., 2013; Radenkovic et al., 2019; Solmundson et al., 2016).

- Questions #23 – 39: attitudes and opinions about the role of physical activity and/or exercise in the field of medicine (Buffart et al., 2009; Frank et al., 2008; Holtz et al., 2013; Ng & Irwin, 2013; Solmundson et al., 2016)

- Questions # 40 - 42: facilitators (Abramson et al., 2000) and barriers (Abramson et al., 2000; Hebert et al., 2012) to physical activity counselling

- Questions #43 – 48: physical activity levels/behaviours, Godin - Shephard Leisure Time Exercise Questionniare (Godin & Shephard, 1985)

- Questions # 49 – 50: sedentary behaviour (Solmundson et al., 2016)

- Questions # 51 – 63: general health, sleep time, fruit and vegetable consumption, smoke, drug, and alcohol use, and the ability to manage stress (Canadian Community Health Survey; Frank et al., 2006, 2008; Gnanendran et al., 2011)

- Questions #64 – 75: personal demographics and characteristics (Frank et al. 2006, 2008; Gnanendran et al., 2011; Holtz et al., 2013; Ng & Irwin, 2013)

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Appendix F.

UBC MD Curriculum Search: Physical Activity/Exercise Sessions, Abstracts and Objectives

Course	Week / Block	Session Title	Session Duration (Mins)	Session Abstract	Session Objectives
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 5: Immunology and Allergy	Vital Signs	120	This hands-on small group facilitated by a family physician will discuss the appropriate methods and common pitfalls of determining vital signs, demonstration of the proper technique, and provide the opportunity for repeated practice in a simulated setting (student-student).	1. Demonstrate knowledge of relevant surface anatomy (antecubital fossa, antecubital crease, biceps tendon, brachial artery, radial artery) 2. Demonstrate how to obtain and report an accurate pulse 3. Demonstrate how to obtain and report an accurate respiratory rate 4. List which factors confound accurate BP measurement 5. Describe the Korotkoff sounds and the significance of an auscultatory gap 6. Demonstrate familiarity with the blood pressure measurement equipment and how to properly position a blood pressure cuff 7. Demonstrate appropriate patient positioning and preparation for a BP measurement 8. Demonstrate how to appropriately size a BP cuff and understand the implications of the wrong cuff size 9. Demonstrate the technique for systolic BP measurement by palpation at the brachial and radial artery 10. Demonstrate the technique for systolic BP measurement by auscultation 11. Demonstrate knowledge of potential fifth vital sign 12. Explain the importance of physical activity (PA) as a potential vital sign, and demonstrate effective communication with a patient regarding their regular physical activity
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 7: Chronic Obstructive Pulmonary Disease (COPD)	Physical Activity	180	This family physician facilitated case-based session will discuss the recommendations for exercise, motivational interviewing techniques to encourage patients to become active, and the requirements on history and physical exam to safely recommend exercise.	1. Define physical inactivity and list the benefits of regular exercise 2. Apply the current Canadian Society of Exercise Physiologists (CSEP) Physical Activity Guidelines for adults 3. Explain to how use the Get Active Questionnaire as a pre-screening tool to identify individuals who may require supervision or medical clearance before beginning exercise 4. Identify the most common risks associated with exercise and discuss the new ACSM (American College of Sports Medicine) physical activity pre-participation screening guidelines for identifying patients who may be at risk 5. Describe the components of a focused pre-activity history and physical exam 6. Develop an awareness of the barriers to exercise and discuss strategies to help patients overcome them 7. Create a patient-centered exercise prescription to help patients meet the Physical Activity Guidelines 8. Discuss the importance of supporting patients with tools and strategies to maintain their motivation 9. Discuss the Exercise Vital Sign and how it is used to assess patient's current physical activity levels 10. Assess readiness to change using the ACSM Health Care Provider's Action Guide Change Theory Model
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 7: Chronic Obstructive Pulmonary Disease (COPD)	Attendance Required (Patient/Guest) – Chronic Airway Disease	110	This large group discussion session with experts from pulmonary medicine, pharmacotherapy, rehabilitation, exercise/nutrition, palliative care, and population/public health provides a broad-based summary of all of the concepts relevant to the etiology, risks, diagnosis and management of COPD. The epidemiology and health economics of COPD will be discussed. The essential role of spirometry in management of COPD, the absence of a cure and the importance of smoking cessation will be emphasized.	1. Describe the pharmacology of nicotine addiction and smoking cessation 2. Describe the overall management of COPD from pharmacological and non-pharmacological perspectives 3. Describe the role of rehabilitation, nutrition and advance care planning in managing patients with COPD 4. Describe the use of spirometry in diagnosis and management of COPD 5. Interpret spirograms showing obstructive and restrictive ventilatory patterns 6. Describe the impact of COPD both on the Canadian population and the public health care system

MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 9: Hypertension	Role of Genetics, Exercise, Stress and Lifestyle Factors in Hypertension	50	This session discusses the multiple and complex factors including the roles of genetics, exercise, stress, and diet that interplay in the pathogenesis of hypertension.	1. Describe the genetic determinants of hypertension 2. Discuss the role of exercise, stress, diet, and other health behaviour factors in contributing to hypertension
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 9: Hypertension	Management of Hypertension - Clinical Manifestations, Investigations, and Non-Pharmacologic Management	50	This session describes the clinical manifestations of hypertension, its various secondary causes, and the appropriate investigations that may be used in its management. This session emphasizes non-pharmacologic interventions for blood pressure control.	1. Differentiate the primary and secondary causes of hypertension and list the appropriate associated investigations 2. Describe white coat hypertension, masked hypertension, and causes for exacerbation of blood pressure 3. Identify and discuss the clinical manifestations of hypertension, including hypertensive emergencies, and the clinical features associated with secondary causes of hypertension 4. Discuss various non-pharmacologic interventions utilized in the management of hypertension
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 9: Hypertension	CBL - Hypertension	220	A previously healthy 34-year-old Caucasian woman who incidentally detects an elevation in her BP at a pharmacy. After serial examinations by her family physician, she is eventually diagnosed with hypertension. A cardiovascular risk factor assessment is performed and non-pharmacologic strategies appear to be optimized. Since the patient has been using an oral contraceptive medication (which is known to cause hypertension in some patients) this was discontinued for several months. Despite this, Carol's BP remains elevated and, therefore, her family doctor suggests pharmacologic therapy. The patient experiences adverse effects from the first antihypertensive medication that was prescribed and this causes her to question the benefit of treating a silent disease. The implications of hypertension and its treatment during pregnancy arise because the patient is of child-bearing age and she is considering having children. Hence, this case highlights how a chronic disease might affect a patient throughout their life cycle.	1. Delineate the diagnostic criteria for the diagnosis of hypertension 2. Explain the role of the cardiovascular examination and routine investigations for determination of etiology of hypertension (primary vs. secondary) and screening for target organ damage 3. Outline a diagnostic approach for differentiating primary from secondary hypertension 4. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 5. Describe the epidemiology of hypertension, including populations at risk, overall burden of disease and outcomes based on socioeconomic status 6. Recognize the importance of performing a global cardiovascular risk factor assessment in a patient with hypertension 7. Explain the multifactorial etiology of hypertension, including the interaction of genes (nature) with the environment (nurture) 8. Describe the mechanisms of action and pharmacology of common classes of drugs used to treat hypertension 9. Discuss goals of hypertension therapy in the elderly 10. Demonstrate respect for patients who use complementary and alternative medical therapies 11. Discuss management of hypertension: (a) lifestyle modification (diet, exercise and cessation of smoking) (b) medical (pharmacological therapy, which can include discontinuation of a drug) (c) surgical (excision of pituitary and adrenal tumors and endovascular procedures in the case of coarctation of the aorta or renal artery stenosis) 12. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments

MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 9: Hypertension	Hypertension	180	This family physician facilitated session will explore the biopsychosocial approach to the diagnosis and management of hypertension, with a focus on the longitudinal relationship between a family physician and a patient as well as lifestyle and behavioural interventions or modifications.	1. Discuss the often subtle or asymptomatic presentation of high blood pressure 2. Describe the appropriate history and physical examination of a patient with high blood pressure 3. Outline the diagnostic criteria for essential hypertension 4. Describe body mass index (BMI) and waist circumference calculation, and their normal ranges 5. Discuss the role of lifestyle interventions in managing hypertension 6. Discuss the importance of eliciting and respecting patient lifestyle choices, values and preferences 7. Discuss the importance of patient education, involvement, and self-monitoring in establishing an optimal outcome in hypertension management 8. List the investigations indicated in patients with uncomplicated and complicated (Renal disorder, diabetes, etc) hypertension 9. Evaluate the advantage of a longitudinal relationship and a biopsychosocial approach with a patient in managing a chronic health problem such as hypertension
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 14: Diabetes Mellitus	CBL - Diabetes Mellitus	330	George is a 53-year-old truck driver from Bella Coola, BC, who presents to his family doctor for a physical examination as part of his driver's medical. His work is very sedentary and he is obese. Review of his diet reveals that it contains a large amount of processed carbohydrates and fats. He is of First Nations heritage with a family history of diabetes in his mother and maternal uncle. A blood test confirms a diagnosis of diabetes and he is referred to a local health unit for dietary counseling and diabetes education.	1. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 2. List the risk factors and the recommended screening and diagnostic tests for diabetes mellitus 3. Describe the recommended approach to the lifestyle (diet and exercise) management of prediabetes and type 2 diabetes 4. Explain the pathophysiology and management of hyperglycemic hyperosmolar syndrome (HHS) and what distinguishes it from diabetic ketoacidosis (DKA) 5. Describe the long-term goals of diabetes management, including individualized glucose targets 6. Describe the recommended monitoring (tests and frequency) used in the long-term management of diabetes 7. Describe the classes and mechanisms of pharmacologic agents available for the management of diabetes 8. Describe the anatomy of the endocrine pancreas and describe the hormones produced by the various cells of the pancreatic islets of Langerhans and the role insulin and glucagon play in the regulation of glucose homeostasis 9. Describe the mechanism and list potential causes of a wide anion gap 10. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments 11. Discuss the importance of understanding illness in the patient's personal context, including with regards to the patient's sexual functioning, and the negative consequences of failing to do so
MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 14: Diabetes Mellitus	Diabetes Prevention and Non-Pharmacological Management	50	This lecture will focus on the evidence for interventions to prevent or delay the progression of hyperglycemia and diagnosis of diabetes. It will discuss the role of 'lifestyle' interventions, including the physiologic mechanisms and the clinical implementation of exercise as well as the role of pharmacological interventions with evidence for diabetes prevention.	1. Compare the physiological mechanisms regulating metabolism to the mechanisms of action for the pharmacological and non-pharmacological interventions for diabetes prevention and treatment 2. Describe the evidence behind the non-pharmacologic and pharmacologic measures for type 2 diabetes prevention 3. Describe how exercise can be used to help control blood glucose levels

MEDD 411 Foundations of Medical Practice I (FOMP I)	Week 16: Pregnancy	CBL - Pregnancy	330	This is the continuation of a 6 day CBL case that spans week 15 (Infertility) and 16 (Pregnancy). This portion of the case follows our patient through her pregnancy, with physician visits at 8 weeks, 24 weeks, 36 weeks, and postpartum. The prenatal visits are used to highlight issues regarding routine prenatal care, maternal physiology and fetal physiology. The case should direct the students to develop a basic approach to understanding the maternal physiologic changes in pregnancy.	1. Summarize and interpret the prenatal care of a low risk pregnancy 2. List methods to assess fetal growth and fetal well-being 3. Identify barriers to access to care and consider the physicians role in leadership, health advocacy and health systems improvement 4. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 5. Outline current recommendations for exercise, weight gain, and nutrition in a low risk pregnancy 6. Develop an approach to identifying maternal and fetal risk factors that might impact a pregnancy 7. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments
MEDD 412 Foundations of Medical Practice II (FOMP II)	Week 21: Stroke	CBL - Stroke	330	The case presents a 64-year-old woman, being brought to the emergency department with global aphasia, right hemiplegia, right field cut and forced gaze deviation to the left. During the history, it is mentioned that she has had a prior episode of amaurosis fugax (painless transient visual loss) affecting the right eye, caused by high grade right internal carotid artery stenosis for which she had a right carotid endarterectomy. Students discuss the differential diagnosis of an episode of acute vision loss and management of symptomatic and asymptomatic carotid stenosis. Then students discuss the localization for Monica's current presentation and generate a differential diagnosis. After some initial investigations, it becomes apparent that she is having a stroke due to atrial fibrillation. She receives treatment and follow up.	1. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 2. Describe the anatomical blood supply to the brain, the vascular territory supplied by each major cerebral artery, and the clinical presentations of common stroke syndromes associated with each of these large arteries 3. Describe the location and function of primary and association areas of the cortex 4. Recognize major aphasias and localize them to specific language areas of the cortex 5. Relate symptoms seen in vascular disease of the central nervous system (CNS) to the functional areas of the cortex supplied by the cerebral arteries 6. List and describe the major modifiable and non-modifiable risk factors for ischemic stroke 7. Describe evidence-based strategies for ischemic prevention including the importance of nutrition and physical activity, pharmacological management of risk factors and treatment of artery stenosis and atrial fibrillation 8. Describe the pathophysiology, clinical presentation, investigations, and management of acute ischemic stroke 9. Describe the use of antithrombotics in vascular neurology 10. Identify common complications in the acute and chronic post-stroke period, including effects on mood, cognition, and maintenance of nutritional status 11. Identify the factors that can affect a stroke patient's ability to rehabilitate (e.g., aphasia, neglect) and that help determine reasonable rehabilitation goals post stroke 12. List members of the interdisciplinary team and community supports available for people with stroke-related disability 13. Consider how location (urban vs rural) and technology can aid in the timely diagnosis, treatment, and intra and inter-professional collaboration in a patient with a stroke 14. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments
MEDD 412 Foundations of Medical Practice II (FOMP II)	Week 21: Stroke	Stroke Prevention - Part 1	50	In this lecture you will learn about the major risk factors for stroke and their role in primary and secondary stroke prevention. Evidence based strategies for primary and secondary stroke prevention will be reviewed.	1. Define the major modifiable and non-modifiable risk factors for stroke and describe how each factor contributes towards increased stroke risk 2. Discuss evidence based strategies for the management of stroke risk factors including hypertension, hyperlipidemia, diabetes, smoking, atrial fibrillation, and large vessel intracranial/extracranial atherosclerotic disease 3. Describe the importance of lifestyle modification, including nutrition and physical activity in stroke prevention

MEDD 412 Foundations of Medical Practice II (FOMP II)	Week 28: Depression	CBL - Depression	330	Anna Becker visits her family practice clinic reporting difficulty sleeping, inability to concentrate at work and feeling "tired, stressed and irritable". Upon further investigation, symptoms are indicative of generalized anxiety disorder, and treatment is initiated. Anna subsequently experiences a major depressive episode. Management of generalized anxiety disorder and major depressive disorder, including pharmacological and non-pharmacological therapies, medication side effects, risk factors and prognosis are explored in detail.	1. Describe the role of the psychiatric interview and mental status exam in diagnosing mood and anxiety disorders 2. Describe the role of the PHQ9 and GAD7 in identifying and monitoring psychiatric symptoms 3. List content that should be covered in a suicide risk assessment 4. Formulate a basic treatment plan for GAD and MDD, including pharmacological and non-pharmacological interventions 5. Describe the mechanism of action of first-line medications used to treat GAD and MDD, in relation to their clinical effect and side effect profiles 6. Outline the basic principles of cognitive behavioural therapy 7. Identify risk factors that might influence onset, recovery or relapse of mood and anxiety disorders 8. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 9. Explain how the DSM-5 manual is used to classify psychiatric disorders in general and summarize DSM-5 criteria for generalized anxiety disorder (GAD) and major depressive disorder (MDD) 10. Summarize sleep disturbances associated with mood, anxiety and related disorders 11. Identify the role of lifestyle factors, including exercise, nutrition, and sleep hygiene in the management of mood and anxiety disorders 12. Consider why mood and anxiety disorders commonly co-occur 13. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments
MEDD 421 Foundations of Medical Practice III (FOMP III)	Week 41: Normal and Abnormal Growth and Development	Impact of Physical Literacy on Growth and Development in Children [Online Module]	60	For a person to be active for life, they require a foundation of physical literacy that will provide the motivation, confidence, competence, knowledge and understanding that will allow them to be physically active throughout their life. Health professionals need to understand the importance of being physically active for preventing and treating most health conditions. This module will provide the definition of physical literacy and demonstrate the importance of physical literacy as an integral component of the treatment of various diseases.	1. Describe the components and process for developing physical literacy 2. Identify the resources required to achieve physical literacy 3. Recognize the advocacy role a physician can play in promoting physical activity 4. Define physical literacy and describe its importance
MEDD 421 Foundations of Medical Practice III (FOMP III)	Week 42: Adolescent Health and Development	The Importance of Physical Activity in the Health and Well Being of Children and Adolescents	50	This session will start with a perspective of how physical activity fits into health promotion and its importance in the curriculum, particularly with regards to the treatment and prevention of chronic disease. An overview of current knowledge regarding physical activity levels in children and adolescents will be given. The new 24 hour movement guidelines and how these can be employed to increase physical activity levels in children and adolescents will be described. The role of physical activity in promoting health and well-being in children and adolescents will be discussed. The role health care professionals can play in promoting physical activity in children and adolescents will also be examined.	1. State the current levels of physical activity in children and adolescents based on published data 2. Discuss how physical activity relates to health promotion 3. Describe the new 24 hour movement and physical activity guidelines for children and adolescents 4. Discuss the importance of Physical Literacy. 5. Describe how physicians can be involved in promoting physical activity for children and adolescents through the Live 5-2-1-0 initiative

MEDD 421 Foundations of Medical Practice III (FOMP III)	Week 42: Adolescent Health and Development	The Role of Health Care Professionals in Promoting Physical Activity across the Lifespan and Opportunities to Advocate for Physical Activity	50	Physical activity (PA) is very important for our health and well-being. The role of PA is critically important for chronic disease prevention and treatment. For PA to be optimally beneficial it should be carried out across the lifespan. However, PA can still have benefits at any age. The impact of sedentary behavior will be examined and whether or not it can be offset by PA. The benefits of PA in preventing cardiovascular disease and cancer as well as the benefits of exercise in mental health will be presented. The role physicians and other health care professionals can play in promoting PA will be discussed.	1. List the benefits of physical activity (PA) for ourselves and our patients' health and well being 2. Discuss the role of PA in the prevention and treatment of chronic disease including mental health 3. Discuss how the benefits of PA can be offset by sedentary behavior 4. Describe how physicians and other health care professionals can play a critical role in PA promotion
MEDD 421 Foundations of Medical Practice III (FOMP III)	Week 47: Osteoporosis	Clinical Role of Calcium, Vitamin D and Exercise in the Maintenance of Bone Health	50	This lecture will present the importance of calcium, vitamin D and exercise in the maintenance of bone health and in the prevention of osteoporosis. This lecture will encompass the clinical recommendations for vitamin D supplementation and calcium intake either through diet or supplements, and will also address some of the controversies. In addition, the lecture will explore data regarding effects of exercise on bone health.	1. Describe the role of calcium nutrition and supplements in the maintenance of bone health 2. Describe the role of Vitamin D supplements in the maintenance of bone health 3. Discuss the importance of exercise in creating and maintaining bone health and in preventing fracture 4. Review the vitamin D metabolic pathway and its relationship with parathyroid hormone 5. Discuss the importance of exercise in maintaining muscle strength and prevention of falls
MEDD 421 Foundations of Medical Practice III (FOMP III)	Week 47: Osteoporosis	CBL - Osteoporosis	220	The case is of an elderly woman who presents to the emergency department with a hip fracture after a fall from standing height. An X-ray shows an intertrochanteric hip fracture. She is admitted to hospital and is assessed by orthopedic surgery. She undergoes a hip arthroplasty. Risk factors of falls and future fracture are assessed. The assessment of fracture risk using ten-year fracture risk calculators (CAROC, FRAX), and the consequences of fracture in the elderly are discussed. Pharmacological and non-pharmacological management options to reduce this patient's future risk of fall and fracture will be covered.	1. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 2. Describe the risk factors for fractures associated with osteoporosis 3. Discuss the assessment of patients at risk of fracture including clinical, laboratory and bone density evaluations 4. Discuss the non-pharmacologic management (calcium, vitamin D, exercise, falls prevention) for patients with osteoporosis and fracture risk 5. Discuss the pharmacologic options for the management of osteoporosis 6. Discuss how inappropriate polypharmacy (example: over-treatment of hypertension) in the elderly may increase risk of falls and fractures and how this can be prevented 7. Discuss community resources available to support the frail elderly and health professionals who could be involved in the team management of the osteoporosis patient 8. Explain the nutritional influences on bone health across the lifespan 9. List the indications for BMD (bone mineral density) testing in older adults 10. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments
MEDD 421 Foundations of Medical Practice III (FOMP III)	Week 50: Chronic Kidney Disease	Diabetes	180	In this session, students will go through the presentation and management of a patient with type II diabetes mellitus. Students will discuss a patient presenting with new onset diabetes from a Family Practice perspective, and continue to manage the patient over the next few years with return visits.	1. Identify the presentation of type II diabetes mellitus in the family practice clinic/office 2. Define the diagnostic criteria for pre-diabetes and diabetes 3. Interpret the criteria for screening for diabetes 4. Develop a plan for investigation and management for diabetes 5. List the BC Guidelines "Diabetes Care" recommendations for patient self-management 6. Discuss the importance of patient education in the management of diabetes 7. Recognize the short and long term care objectives of a diabetic patient within the family practice setting 8. Discuss management for diabetes within the family practice clinical setting 9. Describe the benefits of physical activity in patients living with diabetes 10. Recognize the value of a longitudinal relationship with patients dealing with chronic diseases such as diabetes

MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 56: Chest Pain / Angina / Myocardial Infarction	Cardiovascular Risk Assessment, and the Global Impact of Atherosclerosis	30	This lecture will outline the concepts of atherosclerosis as the leading cause of death in the world, the major risk factors (both non-modifiable and modifiable) for developing atherosclerosis and how they contribute to the disease, as well as how these factors can be reduced to prevent the development of end-organ damage associated with atherosclerosis. This lecture will also discuss the clinical problem and global population burden of atherosclerosis and cardiovascular disease.	1. Discuss the evidence and strength of the evidence implicating modifiable and non-modifiable risk factors in the development of atherosclerosis 2. Describe and evaluate the utility and limitations of commonly used risk assessment scoring systems, such as that of the Framingham Risk Score (FRS) in determining cardiovascular disease 3. Identify non-modifiable, modifiable, and novel risk factors traditionally utilized in the assessment of cardiovascular events and how they relate to the global population impact of cardiovascular disease
MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 56: Chest Pain / Angina / Myocardial Infarction	Management of Coronary Artery Atherosclerosis - Lifestyle and Non-Pharmacologic Preventative Therapies	50	This didactic lecture will provide students with an overview of the non-pharmacological management of cardiovascular risk factors with a focus on exercise, diet, smoking cessation and stress management.	1. Review the modifiable cardiovascular risk factors 2. Review the non-pharmacological management of cardiovascular risk factors with a focus on: a. Evidence-based dietary modifications with proven cardiovascular benefit; b. Supervised exercise program and long-term exercise prescription; c. Smoking cessation (both pharmacological and non-pharmacological management)
MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 58: Osteoarthritis	CBL - Osteoarthritis	220	Mr. Julio Romero is a 52-year-old carpenter who sustained a sports-related left knee injury 30 years previous to his current issues, which compromised the status of his knee. He now presents with increasing pain and discomfort due to osteoarthritis of the same knee. The pain is associated with stiffness after prolonged inactivity and is located over the medial aspect of the knee. The pain is exacerbated by weight-bearing and stair-climbing. His job as a carpenter involves lifting, reaching and weight bearing for prolonged intervals, and he is finding this to be challenging. Mr. Romero also reports discomfort in his lower back, which at times appears to give him pain involving the entire leg. His contralateral knee has no symptoms. While Julio's knee osteoarthritis is secondary to previous trauma, students will be encouraged to learn the diverse etiology of osteoarthritis), both primary and secondary forms. They will learn the clinical manifestations of osteoarthritis in joints of the lower extremity, as well as the hands (generalized osteoarthritis of the hands), and will gain insight into degenerative processes affecting the spine. The week will conclude with educational objectives targeting non-surgical and surgical optimization of osteoarthritis.	1. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 2. Describe the work up of a patient with suspected osteoarthritis as far as imaging tests, in an urban versus a rural, more isolated medical practice and keeping in mind that osteoarthritis is mainly a clinical diagnosis 3. Describe appropriate management options for symptomatic osteoarthritis, including non-surgical (non-pharmacologic and pharmacologic) and surgical management 4. Recognize how pain and suffering is a challenge for the patient with severe end-stage osteoarthritis who is wait-listed for surgery 5. Describe points of transition in the care of chronic conditions and their impact on effective collaborations amongst different professionals 6. List the key recommendations from the B.C. Opioid Treatment Guidelines - "Together we can do this" and the challenges in treating chronic pain with these drugs 7. Briefly describe the main forms of mechanical low back pain 8. Describe the biochemistry, structure and role of proteoglycans, collagen, and metalloproteases in articular cartilage in normal aging as well as primary and secondary osteoarthritis 9. Describe key pathogenetic factors with regards to cartilage (i.e., normal vs. abnormal cartilage) and mechanical forces (i.e., normal vs. abnormal force) that can predispose to osteoarthritis 10. Outline the pharmacologic treatment of osteoarthritis, including the use of acetaminophen, NSAIDs (and their potential toxicity, particularly in the elderly), duloxetine (antidepressant; selective norepinephrine reuptake inhibitor, SNRI), nutriceuticals (such as glucosamine sulfate, chondroitin sulfate), intra-articular corticosteroids, and hyaluronic acid injections 11. Describe the approach to physical examination of the knee, with emphasis on tests designed to assess for a mechanical basis of knee pain 12. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments

MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 58: Osteoarthritis	Non-Pharmacological Treatment of Osteoarthritis of the Spine and Extremities	50	This lecture will address the non-pharmacologic treatment of osteoarthritis (OA) of the lower limb joints as well as degenerative disease of the spine. The importance of patient education and psychosocial support will be discussed. The integral roles of allied health care professionals such as physiotherapy and occupational therapy and self-management strategies will be stressed and the "the team approach" will be emphasized. Weight bearing assistive devices to help ambulation and the role of bracing will be considered as well as the importance of attempts at weight reduction and balanced physical activity. The role and indications for surgery in the overall management of hip and knee OA will be described.	1. Explain the roles of assistive walking devices, footwear and bracing in osteoarthritis (OA) 2. Recognize the indication and advances in orthopedic surgery in osteoarthritis (OA) of the hip and knee 3. Discuss the role of patient education & self-management in osteoarthritis (OA) of the lower limb joints and spine 4. Explain the role of the health care team, with an emphasis on physiotherapy and occupational therapy, in the management of osteoarthritis (OA) 5. Recognize the importance of weight control in osteoarthritis (OA) and the roles of physical activity and therapeutic exercise
MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 59: Heart Failure	Congestive Heart Failure (CHF)	180	In this session, students follow the case presentation of a patient with congestive heart failure (CHF) as presenting to a Family Practice office. They will review the definition and pathophysiology of CHF and investigations necessary to identify the underlying etiology. Students will learn a comprehensive treatment strategy, including non-pharmacologic and evidence-based pharmacologic therapies. Advance care planning is discussed as part of the holistic management of CHF.	1. Identify characteristic features on history and physical exam of a patient that would lead to diagnosis of congestive heart failure (CHF) and uncover any precipitating factors 2. Identify role of investigations (laboratory and imaging) in diagnosis, underlying etiology, co-morbid risk factors, and follow up of congestive heart failure (CHF) 3. Explain treatment and management strategies including lifestyle interventions, pharmacologic (evidence-based strategy) and non-pharmacologic options for patients presenting with congestive heart failure (CHF) 4. Discuss advance care planning as it applies to congestive heart failure (CHF) 5. Discuss the role of the long-term doctor patient relationship and patient self-management as it applies to congestive heart failure (CHF)
MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 61: Pregnancy, Delivery and Newborn	Maternal Nutrition and Gestational Diabetes	50	Students will learn the nutritional and exercise requirements of a normal pregnancy. We will review the recommendations for foods, supplements and substances to add and to avoid in pregnancy, and the rationale for these. Gestational diabetes will be introduced, including risk factors, diagnostic testing, standard management and longterm maternal implications. The fetal and neonatal consequences of poorly controlled gestational diabetes will be discussed.	1. Outline nutritional requirements and recommendations for supplementation in normal pregnancy 2. Describe how personal beliefs and unhealthy lifestyles, such as use alcohol and other drugs, can affect pregnancy 3. Describe the laboratory investigations and rationale for screening for gestational diabetes 4. Describe the impact of suboptimal maternal nutrition and gestational diabetes on fetal and neonatal growth and development 5. Describe appropriate modifications of physical activity prescription for various conditions during pregnancy 6. Define the relationship between maternal nutrition and physical activity on maternal health and fetal development
MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 61: Pregnancy, Delivery and Newborn	Normal and Abnormal Maternal Physiology (Streaming of Pre-Recorded Lecture)	50	Through this didactic lecture, students will apply their foundational physiology knowledge of non-pregnant "systems" to the physiologic state of pregnancy. This will spiral from the brief introduction to normal maternal physiology given in MEDD411, and explore some of the most common pathophysiologic conditions unique to/during pregnancy, with particular emphasis on gestational hypertension and pre-eclampsia. Principles of managing pre-existing maternal medical conditions in pregnancy will be covered.	1. Identify and explain the physiologic changes unique to pregnancy using a systems based approach 2. Define gestational hypertension and pre-eclampsia based on the current Canadian guidelines 3. Outline the basic investigations and principles of management of gestational hypertension 4. Describe the principles in managing pre-existing maternal medical conditions in pregnancy 5. Describe appropriate modifications of physical activity prescription for various conditions during pregnancy

MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 62: Inflammatory Joint Disease	CBL - Inflammatory Joint Disease	220	Ms. Rebecca Johnny is a 32-year-old Haida woman living in Kitimat, BC. She first presents to her family physician with a gradual onset of right elbow pain and swelling. After assessment and testing, a diagnosis of chronic monoarthritis is made and infection is ruled out. Over the next month, Ms. Johnny has progressively worsening joint pain and swelling, and difficulty with her activities of daily living. Her family physician notes that she has evolved from her initial presenting monoarthritis to an inflammatory polyarthritis (5 or more joints), therefore she requires an urgent referral to a Rheumatologist via eHealth. Allied health professionals, including a physiotherapist, an occupational therapist, and a social worker are involved in her care in Kitimat. Lab results reveal a positive test for Rheumatoid factor (RA factor) and a positive Anti-Nuclear Antibody (ANA), further fueling the differential diagnosis of Rheumatoid arthritis (RA) versus Lupus (systemic lupus erythematosis; SLE). Eventually a positive cyclic citrullinated peptide (CCP) blood test confirms the diagnosis of RA. In addition to laboratory findings, radiographic findings are presented. Pharmacological and non-pharmacological treatment options are discussed. Along the way, the patient wants to access Indigenous medicines and naturopathic treatments and this delays the institution of commonly prescribed treatments, due to the patient's hesitation. Emphasis is on the importance of an expedited involvement of a Rheumatologist once the patient progresses to an inflammatory polyarthritis and on the role	1. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 2. Compare and contrast the clinical, laboratory, synovial fluid, and radiographic differences among the various forms of arthritis, with emphasis on inflammatory forms of arthritis 3. Discuss the role of "modified balanced physical activity" in dealing with arthritic conditions 4. Describe the role of the Health Care Team, including that of the physician, nurse, physiotherapist, occupational therapist, social worker, and traditional health care provider in treating the "whole" patient and discuss the concept of the biopsychosocial model in chronic disease 5. Explain the critical importance of conventional treatments, such as Disease Modifying Anti-Rheumatic Drugs (DMARDs) for the management of inflammatory arthritis 6. Describe effective collaborations (e.g., referral patterns) across specialties and health professions including long term follow up care from a distance and the use of telehealth and eHealth 7. Describe the roles and responsibilities of each health professional in the establishment of an effective rehabilitation plan 8. Identify "burden of disease" for Indigenous people as well as resources and supports available for Indigenous people living with a chronic disease 9. List the clinical features, both articular and extra-articular, of Rheumatoid Arthritis (RA), along with lab tests and key radiographic changes seen in RA 10. Describe the clinical features of Systemic Lupus Erythematosis (SLE/lupus), and the importance of the Rheumatology Review of Systems, along with the typical laboratory findings and potential complications of this condition 11. Discuss the importance of being open-minded and non-judgmental about the use of complementary and alternative medical therapies 12. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments
MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 67: Dementia	Non-Pharmacological Treatment for Dementia	50	The goal of this lecture is to discuss the current non-pharmacological therapies for Alzheimer's disease and other dementias based on available research and clinical practice guidelines. Prevention of Alzheimer's dementia with non-pharmacological strategies will also be discussed, specifically the role of exercise.	1. Discuss non-pharmacological strategies for the prevention of Alzheimer's disease (specifically the role of exercise) 2. Describe non-pharmacological strategies for cognitive symptoms in Alzheimer's disease and other dementias 3. Describe non-pharamacological strategies for behavioral symptoms in Alzheimer's disease and other dementias

MEDD 422 Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education	Week 68: Transition Into Clinical Education 1 (TICE)	CBL - Transition Into Clinical Education 1	220	This week builds on the knowledge from Diabetes Week (MEDD411), focusing on the management of a diabetic patient with a history of chronic smoking, hypertension and obesity. Students will have opportunities to practice counseling skills focusing on lifestyle modification and medical management. When there is no significant improvement to this patient's glycemic control, students will discuss alternative strategies that also incorporate other health care professionals. Students will have a chance to write a referral letter and perform other general tasks expected of a family practitioner in the day-to-day care of this patient in the outpatient setting.	1. Apply foundational knowledge, critical thinking skills and clinical decision making to a simulated or real clinical scenario 2. Describe indications, contraindications and side effects of commonly used medications such as metformin, ACE inhibitors, diuretics, and statins 3. Demonstrate correct medication prescribing and charting practices 4. Demonstrate ability to counsel patients on risks and benefits of starting common medications 5. Demonstrate the use of point-of-care electronic clinical resources to answer clinical questions 6. Communicate pertinent patient information clearly and assist in setting a shared care plan with other health care professionals 7. Demonstrate professional behaviour particularly in regards to appropriate response to feedback, appearance, communication, confidentiality, boundaries, honesty and respect in clinical and non-clinical learning environments 8. Explain the role of clinicians and different members of a health care team in the diagnosis and management of patients with chronic diseases such as type 2 diabetes 9. Manage a patient with type 2 diabetes in the ambulatory setting including the following: a. Perform and document the history and physical exam with attention to the secondary complications of diabetes and associated risk factors for end organ damage b. Counsel a patient on management of type 2 diabetes, including an exercise program, healthy diet and pharmacotherapy. c. Empower the patient and his family to be active participants in their care using e-health tools d. Consult with other health care professionals in the long-term management of a patient with diabetes and its complications
MEDD 431 Clerkship	Ambulatory Block	Family Practice: Dyslipidemia	180	Students should seek out clinical opportunities for learning from patients with dyslipidemia. To complement and supplement clinical learning, the following resources are available to students. (1) Facilitated AHD sessions (2) Paper-based cases (see Entrada) (3) CARDS micro-cases (see Entrada). Where this fits in the spiral: Year 2 > MEDD 422: Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education > Week 56: Chest Pain / Angina / Myocardial Infarction Lipoprotein Metabolism and Cardiovascular Risk Assessment Year 2 > MEDD 421: Foundations of Medical Practice III (FOMP III) > Week 47: Diabetes Mellitus.	1. Identify patients in the family practice setting who would benefit from lipid screening and for whom non-fasting determination of lipids is acceptable 2. Compare and contrast the concepts of primary and secondary prevention 3. Use risk stratification tools (such as Framingham Risk Score) to identify patients at high risk of developing cardiovascular disease and describe the limitations of the tools 4. Describe medications available for treatment of dyslipidemia, including the benefits and risks of statin treatment 5. Find and evaluate the quality and the applicability of current guidelines and studies, identifying limitations and possible bias they contain 6. Counsel patients on appropriate lifestyle modifications, utilizing resources and tools that take into account a patient's health literacy and sociocultural context

MEDD 431 Clerkship	Ambulatory Block	Family Practice: Adult Female Prevention Care	1761	Students should seek out clinical opportunities for learning from patients seeking preventive care or presenting with opportunities for preventive care. To complement and supplement clinical learning, the following resources are available to students. (1) Facilitated AHD sessions (2) SHARC-FM resources https://sites.google.com/site/sharcfm/sharc-fm-list-1 Where this fits in the spiral: Year 1 > MEDD 411: Foundations of Medical Practice I (FOMP I) > Week 6: Breast Mass - Overview of Mammography Year 2 > MEDD 421: Foundations of Medical Practice III (FOMP III) > Week 49: Osteoporosis Week 47: Diabetes Mellitus Year 2 > MEDD 422: Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education > Week 64: Prostate Cancer and Other GU Tumors / Health Promotion, Screening Tests and Evidence Based Medicine.	1. Conduct a patient interview so as to identify any significant age, sex and context-specific risk factors for health conditions (ex: exercise, diet, substance use, immunizations, falls) 2. Conduct an age, sex and context-specific evidence-informed physical exam (ex: blood pressure, weight, waist circumference) 3. Discuss pertinent screening tests and explain their purposes and limitations (ex: pap tests, mammography, colorectal cancer screening, bone mineral density, PSA testing, diabetes and hyperlidipemia screening) 4. Counsel patients on relevant health promotion/disease prevention strategies (ex: immunizations, exercise, diet, calcium/vitamin D, smoking cessation)
MEDD 431 Clerkship	Ambulatory Block	Family Practice: Adult Male Prevention Care	1761	Students should seek out clinical opportunities for learning from patients seeking preventive care or presenting with opportunities for preventive care. To complement and supplement clinical learning, the following resources are available to students. (1) Facilitated AHD sessions (2) SHARC-FM resources https://sites.google.com/site/sharcfm/sharc-fm-list-1 Where this fits in the spiral: Year 2 > MEDD 421: Foundations of Medical Practice III (FOMP III) > Week 49: Osteoporosis Week 47: Diabetes Mellitus Year 2 > MEDD 422: Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education > Week 64: Prostate Cancer and Other GU Tumors / Health Promotion, Screening Tests and Evidence Based Medicine - PSA / Other Screening Tests.	1. Conduct a patient interview so as to identify any significant age, sex and context-specific risk factors for health conditions (ex: exercise, diet, substance use, immunizations, falls) 2. Conduct an age, sex and context-specific evidence-informed physical exam (ex: blood pressure, weight, waist circumference) 3. Counsel patients on relevant health promotion/disease prevention strategies (ex: immunizations, exercise, diet, calcium/vitamin D, smoking cessation) 4. Discuss pertinent screening tests and explain their purposes and limitations (e.g. colorectal cancer screening, bone mineral density, PSA testing, diabetes and dyslidipemia screening)
MEDD 431 Clerkship	Ambulatory Block	Ambulatory Internal Medicine: Diabetes	60	The Aquifer Internal Medicine cases 7 and 8 covering Diabetes are to be completed by the student during independent study time. Where this fits in the spiral: Year 2 > MEDD 421: Foundations of Medical Practice III (FOMP III) > Week 47: Diabetes Mellitus Year 2 > MEDD 422: Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education > Week 68: Consolidation of Clinical Transition 1 (TICE).	1. Describe the basic management of hypertension and hyperlipidemia in the diabetic patient 2. List the major causes of morbidity and mortality in diabetes mellitus 3. Discuss the pathogenesis of type 1 and type 2 diabetes 4. Describe the basic management of diabetic ketoacidosis and nonketotic hyperglycemic states, including the similarities and differences in insulin therapy and fluid and electrolyte replacement 5. Counsel diabetic patients on behaviour change including dietary measures and exercise 6. Review and utilize chronic Canadian Diabetes disease management guidelines- http://guidelines.diabetes.ca/docs/CPG-quick-reference-guide-web-EN.pdf

MEDD 431 Clerkship	Brain and Body Block	Psychiatry Clinical Objectives: Depressive Episode	4064	Students should seek out clinical experiences that support these learning objectives. Where this fits in the spiral: Year 1 > MEDD 412: Foundations of Medical Practice II (FOMP II) > Clinical Experiences - Psychiatry 1 Year 1 > MEDD 412: Foundations of Medical Practice II (FOMP II) > Clinical Experiences - Psychiatry 2 Year 1 > MEDD 412: Foundations of Medical Practice II (FOMP II) > Week 28: Depression Year 3 > MEDD 431-Clerkship: Brain and Body Adult Psychiatry - Depressed Anna Adult Psychiatry - Depressed Mrs. Schwartz - Geriatrics Adult Psychiatry - ECT Neurostimulation Treatments in Psychiatry.	1. List the DSM-5 criteria for a major depressive episode 2. List first-line pharmacotherapy options for the management of major depressive disorder 3. Use evidence-based strategies, such as switching and adjunctive approaches, to manage non-response or incomplete response 4. Describe short-term and long-term side effects of first-line pharmacotherapy options for the management of major depressive disorder and demonstrate how to monitor for them, including sexual side effects 5. Identify which class an antidepressant belongs to, based on its mechanism of action 6. Describe the components of cognitive behavioural therapy (CBT) for depression 7. List the types of psychotherapy used in the treatment of major depressive disorder 8. Identify the best practice guidelines for antidepressant use in adolescent depression 9. Recognize key risk factors associated with adolescent suicide 10. Outline the diagnostic criteria for disruptive mood dysregulation disorder (DMDD) 11. Describe the epidemiology and natural history of major depressive disorder 12. Identify age-related factors in the onset and presentation of depressive disorders in older adults 13. List the neurotransmitters involved in depression 14. Recognize that treatments can be delivered individually or in groups 15. Recognize the role of symptom severity on treatment selection (e.g., pharmacotherapy, psychotherapy, exercise, light therapy, neurostimulation therapy [electroconvulsive therapy (ECT), repetitive transcranial magnetic stimulation (rTMS)]) 16. Compare the similarities and differences in the management of major depressive disorder in children/adolescents, adults, and older adults/geriatrics 17. List commonly used psychiatric rating scales (e.g. PHQ-9, GAD-7) and explain their application to clinical practice 18. Evaluate the role of cognitive behavioural therapy (CBT) in the treatment of adolescent depression
MEDD 431 Clerkship	Women's and Children's Health Block	Pediatrics: Obesity	50	This session focuses on management of obesity and its complication. Where this fits in the Spiral: Year 2 > MEDD 422: Foundations of Medical Practice IV (FOMP IV) and Transition into Clinical Education > Week 68: Consolidation of Clinical Transition 1 (TICE).	1. Demonstrate ability to plot height, weight and body mass index on growth charts 2. List causes of obesity 3. Describe potential complications of obesity 4. Manage patients with obesity, including the application of the 5-2-1-0 rule 5. Empower patients to be active participant in their obesity management

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