Exercise Prescription in Future Medical Practice

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE in The Faculty of Graduate and Postdoctoral Studies (Kinesiology)

THE UNIVERSITY OF BRITISH COLUMBIA (VANCOUVER)
July, 2014

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ABSTRACT

Physical inactivity is a major risk factor in chronic disease and Canadians are insufficiently active. Exercise prescription has been shown to be effective but few physicians prescribe it. The purpose of this study was to determine family medicine residents' perceived importance of exercise prescription, and to assess the factors associated with residents who indicate the strongest conviction to prescribe exercise. All 396 family medicine residents registered in first or second year at the University of British Columbia, during June 2013 - August 2013, were eligible to complete the cross-sectional 49-item survey. The outcome measures were (1) the importance of exercise prescription in future practice (2) perception of their training in exercise medicine (3) change of the importance of exercise prescription over the course of residency. The data were analyzed using descriptive and inferential statistics to assess significant relationships between each independent variable, resident physical activity levels, attitudes/beliefs, current counselling/prescribing behaviours, awareness/knowledge of physical activity guidelines, self-perceived competence in exercise prescription, and perception of training received, to their perceived importance of exercise prescription in future practice. The data were analyzed as continuous or categorical variables primarily using bivariate analysis with statistical significance set at the level of 0.05. The response rate was 80.6% (319/396). 95.6% of residents indicated exercise prescription would be important in their future practice with 37.5% strongly agreeing (termed "prescribers"). Prescribers had stronger beliefs in the importance of physical activity in health (p<0.001), physical inactivity in disease (p<0.001), and higher rates of current exercise counselling (p=0.001), exercise prescription (p=0.001), and competence prescribing exercise (p=0.005) compared to their colleagues. There was no difference between prescribers and non-prescribers regarding their levels of physical activity, knowledge, or perception of training. The importance of exercise prescription did not change over the course of residency. Only 18.6% of all residents feel they receive adequate training and 91% desire more training in exercise medicine. Exercise prescription is important
to residents, but residency is not sufficiently preparing them to prescribe exercise effectively.
PREFACE

This thesis represents the independent work of the author and contains original, unpublished data collected and analyzed for partial fulfillment of the author’s Master of Science degree. The study, Exercise and Future Clinical Practice, and research tool were approved by the Behavioural Research Ethics Board (Approval number: H13-00786) at the University of British Columbia.
# TABLE OF CONTENTS

Abstract .................................................................................................................................ii
Preface .................................................................................................................................iv
Table of Contents ....................................................................................................................v
List of Tables ..........................................................................................................................viii
List of Figures ........................................................................................................................ix
Acknowledgements ..............................................................................................................x
Dedication .............................................................................................................................xii

## INTRODUCTION

- Objectives .........................................................................................................................5
- Hypotheses ..........................................................................................................................6

## METHODS

- Study Population ..............................................................................................................8
- Research Tool Development ............................................................................................8
- Questionnaire ....................................................................................................................10
- Survey Distribution .........................................................................................................12
- Data Analysis ....................................................................................................................13

### Primary Outcome Measure

- Objective 1
  - Physical activity levels .................................................................................................14
  - Current exercise counselling and prescription ...............................................................16
  - Attitudes and beliefs .........................................................................................................16
  - Knowledge of the Canadian Physical Activity Guidelines .............................................17
  - Self-perceived competence ..............................................................................................18

### Objective 2

- Residents’ perception of medical training received in exercise medicine and exercise prescription ..............................................................21

### Objective 3

- Changes in residents’ perception of the importance of exercise prescription over the course of residency .................................................................22
RESULTS .............................................................................................................................................23

Survey Response ..................................................................................................................................23
Descriptive Statistics ...............................................................................................................................23
Primary Outcome Measure ..................................................................................................................25

Objective 1
Physical activity levels ............................................................................................................................27
Current exercise counselling and prescription ......................................................................................31
Attitudes and beliefs ...............................................................................................................................33
Knowledge of the Canadian Physical Activity Guidelines .....................................................................39
Self-perceived competence ....................................................................................................................42

Objective 2
Residents’ perception of medical training received in exercise medicine and exercise prescription ..........................................................45

Objective 3
Changes in residents’ perception of the importance of exercise prescription over the course of residency ...........................................................47

DISCUSSION .........................................................................................................................................48

Primary Outcome Measure ..................................................................................................................48

Objective 1
Physical activity levels ............................................................................................................................48
Current exercise counselling and prescription ......................................................................................52
Attitudes and beliefs ...............................................................................................................................56
Knowledge of the Canadian Physical Activity Guidelines .....................................................................57
Self-perceived competence ....................................................................................................................61

Objective 2
Residents’ perception of medical training received in exercise medicine and exercise prescription ..........................................................63

Objective 3
Changes in residents’ perception of the importance of exercise prescription over the course of residency...........................................................66
Strengths and Limitations

Limitations .................................................................................................................67
Strengths .....................................................................................................................68

CONCLUSIONS ..............................................................................................................70
REFERENCES ................................................................................................................72
APPENDICES ................................................................................................................83

Appendix A
  Qualitative Data - Residents’ Comments .................................................................83

Appendix B
  Questionnaire ............................................................................................................93

Appendix C
  Elicitation Interview Question Guide .....................................................................103

Appendix D
  Participant Recruitment - Cover Letter .................................................................109
  Consent Form ............................................................................................................110

Appendix E
  Canadian Physical Activity Guidelines ..................................................................111

Appendix F
  Canadian Sedentary Behaviour Guidelines ...........................................................113
LIST OF TABLES

Table 1: Representation of Study Participants from all UBC Family Practice Residency Sites .................................................................24

Table 2: Current Physical Activity Counselling and Exercise Prescription Rates of UBC Family Medicine Residents in a typical office encounter ..............32

Table 3: Current physical activity counselling and exercise prescription rates of Prescribers compared to Non-prescribers .......................................................32

Table 4: Difference in confidence prescribing exercise and perceived success in engaging patients in exercise between Prescribers and Non-Prescribers .................................................................33

Table 5: Attitudes and beliefs about physical activity in health between Prescribers and Non-Prescribers .................................................................36

Table 6: The different perceptions of program support of resident physical activity as a function of different stages of training ..................................38

Table 7: Paired T-Tests comparing residents self-rated competence prescribing exercise to healthy vs NCD patient populations ...........................................42

Table 8: Exercise Prescription Competence of Prescribers and Non-Prescribers in patients who are healthy and patients with NCD ....................44

Table 9: Comparing the importance of exercise prescription in future practice between three cohorts of residents at different stages of training .........................47
LIST OF FIGURES

Figure 1: Residents’ Previous Exposure to Exercise Medicine ..............................25

Figure 2: Primary Outcome Measure: Residents Perceived Importance of
Exercise Prescription in Future Practice ............................................................26

Figure 3: Residents Activity Levels Classified by Met-Min/Week Achieved ........28

Figure 4: Comparing Residents Perceived Importance vs.Control over
their Personal Exercise ....................................................................................30

Figure 5: UBC Family Medicine Residents’ Attitudes and Beliefs of Physical
Activity in Health ..........................................................................................35

Figure 6: Residents’ Perspectives on the Importance vs. Actuality of
Programs Encouraging Residents’ Physical Activity ........................................37

Figure 7: Residents Awareness of Canadian Physical Activity Guidelines ........39

Figure 8: Resident Knowledge of the Canadian Guideline Recommended
Levels of Physical Activity ..............................................................................40

Figure 9: Knowledge Score: Physical Activity Recommendations in Health ....41

Figure 10: Residents’ Competence in Exercise Prescription Skills to Different
Patient Populations .........................................................................................43

Figure 11: Residents’ Perspectives on their Training in Exercise Medicine and
Exercise Prescription ......................................................................................46
ACKNOWLEDGEMENTS

I consider myself very fortunate to have had the opportunity to work under the leadership and guidance of my supervisor, Don McKenzie. I reveled under his tutelage, to the extent I chose to prolong my masters. I delighted in our discussions, seated in the well-worn chair, countless graduate students have frayed before me. It is not often one has the opportunity to learn and grow under the supervision of another, whom inspires you both professionally and personally. I have and I am eternally grateful. Don, you are no longer my supervisor, but you are forever my mentor.

It is not often good fortune strikes twice, and it did for me, in the opportunity of working with Michael Koehle. Thank you, Mike, for your incredible patience, tolerance (for things I should already know), support with technology, and inspiring words. Mike is arguably one of the most intelligent, diversely skilled, pragmatic, multi-talented and genuinely kind individuals that I know. I am so incredibly fortunate to have met and worked with you, Mike, and I hope to continue to work with you for years to come.

Thank you Gina, for agreeing to be on my committee, despite your incredibly demanding schedule. You are a gifted scholar and educator, and were able to teach me a significant amount in a short period of time. You introduced me to several key concepts and theories, integral to research. Your lessons were incredibly valuable, not only for my current research but relevant for any future research I engage in. You introduced a dimension to research of which I knew little about. I appreciated your input, and continue to, more than you know.

I’d like to thank the partners at UBC Allan McGavin, Rob, Navin and Jack for being understanding and supportive in my epic fellowship. You all are such fabulous
guys, I thought I’d hang around awhile. Thank you for continually guiding me back to “the brick,” not the city wall. And to Nancy, for being Nancy.
I would like to acknowledge Shirley Tam for distributing the electronic survey and being a point person for me at the department of family practice. I am grateful to doctors Ruth Martin, Betty Calam, Eva Knell, and Willa Henry for allowing me the opportunity to speak directly to residents, at three key program wide resident gatherings.

I’d like to acknowledge the statistical support of Dr. Jonathan Berkowitz who promptly and tirelessly answered my endless questions and did a superb job analyzing the significant volume of data collected.

Thank you to Wendy Norman, the UBC Clinical Scholars program for the funding and support, and the UBC Department of Family Practice Research for being inclusive of new researchers and sharing your varied experiences.

I would be amiss to not acknowledge my colleagues who were subjected to various stages of questionnaire development. I am grateful to each of you, for all of your input and feedback, as well as the UBC residents who participated in the study. Your thoughts and opinions are insightful, and may change the course of UBC family medicine training.

Finally, an enormous thank you to my family. My children for their unconditional love and for understanding that occasionally mommy couldn’t be goalie, but needed to work. To my sister for leaving inspirational comments, my mom for her tireless editing and my dad for always balancing the other end of the canoe. Finally, to my husband Chris, who is my soulmate and true life partner, in every possible way. I couldn’t have done this without you.
DEDICATION

I dedicate this thesis to my boys, Finn and Grady. They are my joy and inspiration. Their health and future fueled both my passion for this topic and my perseverance to finish, so that one day physical activity is the norm, and we again restore the longevity of our future generations.
INTRODUCTION

The World Health Organization’s (WHO) most recent global status report shows that noncommunicable disease (NCD) is responsible for 89% of mortality in Canada and 63% of global mortality.[1] The world health organization has targeted physical inactivity along with smoking, poor diet and excessive alcohol use, as the four greatest modifiable risk factors to target in the effort to decrease the 36 million global deaths due to NCD that occur annually.[2]

Physical inactivity contributes to key metabolic and physiologic changes that increase the risk of chronic disease, resulting in high blood pressure, impaired blood sugar, and obesity. Physical inactivity itself is the direct cause of 3.2 million deaths and is the fourth leading cause of global mortality according to the World Health Organization’s global health statistics.[2,3] Accordingly, physical inactivity plays a significant role in four out of the top five leading causes of global mortality, hypertension (16.5%), impaired glucose (6%), physical inactivity (6%) and overweight/obesity (5%), with tobacco (9%) being the only exception in which physical inactivity doesn’t play a direct role. [1,2,4,5]

Similar to physical inactivity’s role in disease, physical activity’s role in health is well established. There is substantial evidence of the role of physical activity and exercise in the prevention and treatment of over 25 different chronic diseases.[6,7] Extensive data accumulated over decades of research provide the foundation of the Physical Activity Guidelines for Canada.[6-15] The physical activity guidelines are very similar between nations due to both the scientific foundation from which they are derived, as well as a concerted effort by nations to promote consistent messaging to best inform appropriate targets or levels of physical activity, to improve the health of all populations.[3]
The Canadian Physical Activity Guidelines (PAG) recommend adults (18-64 y.o.) attain 150 minutes of moderate to vigorous physical activity (MVPA) per week and perform a form of resistance/strength training two times per week (www.csep.ca/guidelines).[6] (Please refer to the appendix for details of the specific Canadian Physical Activity Guidelines.) It is estimated that if Canadians achieved the recommended level of activity, the premature death rate of Canadians would decrease 30%, cardiovascular disease (30%), stroke (25%), osteoporosis (25%), hypertension (20%), diabetes (20%), colon cancer (20%) and breast cancer (14%), while simultaneously improving Canadians' mental health and quality of life.[6,12,13,16] However, Canadians remain insufficiently active. At least half of Canadians report insufficient physical activity to meet the recommendations,[17] and objective accelerometer data indicate that only 15% of Canadian adults are actually achieving 150 min MVPA per week.[18] Equally, if not more concerning, is that accelerometer data indicate only 7% of Canadian children and youth are actually achieving the recommended guideline of sixty minutes per day of physical activity for their best health.[19]

Primary care physicians are well positioned to counsel patients on the importance of physical activity and to prescribe exercise for their patients' best health. Physicians are a respected, trusted and expected source of health information and health promotion.[20,21] Primary care physicians service a large portion of the population and statistics indicated that 80-94% of North Americans visited a family physician over a one year period and that Canadian adults average 3.1 visits per year to their family physician.[22-24]

Studies evaluating the impact of physicians on changing and supporting patient health behaviours such as physical activity, in the primary-care environment, have shown a positive outcome.[25-27] Studies have reported family physicians were effective in increasing physical activity in their patients.[28]
Physical activity counselling and exercise prescription by primary care physicians, however, remains low.[29] Despite data supporting that detailed written exercise prescription is more effective than exercise counselling alone, physicians’ are more comfortable counselling, compared to prescribing exercise.[30-33] Physicians’ report offering general advice or encouragements much more frequently than providing either specific verbal counselling or written exercise prescription for their patients.[29,34,35] The largest study of (13,166) Canadian family physicians reported 69.8% of physicians provided generalized verbal counselling, yet only 15.8% provided detailed exercise prescriptions to their patients.[29] Ideally, physicians would provide specific written exercise prescriptions tailored to a patient’s health and specific medical conditions and prescribe physical activity in the same manner as they would a pharmaceutical product, specifying the type of activity (drug), and the frequency, intensity and duration of the activity (dose).[7]

When exercise prescription was defined by researchers into three composite components, (1) taking a physical activity history, (2) performing a physical exam +/- investigations as required, (3) and writing a specific exercise prescription, only 6.7% of Canadian family physicians rated themselves as “very knowledgable”; the majority identified themselves as being “slightly knowledgable” or below and 17% reported having “no knowledge/ability” in providing proper exercise prescription.[36]

Studies indicate physical activity and exercise prescription competence is low at all levels of training. Medical students, residents and experienced clinicians, all report lack of knowledge and training as a significant barrier to providing patients with exercise prescription. Medical students rated themselves as only moderately competent in exercise prescription, only 28% of residents felt confident in their exercise prescription skills, and practicing physicians indicated they do not feel adequately trained or competent to provide patients with specific exercise prescriptions.[36-38] Further, deans of medical programs report only 10% of their graduating students are competent in exercise prescription.[39]
Despite the acknowledgment of the medical education community that a training deficiency in exercise medicine exists, few medical schools or residency programs have formal or well structured training in exercise medicine [39-43] and few have any immediate plans to change the current curriculum to address this gap.[39] Despite the known efficacy of exercise as prevention and treatment in chronic disease, and studies reporting medical students, residents and practicing physicians all feel inadequately prepared to prescribe exercise, skills related to physical activity counselling and exercise prescription remain underemphasized in medical education.

The discrepancy between current and desired exercise counselling and prescription practices is frequently reported for physicians at all stages of their careers. It appears doctors are aware of the importance of the role of exercise and physical activity in health, yet because they do not feel adequately prepared to prescribe exercise to their patients, they are not currently prescribing it, despite their desire to do so. With minimal exposure to exercise medicine over the course of training, it is not surprising that medical trainees and physicians report low levels of knowledge and competence in exercise prescription and subsequently rates remain low.[29,36] Medical students, residents and practicing physicians have consistently indicated a desire to receive more education and training in exercise medicine, to enable them to competently and effectively prescribe exercise to their patients.[29,36,44-46]

There are few studies in the physical activity literature assessing family practice residents. Residents, however, are at a potentially optimal stage of training for future exercise medicine curriculum. Residents have a knowledge base in physiology and pathophysiology, which serve as an effective foundation to educate on the physiologic impact of exercise in health and physical inactivity in disease. Residents have fundamental clinical skills, care for a high volume of patients and have regular academic sessions. This combination provides opportunity for
residents to learn essential skills in exercise prescription, and develop their proficiency integrating exercise counselling into their patient encounters. Educating residents in the principles of exercise in health and disease, while developing their skills integral to exercise counselling, will help prepare our future doctors to prescribe exercise effectively for the prevention and treatment of NCD.

This is the first study to examine Canadian family medicine residents regarding their perceived importance of exercise prescription and their intention to prescribe exercise in their future practice.

**OBJECTIVES**

1. To assess the relationship between residents’ perceived importance of exercise prescription in their future practice with their:
   a. personal physical activity levels;
   b. attitudes and beliefs;
   c. current physical activity counselling and exercise prescription behaviours;
   d. awareness and knowledge of the Canadian Physical Activity Guidelines;
   e. self-perceived competence in exercise prescription

2. To determine residents’ perception of the training they receive in exercise as medicine and exercise prescription.

3. To assess if the perceived importance of exercise prescription in future practice changes over time, from the beginning of residency training through to graduation.
HYPOTHESES

1. Residents who indicate a higher level of perceived importance of physical activity prescription in future medical practice, compared to their colleagues will differ in the following ways:

   a. Personal physical activity levels:
      i. be more active (now and prior to residency training)
      ii. feel greater self-efficacy and control of their own physical activity

   b. Current Counselling and Prescription Practices:
      i. currently counsel and prescribe exercise more frequently
      ii. feel more effective in getting patients to start exercising

   c. Attitudes and Beliefs:
      i. be more interested in prevention
      ii. hold stronger beliefs of the role of physical activity in health and physical inactivity in disease
      iii. believe their exercise counselling is more credible if they are physically active

   d. Knowledge:
      i. be more aware of the physical activity guidelines
      ii. be more knowledgeable about the role of physical activity in health and physical inactivity in disease

   e. Self-Perceived Competence:
      i. be more comfortable/competent prescribing exercise to both healthy patients and those with chronic disease

2. Residents will feel their training has not been extensive in exercise medicine and the majority will be interested in receiving more education in physical activity and exercise prescription, regardless of whether they’ve indicated exercise prescription will be an integral part of their future practice.
3. The relationship between stage of family medicine residency training (incoming first year residents (R1), residents midway through their training, or graduating second year residents (R2)) will not be as predictive, or possibly show no relationship, as residents' personal factors such as physical activity levels, attitudes and beliefs, knowledge and competence on their perceived importance of exercise prescription in their future practice.

This study serves as an important step towards bridging the disconnect between the strong evidence of physical inactivity in disease and physical activity in health, to the delivery of specific patient-centered exercise prescriptions by physicians. Assessing the factors associated with residents who indicate exercise prescription will be integral in their future practice, will assist in informing change, to ensure we are most effectively preparing the new generation of physicians with the knowledge, attitude and skills to counsel and prescribe exercise to their patients. Family medicine residents, are optimally situated to bridge this gap, to become leaders in physical activity prescription, and to improve the health of their patients, community and to serve an important role in improving our population health.
METHODS

STUDY POPULATION

Three cohorts of UBC Family Medicine residents were surveyed: graduating second year residents (R2s; graduating class of 2013), incoming first year residents (R1s class of 2015) and residents midway in their training (class of 2014). A total of 396 residents were eligible to participate.

Inclusion Criteria: All first or second year residents registered in the Department of Family Practice at UBC at the time of the study, June 2013 - Sept 2013.

Exclusion Criteria: Any Family Medicine resident not in the R1 or R2 year of study.

RESEARCH TOOL DEVELOPMENT

The survey tool was a 34 question (49-item) questionnaire. Independent variables were chosen based on prior published peer-reviewed research on the predictors and factors related to physician physical activity counselling and exercise prescription. The survey instrument incorporated established validated tools wherever possible.

New questions were designed through a combination of expert opinion, interviews of a similar population to the study population (recent graduates of family medicine), or were natural extensions of previous peer-reviewed studies. New questions were designed specifically to answer the research objectives, and inform areas identified as gaps in the literature.
The advantages, disadvantages, enabling factors and barriers related to discussing physical activity with patients and prescribing exercise were assessed during the interviews of recent graduates. Questions were developed or modified based on the outcomes of the interviews and were further refined by expert panel as required. (Please refer to elicitation interview question guide included in the appendix.)

Current physical activity levels were assessed using the established International Physical Activity Questionnaire (IPAQ). The IPAQ is a physical activity assessment tool that has been validated in twelve countries and shown to be reliable and valid for assessing levels of physical activity and inactivity.[47-49] It has been used to assess physical activity levels in specific populations, has 24 cultural and language specific versions ([https://sites.google.com/site/theipaq/questionnaire_links](https://sites.google.com/site/theipaq/questionnaire_links)) and is recommended to assess physical activity in population health.[50,51]

The present study used the short form version, to avoid unnecessary length of the overall research tool, in which subjects recall their activities over the previous seven days ([https://sites.google.com/site/theipaq/](https://sites.google.com/site/theipaq/)). The short form version of the IPAQ has been recommended for national monitoring of physical activity.

Questions from published peer-reviewed studies that were relevant to the study’s objectives were included in the research tool. All questions underwent rigorous evaluation prior to inclusion in the survey tool. Questions were carefully assessed by independent clinicians and piloted in three stages of questionnaire development prior to being incorporated into the final research instrument.

A formal sample size calculation based on statistical power considerations was not completed due to the lack of established relationships between physicians and exercise prescription in the literature. Additionally, this study was a hypothesis generating study, not a hypothesis testing study. Instead, an analysis of achievable
target sample sizes was undertaken based on margins of error for confidence intervals, and the proposed two-group comparisons of means and proportions using generally accepted guidelines for effect sizes.

Study variables were analyzed both in binary and in measurement scale versions. For 95% confidence intervals for proportions, a sample size of 300 would lead to a precision of better than plus or minus 6%. For 95% confidence intervals for means (on 7-point scales), assuming a standard deviation of 2 points, a sample size of 300 would lead to a precision of less than 0.25. Thus a sample of 300 provides ample precision in estimation.

For two-group comparisons of means, using a medium effect size (i.e. half a standard deviation difference between means) with 80% power and a 5% significance level, approximately 64 subjects per group were needed. For two-group comparisons of proportions, a difference of approximately 20% requires at least 50 subjects per group, while a difference of approximately 15% requires about 100 subjects per group, for 80% power and 5% significance. Thus, for exploratory comparisons (e.g. between exercise prescribers and non-prescribers), a sample size of 300 was sufficient to achieve reasonable power.

**Questionnaire**

The survey consisted of seven main sections:

1. **Residents' personal physical activity levels** - including residents previous levels of exercise in medical school and prior to medical training, current physical activity, the importance of their personal exercise levels and feelings of control over their exercise
2. **Current and future physical activity prescription practices** - including current physical activity counselling and exercise prescription behaviour, confidence in prescribing exercise, perceived success in getting patients active and the importance of exercise prescription in their future practice (main outcome measure)

3. **Attitudes and beliefs of physical activity in health and physical inactivity in disease** - including residents’ belief of the importance of physical activity to a patient’s current health, assessment of residents’ interest in prevention versus treatment, belief that physicians have a responsibility to prescribe exercise to patients, belief that they feel their advice will be more credible and effective if they exercise, residents’ perception whether it is important for programs to encourage residents to be physically active and their perception of whether or not their residency program does achieve this goal

4. **Awareness and knowledge of the Canadian Physical Activity Guidelines** - including awareness of the physical activity guidelines, knowledge of the recommended levels of aerobic and strength activities for different population age groups, including children, adults and older adults and the role of physical inactivity in disease

5. **Self-rated competence in three key aspects of exercise prescription** - including clinical assessment, aerobic exercise prescription and resistance (strength) exercise prescription for both healthy patients and patients with chronic disease

6. **Perception of medical training received in exercise medicine and exercise prescription** - including residents’ perception of the adequacy of their training received in exercise medicine, and if they desire further training
7. **Basic demographic data** - including stage of training, training site, previous exposure/experience in exercise medicine, gender, birth year, perception of their own body weight and level of fitness, and a free text section for open comments

The final 49-item questionnaire was tested first in an open format on a similar population to the target audience. It was modified accordingly, reviewed by expert panel and piloted tested on another representative population, recent family medicine graduates, to ensure face validity, readability, clarity and and timing. The survey took approximately 10 minutes to complete and final refinements were performed prior to its distribution to the target population of current UBC family medicine residents. The study was approved by the UBC behavioural research ethics board.

**SURVEY DISTRIBUTION**

Residents currently registered in the University of British Columbia Department of Family Practice were contacted via the secure UBC family practice resident email listserv via by the program administrator and/or the education manager of the Department of Family Practice. Participants were invited to complete an online survey through the Canadian web based platform Fluid Survey. At the time of the initial contact potential study participants received a study information package consisting of a cover letter inviting participation and a consent document. Subjects were not asked for information in the survey which would personally identify them. A follow-up email was sent 1-2 weeks following the initial contact and a final reminder of the survey’s closing was sent 6-8 weeks following the initial invitation to participate in the study.
UBC family medicine residents train at multiple sites across the province and occasionally gather at program-wide events. On three of these occasions residents were informed by one of the researchers of their opportunity to participate in this study. These site-wide gatherings included the program wide R1 academic session (June 20th, 2013), the Department of Family Practice resident research day, (June 21st, 2013) and the incoming new resident orientation session, (June 27th, 2013). At the R1 and R2 resident research day the opportunity for residents to complete the online survey at individual tablets was available over the duration of the day.

DATA ANALYSIS

PRIMARY OUTCOME MEASURE:

The Importance of Exercise Prescription in Future Medical Practice

The majority of the questions were designed to facilitate responses on a 7-point Likert scale. Responses using a 7-point Likert scale have the flexibility to be analyzed as either a continuous measure or collapsed into categorical variables. For maximal clinical relevance the primary outcome measure (Q11, item 18) was collapsed into two dichotomous measures at the level of 7/7 on the 7-point Likert scale apriori for the subsequent statistical bivariate analysis. This level of division facilitated study of the residents who indicated exercise prescription will be integral in their future clinical practice and are referred to for the remainder of the analysis as “prescribers,” compared to their colleagues who less strongly indicated exercise prescription will be important in their future practice (1-6/7 on the 7-point Likert scale) and are referred to as “non-prescribers.” The same level of collapse on the 7-point Likert scale, 1-6 vs 7, that was applied to the main dependent variable as
described, was objectively applied apriori to all independent variables when creating categorical measures for the ensuing bivariate analysis. Data were analyzed using descriptive and inferential statistics. Frequency tables, t-tests, one-way ANOVA, and Chi-square tests of independence, were used as detailed below. Statistical significance were set to the p=0.05 level with Bonferroni correction to mitigate erroneously attributing significance to a relationship. Confidence intervals were constructed where appropriate.

OBJECTIVE 1:

To assess the relationship between residents’ perceived importance of exercise prescription in their future practice with:

Section 1: Residents’ Personal Physical Activity Levels (PAL)

Six questions (Q1-6) (items 1-13) addressed various aspects of personal exercise habits:

1. Two questions assessed prior physical activity (7-points scales) (Q1-2) (item1-2)
2. Two questions assessed current physical activity using the International Physical Activity Questionnaire (IPAQ) short form. The IPAQ-7 is a seven day recall of physical activity and consists of seven questions. Three couplets evaluate the frequency and duration of physical activity performed at varying intensities of effort, including vigorous, moderate and walking, with a final question assessing time spent sitting. The responses are converted into met-minutes, with calculations of frequency x duration (in minutes) x a metabolic equivalent (MET) assigned to that level of activity
(8,4,3.3 respectively for vigorous, moderate and walking). Totals are summed to give an individual’s total met-minutes/week, which are analyzed either as a continuous variable or classified in accordance with the validated IPAQ criteria for high, moderate or low levels of physical activity. [47] Both moderate and high IPAQ categories satisfy the Canadian Physical Activity Guidelines of 150 minutes of moderate to vigorous activity a week (30min 5x/week), which is equivalent to equal or greater than 600 metabolic minutes/week.

Our research tool included two new questions in this section of the questionnaire to more specifically evaluate resident physical activity behaviour. The first additional question assessed the time spent sitting on a typical workday compared to a non-working day. This allowed differentiation of resident sedentary behaviour due to their resident duties compared to a day off.

The second additional question further assessed current physical activity patterns by differentiating the type of physical activity engaged in such as resistance/strength exercise compared to the aerobic activity assessed by the IPAQ. It followed the IPAQ tool format and assessed resident participation in strength related physical activity in a typical week. (Q3-4) (item 3-10) (item 11)

3. Two questions assessing perceived self-efficacy in being physically active (7-point scales). (Q5-6) (item 12-13)

Each item was assessed as a predictor of the primary outcome measure (POM), the importance of prescribing exercise in future clinical practice, using Chi-square tests.
Section 2: Current and Future Physical Activity Prescription Practices

Five questions (Q 7-11) (items 14-18) assessed the current counselling and prescription habits, self-efficacy of exercise prescription skills and the importance of exercise prescription in residents' their future medical practice:

1. Two questions assessed the frequency of their current counselling and prescription (Q7-8) (item 14-15)
2. Two questions assessed self-efficacy and perceived control pertaining to exercise prescription, specifically confidence in prescribing physical activity (Q9, item 16) and perceived success in getting patients active (Q 10, item 17)
3. The final question was the primary outcome measure, the importance of prescribing exercise in future medical practice (Q11, item 18)

Current physical activity counselling and prescription practices were assessed using two ordinal scale items that were consistent between the questions. Two self-efficacy items were assessed on a 7-pt Likert scale. The association between current practice and self-efficacy were examined categorically with cross tabulations, then the association between each measure and the dichotomous POM were examined using Chi-square tests.

Section 3: Attitudes and Beliefs

Seven questions (Q12-18) (items 19-25) assessed resident attitudes and beliefs about physical activity in health and physical inactivity in disease, using 7-point Likert scales:
1. “I believe that regular PA is integral to my patients’ CURRENT health” (Q12, item 19)
2. “I believe sedentary behaviour is harmful to my patients’ health” (Q13, item 20) *inverse scoring
3. “I believe sedentary behaviour is harmful to my patients’ health” (Q14, item 21)
4. “I will be able to provide more credible and effective counselling if I exercise and stay fit” (Q15, item 22)
5. “I believe physicians have a responsibility to promote physical activity to their patients” (Q16, item 23)

The five items (Questions 12-16, items 19-23) were summed (with Question 13, item 20 reverse coded) to compute an overall attitude/belief score (range 5 to 35); and the association with the POM was examined by correlation. Each individual item was collapsed categorically into a dichotomous variable at the same level as the primary outcome measure and evaluated using Chi-square tests.

The two final questions in this section examined resident attitudes and beliefs regarding physical activity in residency training programs:

6. “Residency programs should encourage their residents to practice physically active lifestyles” (Q17, item 24)
7. “My residency program encourages residents to exercise and be physically active” (Q 18, item 25)

These two items (Questions 17 and 18) were each compared to the primary outcome measure, cross-tabulated with one another and then further subdivided by residency site.
Section 4: Awareness and Knowledge of Physical Activity Guidelines and the Role of Physical Activity in Health and Disease

Five questions (Q19-23, items 26-30) assessed awareness of the Canadian Physical Activity Guidelines and knowledge of the role of physical activity in health and physical inactivity in disease:

1. Are you familiar with the Canadian Physical Activity Guidelines? (Yes, No, Unsure) (Q 19, item 26)
2. Questions 20-22 (items 27-29) address recommended physical activity for the adult (age 18-64), pediatric (child 5-11 and youth 12-17) and geriatric (older adult defined as >65 years old) populations based on the Canadian Physical Activity Guidelines and World Health Organization guidelines
3. The role of physical inactivity as a risk factor in chronic disease mortality (according to the World Health Organization) (Q 23, item 30)

A knowledge score (0 to 4) was computed from the number of correct answers to the knowledge items, excluding awareness of the guidelines (Question 20-23, items 27-30). The association between the knowledge score and the POM were carried out with a two-sample t-test comparing mean knowledge of prescribers and non-prescribers, as well as categorically of each variable to the primary outcome measure using Chi-square analysis.

Section 5: Self-Perceived Competence

Exercise prescription comfort or self-rated competence was assessed in two specific populations; healthy patients, to assess competence of exercise prescription as primary prevention, and in patients with pre-existing chronic disease, to assess competence prescribing exercise as secondary and tertiary
prevention. Chronic disease was defined in accordance to the World Health Organization’s definition of Non-Communicable Diseases (NCD), namely cardiovascular disease, diabetes, chronic respiratory disease and cancer. The survey specified the first three chronic NCD in the question stem. Cancer was excluded, in response to feedback obtained from participants during the pre-testing phase of the research tool. Due to the complexity of cancer on patient’s physical health and functional capacity, in effort to mitigate potential confusion and confounding elements to the question, it was agreed upon by expert panel to eliminate cancer from the research tool.

Based on the literature and further delineated by expert panel, the survey assessed the following three specific skills critical to high quality exercise prescription:

1. Conducting an appropriate clinical assessment prior to a patient commencing an exercise program [36] “Clinical assessment” was chosen in lieu of “performing a full exercise history, physical and ordering appropriate investigations” to avoid implying all patients need to undergo extensive evaluation prior to engaging in a moderate-level exercise program. The majority of healthy patients will not require investigations as part of a clinical assessment prior to commencing an exercise program.

2. Prescribing aerobic exercise (frequency, intensity, duration, and type)

3. Prescribing resistance or strength exercise (frequency, repetitions, sets and type)

These skills were assessed in respect to exercise prescription of a healthy patient and for patients with pre-existing chronic disease.

Self rated competence in all six items was assessed on a 7-point Likert scale ranging from highly incompetent to highly competent. Separate scores on each of
the six skills were compared with the POM, in the dichotomous version using Chi-square tests. An overall competence was computed by summing scores of all six skills (range 6-42) and compared to the primary outcome measure, assessed for an association with the knowledge score, was examined compared to scores of confidence in exercise prescription (Q9, item 16) and feelings of success in getting patients physically active (Q10, item 17). Pairwise comparisons of each of the three exercise prescription skills were examined for healthy vs. chronic disease patients using paired t-tests. The overall competence and resident comfort of exercise prescription to the two distinct patient populations (those with and without NCD) was assessed by calculating the sum of all three exercise prescription skills in each patient population and then examined using paired t-tests.

**Section 6: Resident Perception of Training**

The data analysis for this section is detailed below under objective 2.

**Section 7: Demographic Information**

1. stage of training - beginning R1, midway (R1/R2), end/graduating R2
2. family practice residency training site
3. previous training - electives or training in sports and exercise medicine, prevention, undergrad human kinesiology (HKIN) courses, National coaching certification, extensive medical school training, other forms
4. sex - M/F
5. year of birth
6. self-perception of whether they consider themselves a healthy body weight
7. self-perception of physical fitness level
8. open section for optional comments
These data were summarized with frequency tables and descriptive statistics primarily to provide a profile of the respondents. They were also considered as potential covariates along with the independent variables from the previous sections.

**OBJECTIVE 2:**

To determine residents’ perception of the training they receive in exercise as medicine and exercise prescription

This objective examined resident perception of their training in exercise medicine. Specifically, the education and training residents have received on physical activity and exercise in health, prevention and treatment of chronic disease.

1. Question 25 (item37) “I have received an adequate amount of training in exercise as medicine.”
2. Question 26 (item38) “I would like to receive more education/training in exercise prescription.”

Both items were rated on 7-point Likert scales. Prescribers and non-prescribers were compared with respect to each item, using Chi-square tests and the relationship between the two items was examined with cross-tabs.
OBJECTIVE 3:

To assess if the perceived importance of exercise prescription in future practice changes over time from the beginning of residency training through to graduation

The objective was to examine if there is any change over the duration of family medicine residency training with respect to the importance of exercise prescription in future practice. Respondents were classified into three cohorts according to their residency stage of training. The primary outcome measure was compared between incoming first year residents (R1), residents midway in their training (R1/R2) and graduating second year residents (R2), using one-way analysis of variance (ANOVA).

A secondary analysis examining the total scores of the independent variables from the main sections of the questionnaire including residents’ (1) physical activity levels, (2) current counselling and exercise prescription behaviours, (3) attitudes and beliefs, (4) knowledge, and (5) self-rated competence in exercise prescription were compared between the residents at the three different stages of training using one-way analysis of variance (ANOVA).

Comparisons of the three cohorts of residents at different stages of training assessing residents’ perceptions of their training in exercise medicine and exercise prescription received, as well as their perspectives of the importance and perceived program support in living physically active lifestyles were also examined by one-way analysis of variance (ANOVA).
RESULTS

SURVEY RESPONSE

There was an 80.6% response rate with 319 of the 396 eligible residents participating in the study. Twenty-five questionnaires were eliminated, due to incomplete survey response or failure to satisfy inclusion criteria. Incomplete surveys were addressed objectively by applying a standard criterion to all incomplete questionnaires. Simply, if the primary outcome measure (Question 11, item 18) had not been answered it was excluded from the data prior to analysis. This eliminated 24 partial questionnaires and one additional questionnaire was eliminated for failing to satisfy the inclusion criteria of first or second year level of residency training. After eliminating 25 of the 319 responses, 293 surveys were included in the final analysis.

DESCRIPTIVE STATISTICS

The respondents were evenly distributed in level of training with 37.5% at the beginning of first year residency, 33.8% midway through their training, and 28.7% at the end of their residency training. Sixty-five percent of respondents were female, 78.3% of respondents described themselves as having a healthy body weight and 45.7% described themselves as being physically fit. Residents’ age ranged from 25-54 years, with a median age of 30 years. All residency sites were represented (table 1). Fewer than 25% of residents had prior experience or previous exposure to any supplemental training in exercise medicine as depicted in Figure 1.
Table 1: Representation of Study Participants from all UBC Family Practice Residency Sites

<table>
<thead>
<tr>
<th>UBC Family Practice Residency Program Site</th>
<th>Number of Resident Participants</th>
<th>% of Study Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbotsford</td>
<td>15</td>
<td>5.5</td>
</tr>
<tr>
<td>Aboriginal</td>
<td>10</td>
<td>3.7</td>
</tr>
<tr>
<td>Chilliwack</td>
<td>14</td>
<td>5.2</td>
</tr>
<tr>
<td>Nanaimo</td>
<td>18</td>
<td>6.6</td>
</tr>
<tr>
<td>Rural Northwest</td>
<td>7</td>
<td>2.6</td>
</tr>
<tr>
<td>Prince George/Northern Rural</td>
<td>19</td>
<td>7.0</td>
</tr>
<tr>
<td>Rural Fort St. John</td>
<td>7</td>
<td>2.6</td>
</tr>
<tr>
<td>Rural Kelowna</td>
<td>27</td>
<td>10.0</td>
</tr>
<tr>
<td>St. Paul's*</td>
<td>58*</td>
<td>21.4*</td>
</tr>
<tr>
<td>Surrey</td>
<td>18</td>
<td>6.6</td>
</tr>
<tr>
<td>Vancouver Fraser</td>
<td>27</td>
<td>10.0</td>
</tr>
<tr>
<td>Victoria</td>
<td>48</td>
<td>17.7</td>
</tr>
<tr>
<td>Vancouver Island - Strathcona</td>
<td>3</td>
<td>1.1</td>
</tr>
</tbody>
</table>

*St. Paul's (SPH) has representation from two SPH programs; the SPH family medicine program and the SPH International Medical Graduate (IMG) program
Figure 1: Residents’ Previous Exposure to Exercise Medicine

- Course in preventative medicine
- Course in sports and/or exercise medicine
- Human kinesiology undergraduate course
- Coaching certification
- Extensive curriculum in medical school
- Other training

Number of Residents

PRIMARY OUTCOME MEASURE

The main dependent variable, residents’ perception of exercise prescription in their future practice, was rated as important by 95.6% of residents, with 4.1% of residents responding neutrally and only 0.3% of residents indicating it would not. As detailed in the study’s methodology, in order to best address the primary objective of the study, determining which factors are associated with residents who indicate exercise prescription will be important in their future clinical practice, the main dependent variable and all independent variables were collapsed categorically apriori at the level of strongly agree (1-6 vs 7), effectively isolating the 37.5% of residents who reported the strongest conviction to prescribe exercise in their future practice (Figure 2).
Figure 2: Primary Outcome Measure
Residents’ Perceived Importance of Exercise Prescription in Future Practice

Legend: Strongly Disagree (SD); Somewhat Disagree (sD), Somewhat Agree (sA); Strongly Agree (SA)
OBJECTIVE 1:

Assessing the independent variables associated with residents who indicate exercise prescription will be highly important in their future clinical practice:

RESIDENTS’ PERSONAL PHYSICAL ACTIVITY LEVELS

Residents’ activity levels compared to during medical school and prior to medical training

UBC family medicine residents are less physically active than they were prior to residency and prior to medical school. Nearly two-thirds of residents exercised more prior to medical training and nearly half exercised more during medical school than they do currently in residency. There was no significant difference between residents indicating exercise prescription will be highly important in their future practice and those who didn’t, the decrease in physical activity during residency, is similar between both groups.

Residents’ engagement in aerobic physical activity compared to the Canadian Physical Activity Guidelines

Seventy-two percent of residents accumulated a sufficient number of met-min/week to be classified as meeting a moderate or high level of physical activity in accordance to the IPAQ tool. However when moderate and vigorous physical activity (MVPA) was assessed, only 51.9% of residents accumulated sufficient physical activity to meet the recommended 150 min of MVPA per week recommended by the Canadian Physical Activity Guidelines. When physical activity levels were classified according to the total metabolic equivalents minutes
per week, fewer than 20% of residents were highly active (>1500met-minutes/wk), one-third were moderately active (>600met-min/wk, which is roughly equivalent to 30min moderate activity 5x/wk), and 48.1% were insufficiently active to meet the basic level of activity recommended for health by Canada and the World Health Organization (Figure 3).

**Figure 3: Residents’ Activity Levels Classified by Met-Min/Week Achieved**

Legend: Highly Active >1500 met-min/wk; Moderately Active >= 600 met-min/wk; Inactive <600 met-min/wk

*600 met-min/wk is equivalent to the Canadian and World Health Organization physical activity guideline recommended level of 150 min of moderate to vigorous physical activity (MVPA) per week*
Residents’ engagement in strength exercise/physical activity compared to the Canadian Physical Activity Guidelines

Only 24.5% of residents currently meet the Canadian and World Health Organization (WHO) Physical Activity Guidelines (PAG) of performing a form of resistance or strength exercise twice a week and this is consistent among all residents, with no difference between prescribers and non-prescribers.

Time residents spend daily in sedentary pursuits

The time residents spent sitting on a typical workday, was on average an hour less for prescribers than their colleagues (6.10 hours +/- 3.07) vs 7.07 hours +/- 3.60, t=2.35, p = 0.020) and both groups spent nearly 25% less time sitting on days off than workdays.

Residents’ perceived importance, success and control over being physical active

Being physically active themselves is significantly more important to residents who indicate that exercise prescription will be highly important in their future clinical practice compared to their colleagues 78.2% vs 47.0% (Chi-square 27.57, p<0.001). There was however no significant difference between their perceived importance of their own physical activity levels and the frequency at which they currently prescribed exercise.

Prescribers feel more control over their personal physical activity levels than their non-prescribing colleagues, 25.5% vs 12.0% (Chi-square 8.76, p = 0.003). Overall however, the large majority of residents do not feel a high level of control over their
own physical activity levels. The discrepancy between residents’ perception of the importance of their own exercise in contrast to their perceived control over it is shown in Figure 4.

Figure 4: Comparing Residents’ Perceived Importance vs Control over their Personal Exercise

Legend: SD = strongly disagree, sD = somewhat disagree, sA = somewhat agree, SA = strongly agree
Residents who valued their personal exercise the greatest felt more control over their own exercise, more success in engaging patients in physical activity, and counselled patients on exercise more frequently than their colleagues who felt less strongly about the importance of their personal physical activity. There was, however, no difference in rates of exercise prescription. Similarly, residents who felt the greatest control over their own exercise, reported feeling more successful in engaging patients in physical activity, and counselled their patients more than their colleagues who felt less control over their personal exercise. There was again, no difference in rates of exercise prescription.

CURRENT AND FUTURE PHYSICAL ACTIVITY PRESCRIPTION PRACTICES

Residents’ current physical activity counselling and exercise prescription behaviour

UBC family medicine residents counsel their patients on physical activity more frequently than prescribing exercise (activity, frequency, intensity and time), during a typical office encounter as detailed in Table 2.

Residents who indicate exercise prescription will be highly important in their future clinical practice (prescribers), currently counsel and prescribe exercise to their patients more often than their colleagues (non-prescribers) shown in Table 3.
Table 2: Current Physical Activity Counselling and Exercise Prescription Rates of UBC Family Medicine Residents in a typical office encounter

<table>
<thead>
<tr>
<th>Frequency of Current Behaviour</th>
<th>Residents providing Physical Activity Counselling (%)</th>
<th>Residents providing Exercise Prescription (FITT*) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never &lt;5%</td>
<td>1.4</td>
<td>16.7</td>
</tr>
<tr>
<td>Rarely 5-20%</td>
<td>10.6</td>
<td>22.5</td>
</tr>
<tr>
<td>Occasionally 21-40%</td>
<td>20.8</td>
<td>18.4</td>
</tr>
<tr>
<td>Sometimes 41-60%</td>
<td>21.5</td>
<td>17.1</td>
</tr>
<tr>
<td>Frequently 61-80%</td>
<td>25.9</td>
<td>17.4</td>
</tr>
<tr>
<td>Nearly Always 81-95%</td>
<td>13.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Always &gt;95%</td>
<td>6.1</td>
<td>3.4</td>
</tr>
</tbody>
</table>

*FITT = frequency, intensity, time, type of activity

Table 3: Current physical activity counselling and exercise prescription rates of Prescribers compared to Non-prescribers

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Non-Prescribers</th>
<th>Prescribers</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Activity Counselling &gt;60% of typical office encounters</td>
<td>38.3%</td>
<td>57.8%</td>
<td>0.001</td>
</tr>
<tr>
<td>Prescribe exercise &gt;60% of typical office encounters</td>
<td>18.0%</td>
<td>36.7%</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Residents’ level of confidence and success prescribing exercise

Prescribers report greater confidence prescribing exercise to their patients and greater success engaging patients in physical activity than their peers (Table 4). On the whole however, residents report feeling neither highly confident in exercise prescription (11.6%), nor successful in getting patients physically active (3.8%). Of the 11.6% (34/292) of residents who feel confident writing exercise prescriptions, only one third of them feel successful in getting patients active (32.4% vs 67.6% Chi-square = 86.74, p<0.001). Of the remaining residents, the 88.4% (258/292) who feel less confident prescribing exercise, 0% (0/258) report feeling successful in engaging patients in physical activity (Table 4).

Table 4: Difference in confidence prescribing exercise and perceived success in engaging patients in exercise between Prescribers and Non-Prescribers

<table>
<thead>
<tr>
<th></th>
<th>Non-Prescribers</th>
<th>Prescribers</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence prescribing exercise</td>
<td>3.3%</td>
<td>25.5%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Success in getting patients physically active</td>
<td>0.0%</td>
<td>10.0%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

RESIDENTS’ ATTITUDES AND BELIEFS:

The impact of physical activity on the health of patients

98.0% of residents believe that regular physical activity is integral to their patients’ current health (Figure 5). More prescribers strongly believe physical activity is integral to current health than non-prescribers (Table 5).
The impact of sedentary behaviour on health

98% of all residents believe sedentary behaviour is harmful to patient health (Figure 5) and more prescribers strongly believe this relationship (Table 5).

The impact of personal exercise on the credibility of physical activity counselling

96.5% of residents feel they will “provide more credible and effective counselling if I exercise and stay fit” (Figure 5). More prescribers strongly believe their personal fitness and exercise habits, affects their credibility and effectiveness counselling patients on exercise than non-prescribers (Table 5).

The responsibility to promote physical activity to patients

99.7% of residents believe “physicians have a responsibility to promote physical activity to their patients” (Figure 5). Prescribers feel a greater responsibility to promote physical activity to patients than their colleagues (Table 5).

Residents’ interest in prevention compared to treatment

86.5% of residents disagree with the statement “prevention is not as interesting to me as treatment” (Figure 5). Prescribers are more interested in prevention compared to the non-prescribers (Table 5).
Figure 5: UBC Family Medicine Residents’ Attitudes and Beliefs of Physical Activity in Health

- I believe regular PA is integral to my patients’ current health
- I believe sedentary behaviour is harmful to my patients’ health
- I will be able to provide more effective counselling if I exercise and stay fit
- I believe physicians have a responsibility to promote PA to their patients
- *Prevention is not as interesting to me as treatment (*reversed scoring)
Table 5: Attitudes and beliefs about physical activity in health between Prescribers and Non-Prescribers

<table>
<thead>
<tr>
<th>Statement</th>
<th>Non-Prescribers (%)</th>
<th>Prescribers (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that regular PA is integral to my patients’ CURRENT health</td>
<td>55.3</td>
<td>85.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>I believe sedentary behaviour is harmful to my patients’ health</td>
<td>55.1</td>
<td>84.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>I will be able to provide more credible and effective counselling if I exercise and stay fit</td>
<td>34.6</td>
<td>62.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>I believe physicians have a responsibility to promote physical activity to their patients</td>
<td>50.8</td>
<td>78.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>*Prevention is NOT as interesting to me as treatment</td>
<td>33.0%</td>
<td>56.0%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* Prevention vs. treatment statement is displayed in reverse scoring. The inverse score was used in the calculation of the overall attitude/belief score. Therefore the data displayed represents the number of prescribers compared to non-prescribers who strongly disagreed with the statement.

Residents’ perspectives on the importance of program support of resident physical activity

98.7% of residents believe “residency programs should encourage their residents to practice physically active lifestyles” (Figure 6). More residents who rate exercise prescription as highly important in their future practice strongly believe that residency programs should encourage physically active lifestyles than non-prescribers, 84.0% vs 54.2% (Chi-square 26.03, p<0.001). Residents who rate their own physically activity as highly important, also feel more strongly that
residency programs should encourage physically active lifestyles 80.6% vs 19.4%, respectively (Chi-square 43.65, p<0.001).

Figure 6: Residents’ Perspectives on the Importance vs. Actuality of Programs Encouraging Residents’ Physical Activity

- Residency programs should encourage their residents to be physically active
- My program encourages residents to exercise and be physically active
Residents’ perception of their program’s support of their physical activity

Despite the majority of residents feeling strongly that programs should encourage residents to exercise and be physically active, few residents strongly agree their residency program does so (Figure 6). Lack of program encouragement and support of residents’ physical activity is a common perspective of all residents, with no statistical difference between prescribers and non-prescribers. Even residents reporting the highest level of control over their personal physical activity, did not strongly agree that their program encouraged residents to be physically active, with no statistical difference compared to their colleagues who felt less control over their personal exercise. Interestingly, the perception of program support of residents’ physical activity declined in relationship to residents’ stage of training, with a progressive and statistically significant drop between incoming first year residents through to graduating second year residents (Table 6).

Table 6: The different perceptions of program support of resident physical activity as a function of different stages of training

<table>
<thead>
<tr>
<th>Perception</th>
<th>Incoming first year residents</th>
<th>Residents midway in their training</th>
<th>Graduating second year residents</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Residency program encourages exercise and physical activity</td>
<td>5.12 (+/-1.12)</td>
<td>3.91 (+/-1.64)</td>
<td>3.83 (+/-1.52)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
RESIDENT KNOWLEDGE

**Resident awareness and knowledge of the Canadian Physical Activity Guidelines**

One third of UBC family medicine residents reported they were familiar with the Canadian Physical Activity Guidelines (Figure 7). Less than half of residents knew the recommended amount of moderate to vigorous (MVPA) for adult health and chronic disease prevention, less than a quarter identified the pediatric physical activity target, and less than a third were familiar with older adult strength recommendations by the Canadian Physical Activity Guidelines (Figure 8).

**Figure 7: Residents’ Awareness of Canadian Physical Activity Guidelines**

- Yes: 44%
- Unsure: 22%
- No: 34%
Physical inactivity as a risk factor for chronic disease

Physical inactivity was correctly identified as a top four risk factor for chronic disease mortality in accordance with WHO data, by 70% of residents. There was no statistical difference between the awareness of the guidelines, any of the specific guideline-based questions including physical inactivity as a risk factor for mortality, or the total knowledge score (sum of questions 21-24) between prescribers and non-prescribers. The knowledge score was consistently low for all residents (Figure 9). There was no statistical difference in knowledge score
between residents despite their stage of training, suggesting the current curriculum is not enhancing resident knowledge, with all groups mean score below 50%.

**Figure 9: Knowledge Score: Physical Activity Recommendations in Health**
RESIDENTS’ SELF-PERCEIVED COMPETENCE

Overall, residents do not feel highly competent in performing any of the three skills related to exercise prescription; (1) clinical assessment, (2) prescribing cardiovascular exercise (specifying frequency, duration, time and type) or (3) prescribing strength or resistance exercise (specifying frequency, reps, sets and type) (Figure 10). Each skill was scored on a Likert scale of 1-7 and specifically assessed in two patient populations, healthy patients and those with pre-existing chronic disease. Out of an overall maximal score of 42, on the whole UBC family medicine residents scored 24.61 across the six skills. A total composite score for exercise prescription across the three skills for the two distinct patient populations showed residents were significantly more comfortable prescribing exercise as primary prevention than to patients with established chronic disease or non-communicable disease (Table 7).

Table 7: Paired T-Tests comparing residents’ self-rated competence prescribing exercise to healthy vs NCD patient populations

<table>
<thead>
<tr>
<th>Exercise Prescription Skill</th>
<th>Patient Population</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthy mean score (SD)</td>
<td>Chronic Disease mean score (SD)</td>
</tr>
<tr>
<td>Clinical Assessment</td>
<td>4.43 (1.43)</td>
<td>3.69 (1.47)</td>
</tr>
<tr>
<td>Aerobic Exercise Prescription</td>
<td>4.74 (1.34)</td>
<td>3.95 (1.38)</td>
</tr>
<tr>
<td>Strength Exercise Prescription</td>
<td>4.15 (1.60)</td>
<td>3.61 (1.39)</td>
</tr>
<tr>
<td>Sum of Three Skills (out of possible 21)</td>
<td>13.35 (3.83)</td>
<td>11.26 (3.79)</td>
</tr>
</tbody>
</table>
Figure 10: Residents’ Competence in Exercise Prescription Skills to Different Patient Populations

HP = Healthy Patients; NCD = Non-Communicable Disease/Chronic Disease

Legend: Responses scored on a 7-pt Likert Scale:
1-Highly Incompetent, 2-Incompetent, 3-Somewhat Incompetent, 4-Neutral,
5-Somewhat Competent, 6-Competent, 7-Highly Competent
Prescribers and non-prescribers self-perceived competence in exercise prescription

Residents who indicated exercise prescription will be integral in their future practice, rated themselves at higher competence overall in all components of exercise prescription in a healthy patients compared to their colleagues. Prescribers and non-prescribers felt less competent in all skills of exercise prescription for patients with chronic disease compared those who were healthy.

In patients with NCD there was no difference between prescribers and their colleagues prescribing aerobic exercise, however they felt greater competence performing a clinical assessment and prescribing strength training (Table 8).

Table 8: Exercise Prescription Competence of Prescribers and Non-Prescribers in patients who are healthy and patients with NCD

<table>
<thead>
<tr>
<th>Exercise Prescription Skill</th>
<th>Non-Prescribers</th>
<th>Prescribers</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Patient Population</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Assessment</td>
<td>51.7%</td>
<td>70.2%</td>
<td>0.009</td>
</tr>
<tr>
<td>Aerobic Prescription</td>
<td>61.1%</td>
<td>78.6%</td>
<td>0.005</td>
</tr>
<tr>
<td>Strength Prescription</td>
<td>40.3%</td>
<td>61.8%</td>
<td>0.002</td>
</tr>
<tr>
<td>Pre-existing Chronic Disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Population</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Assessment</td>
<td>28.4%</td>
<td>45.2%</td>
<td>0.014</td>
</tr>
<tr>
<td>Aerobic Prescription</td>
<td>36.9%</td>
<td>51.9%</td>
<td>0.049</td>
</tr>
<tr>
<td>Strength Prescription</td>
<td>25.6%</td>
<td>42.7%</td>
<td>0.012</td>
</tr>
</tbody>
</table>
OBJECTIVE 2:

Assessing Residents’ perceptions of their training in exercise medicine and exercise prescription during family medicine residency:

Residents’ perspectives on the training they’ve received in exercise medicine and exercise prescription

Only 18.6% of residents feel they have received adequate training in exercise as medicine and exercise prescription. This perspective of inadequate training is consistent among all residents, with no difference between residents who indicate exercise prescription will be highly important in their future clinical practice (prescribers) compared to those who do not (non-prescribers) (Figure 11).

Residents’ perspectives on whether or not they desire more training in exercise medicine and exercise prescription

91% of UBC family medicine residents indicated that they desired more training in exercise prescription. The desire for additional training in exercise medicine was consistent among all residents with no difference between groups including 94.2% prescribers and 89.1% of non-prescribers (Figure 11).
Figure 11: Residents’ Perspectives on their Training in Exercise Medicine and Exercise Prescription

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neutral
- Somewhat Agree
- Agree
- Strongly Agree

Response (%)

- Received an adequate amount of training in Exercise as Medicine
- Would like more education and training in Exercise Prescription
OBJECTIVE 3:

Assessing the change over time of the perceived importance of exercise prescription in future practice between residents at different stages of training over the course of family medicine residency:

*The perceived importance of exercise prescription in future practice to three cohorts of residents at different stages over the course of residency*

There was no statistically significant difference between stage of training for residents’ perceived importance of exercise prescription in their future clinical practice, with mean scores of 6.16, 6.13 and 6.08 out of seven for beginning first year residents, residents midway in their training (R1/R2), and graduating second year residents respectively.

**Table 9: Comparing the importance of exercise prescription in future clinical practice between three cohorts of residents at different stages of residency training**

<table>
<thead>
<tr>
<th></th>
<th>Beginning R1</th>
<th>Midway R1/R2</th>
<th>Graduating R2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Importance of Exercise Prescription in Future Clinical Practice</td>
<td>6.16</td>
<td>6.13</td>
<td>6.08</td>
<td>0.20</td>
</tr>
</tbody>
</table>
DISCUSSION

PRIMARY OUTCOME MEASURE

The importance of exercise prescription in future practice was overwhelmingly positive with over 95% of residents indicating it would be important in their future practice. Our data show UBC family medicine residents place an even greater value on the relevance and importance of exercise prescription in their future practice, compared to the 53-79% of Canadian and American medical students perceiving exercise prescription will be relevant to their future practice. [37,45,46,52-54]

OBJECTIVE 1:

Assessing the independent variables associated with residents who indicate exercise prescription will be highly important in their future clinical practice:

RESIDENTS’ PERSONAL PHYSICAL ACTIVITY LEVELS

*Residents’ activity levels compared to medical school and prior to medical training*

UBC family medicine residents are less physically active than they were during medical school and prior to medical training. Residents’ lack of physical activity has been consistently reported, however to our knowledge this is the first study inquiring about changes to residents’ personal physical activity levels over time. It has been reported that among medical students, physical activity levels decline on
entry into clerkship, where ward responsibilities more closely resemble the demands of residency.[52] Residents consistently engage in less vigorous activity than medical students, are less active than both medical students and attending physicians and have lower levels of physical fitness determined objectively on maximal VO2 testing.[55,56] The authors of the latter American study commented that residents are not suitable role models for physical fitness as “their personal activity levels are inferior to the population’s,” however our data indicated that UBC family medicine residents are slightly more active than most of the Canadian population.

**Residents’ engagement in aerobic physical activity compared to the Canadian Physical Activity Guidelines**

Fifty-one percent of UBC family medicine residents attain the Canadian physical activity guideline of 150 min of moderate to vigorous physical activity a week. Therefore, more UBC residents meet the Canadian Physical Activity Guidelines compared to the reported rates of the general Canadian adult population which range from 41%-49%.[52] UBC family residents’ level of activity was higher than what’s reported for American fellows and residents 7.8% - 41% [57,58] and slightly higher to that of practicing physicians 25.9% - 48.5%.[58,59] UBC residents were less physically active than Canadian and American medical students, 61% - 64% of whom are reported to engage in guideline levels of physical activity,[45,46,52] thus in keeping with the decline in physical activity commonly observed from medical school to residency. Over two-thirds of UBC residents engage in vigorous activity at least once per week, which is higher than rates reported for residents and lower than rates reported for medical students and practicing physicians of 44-56%, 95% and 76% respectively. [38,55]
Residents’ engagement in strength exercise/physical activity compared to the Canadian Physical Activity Guidelines

This study was the first to assess resident engagement in strength or resistance exercise. Only 24.5% of residents meet the Canadian Physical Activity Guidelines regarding strengthening exercise, which cannot be compared to other data in medical trainees as to our knowledge this is the first study to assess this outcome.

Time residents spend daily in sedentary pursuits

This study was also the first to our knowledge to document sedentary time and time spent sitting during a resident’s typical workday, and day off. In light of the substantial emerging data linking morbidity and mortality risk with sedentary time, our findings that both groups of residents spent approximately 25% less time sitting on a day off than a typical work day is interesting suggesting that when residents have more control over their schedule and activities, they are less sedentary. During a typical work-day, “prescribers” sat a statistically significant hour less, than their colleagues, possibly reflecting their stronger belief in the role of physical activity in health and physical inactivity and sedentary time in disease, given that they exhibit a difference in their sitting behaviour despite the same demands and conditions in their work schedule and environment.

Residents’ perceived importance, success and control over being physically active

Exercising regularly and being physically active was important to 95% of residents, including 58.7% who indicated it was highly important, yet a only a 17.1% felt they were largely in control over their physical activity levels. The enjoyment of physical
activity and self-efficacy in engaging in exercise have been reported as factors predictive of physical activity counselling in internal medicine residents.[57] UBC residents, who most valued their personal exercise, reported significantly more control over their exercise, greater success in engaging patients in physical activity and counselled more than their peers, although there was no difference in rates of exercise prescription. Our findings are similar to an American study of internal medicine residents which reported few residents felt high self-efficacy or perceived success in their own ability to be regularly physically active.[57] Of the few UBC residents who indicated the greatest perceived control over their exercise, they attributed greater importance to their personal exercise, reported greater success engaging patients in physical activity and counselled patients more frequently than their colleagues, with no difference in current exercise prescription rates. Of the 82.9% of UBC residents reporting lower self-efficacy of their personal exercise, 0% report success in engaging patients in physical activity. It begs the question, if residents lack self-efficacy in their personal exercise, how effective will they be in getting their patients actively engaged in physical activity? UBC residents’ mismatched feelings of high importance, yet low control of their personal physical activity is similar to other studies reporting that resident physicians did not feel that they engaged in sufficient exercise.[60]Residents who attributed the greatest importance to their personal physical activity, unsurprisingly indicated a high importance to program’s supporting residents’ to be physically active. Interestingly, residents reporting the greatest control over their personal exercise, did not feel supported by their program, but rather perceived control in spite of their program, with no difference from their peers, in reporting a distinct lack of program support.

Residents’ current physical activity levels related to their perspectives of the importance of future exercise prescription
Similar to other health behaviours, physicians who are more physically active have been reported in the literature to be more likely to counsel patients about physical activity.[44,58,59,61,62] This pattern has also been shown in Canadian and American physicians and medical students.[52,53,63] Our data, however, did not follow this pattern. Meeting the guideline level of recommended physical activity was not related to UBC residents’ perceived importance of exercise prescription in their future practice, with no difference between future prescribers and their colleagues. A study of 4th year Canadian medical students showed physical activity counselling rates were similarly unrelated to medical students’ moderate physical activity levels, but were instead related specifically to the amount of vigorous activity they engaged in. Although our data did not reach statistical significance, our study showed a trend towards residents, meeting the physical activity guidelines through a higher volume of vigorous activity reporting a greater importance of exercise prescription in their future practice, compared to their colleagues who met the guidelines through primarily moderate exercise.

RESIDENTS’ CURRENT PHYSICAL ACTIVITY COUNSELLING & EXERCISE PRESCRIPTION

Residents’ current physical activity counselling practices

Forty-five percent of UBC residents reported counselling on physical activity in at least 60% of patient encounters which falls within the large reported range of counselling frequency by physicians in the literature.[64-66] UBC residents counsel more than the 38.2% of American residents reported to counsel >67% of their patients,[58] and more than the 37% of US internal medicine residents who counselled >60% of their continuing care clinic patients at some time in the preceding year.[57]
Recall bias exists in physical activity counselling, as it does for most perceived desirable behaviour. Differing physician and patient accounts of exercise and physical activity counselling have been documented, including discrepancies between receiving generalized advice in contrast to a specific well formulated plan on how to become more physically active. It has been reported that while between 22 - 28% of patients report receiving advice regarding physical activity only 7-12% reported receiving assistance in being more active or assistance formulating a plan.[67,68] Frank, however, did validate the physical activity counselling question used in this study, along with other positive health behaviours, in medical students by comparing self-reported physical activity counselling, to the observed counselling behaviours of graduating medical students during their videotaped standardized patient exams.[69]

Residents’ current exercise prescription practices

Exercise prescription rates in the literature are consistently lower than counselling rates, and our findings are in keeping with this, with only one-quarter of UBC residents prescribing exercise in >60% of encounters, which is slightly higher than 15.8% reported in Canadian physicians.[29] Interestingly, there is no change in the frequency of exercise prescription for UBC residents related to their stage of training, suggesting that we are not encouraging or facilitating this skill, or behaviour, as a program.

Exercise is Medicine (EIM) (http://exerciseismedicine.org/) which is globally recognized with an EIM National task force established in 31 different countries, urges medical personnel to inquire about physical activity “with every patient, at every encounter.” While this may not be realistic, it attests to how integral physical activity is to our patients’ health. UBC residents however are far from this target. When counselling rates were assessed in “80% of patient encounters,” less than
8% of residents prescribed exercise and less than 20% counselled on physical activity. Our findings are in keeping with a Canadian study of family physicians which was one of the only other studies to our knowledge that “defined” exercise “prescription,” and reported an exercise prescription rate, to over 75% of their patients, of 11.8%.[36]

Conversely, and perhaps a greater concern, is the high number of residents who prescribe (40%) and counsel (10%) exercise in less than 20% of their typical office encounters. Despite the statistical difference between current counselling and exercise prescription rates between prescribers and their colleagues, overall rates for all UBC residents are low, indicating a substantial opportunity for improving exercise counselling and prescription rates.

Another important finding of our data is the disconnect between the high rates of intended exercise prescription compared to the current rates of exercise prescription. This discrepancy between current and desired behaviour has been reported for physical activity counselling and prescription in the literature in practicing physicians, with the difference attributed to a lack of knowledge and skill of physicians.[36,70] The disconnect in our data highlights an area that may warrants future study, as to our knowledge this is the first study to evaluate current versus desired exercise prescription behaviour in the medical resident population. It is worth noting that the many of the highly significant factors related to the importance of exercise prescription in future practice, such as the importance of personal physical activity, is not associated with current behaviour of exercise prescription. This discrepancy is likely due to confounding factors that influence current behaviour that will dissolve in future practice with greater autonomy and perceived control, as residents inherently have more factors influencing their behaviour than the clinician population.
Residents’ perception of confidence and success prescribing exercise

Only a quarter of residents feel confident in their skills providing exercise prescription, with only 3.3% of non-prescribers feeling highly confident in their skills. It is important to recognize this may be a significant barrier to future exercise prescription. If physicians don’t feel comfortable or adequately prepared in an area, they have a natural tendency to avoid it. As the literature indicates, it is not uncommon for physicians to report that they are comfortable offering generalized advice but the majority feel uncomfortable offering detailed advice on physical activity, to the point some even hesitate initiating discussion on exercise to avoid the possibility of the conversation evolving beyond their scope of knowledge.

Further, if physicians uncover that their patient is insufficiently active, many physicians report not feeling competent or confident in how to safely and effectively prescribe exercise. The majority of physicians do not require expertise to design intricate exercise programs for performance or even in their most complex patients with multiple coexisting chronic disease, but all physicians require a base level of knowledge and skill to be enable them to effectively ask, advise and ideally prescribe exercise to their patient or at least tailor physical activity recommendations to their patients’ current health and co-morbid diseases.

UBC residents reported a very low level of perceived success in getting their patients moving, with fewer than 5% all residents feeling highly successful. This rate is lower than rates of perceived self-efficacy changing patient behaviour reported by American residents and physicians, 11.8% and 17.3% respectively.[58] It is, however, consistent with the low rates of perceived success reported in a study of Canadian family physicians, indicating 8.5% felt successful in engaging 50% of their patients in exercise and only 1.2% felt successful engaging 75% of their patients.[36] Getting patients physically active is multifactorial, and the success is dependent on many variables of which the physician is only one aspect. What is perhaps most interesting with UBC residents, is that 90% of “prescribers”
continue to try to engage patients in physical activity, despite not feeling successful.

RESIDENTS’ ATTITUDES AND BELIEFS

Attitudes and beliefs were most strongly related to the main outcome measure, the importance of exercise prescription in future practice. Interestingly, the majority of all residents had very strong positive attitudes and beliefs of: (1) the role of physical activity in health, (2) the role of physical inactivity in disease, (3) that they would be more credible and would give more effective advice if they themselves exercised and stayed fit, (4) that physicians had a responsibility to promote physical activity and (5) largely disagreed with the statement that “prevention is not as interesting to me as treatment.” These findings are similar to those found of Canadian medical students.[45,46] Despite the overwhelming positive attitudes displayed by the residents, the conviction of these beliefs were significantly stronger in the residents who indicated exercise prescription will be highly important in their future clinical practice. This may be an important area to develop and foster in designing more effective training programs to improve rates of physical activity counselling and exercise prescription. Residents are already generally positive, but solidifying their conviction may be useful in improving the frequency and perceived importance of exercise prescription to patients and warrants further study.

Residents’ perception of their program’s support of their physical activity

Despite the overwhelming number of UBC residents indicating that residency programs should encourage and support residents to be physically active, very few indicate that their program does so. The discrepancy is significant, and it is
important to recognize this perspective is shared between prescribers and non-prescribers with no difference between groups. The literature has established that medical students generally have positive attitudes regarding the importance of physical activity and towards exercise counselling.[45,46] While graduating medical students may carry these beliefs upon entry into residency, residency training itself does nothing to encourage or develop these attitudes, and residents indicate their programs do not facilitate or promote exercise. It is possible that residency actually undermines these important attitudes. Despite all UBC residents feeling programs should encourage physically active lifestyles, resident perception of their program support of physical activity appears to be a function of stage of training, with a significant and precipitous decline from incoming to graduating residents.

**AWARENESS AND KNOWLEDGE OF PHYSICAL ACTIVITY GUIDELINES**

*Residents’ awareness of the Canadian Physical Activity Guidelines*

Residents’ awareness of our national physical activity guidelines is surprisingly low. UBC residents’ familiarity with the Canadian Physical Activity Guidelines is slightly lower than the 40% of medical students from the United Kingdom (UK) in the only other study to our knowledge assessing guideline awareness with one question verifying content. Physician knowledge of the physical activity guidelines is being recognized as increasingly important as “the education of health professionals is a key element of the wider strategy to increase society’s physical activity levels.”[71]

The low awareness of UBC residents may be a reflection of the formal curriculum not evolving in pace with the medical evidence and societal need. The role of physical activity in health and the skills of exercise prescription continue to be
absent and under emphasized in medical training including residency. Historically, exercise has not been a focus in medical education, and physical activity is currently combined with other health related behaviours and identified as a group termed “lifestyle” as one of Canadian College of Family Physicians’ (CCFP) 99 core competences.[72] However, knowledge specific to exercise medicine and skills in exercise prescription are to our knowledge not specifically examined in residents’ oral or written examinations.

Residents’ knowledge of the Canadian Physical Activity Guidelines

The large majority of residents scored below 50% on their composite knowledge score with no difference in knowledge between stage of training cohorts, highlighting the lack of adequate education we are currently providing residents. These findings suggest we are not teaching residents sufficiently in exercise medicine, nor providing new doctors with the essential foundation they require to effectively advise patients with respect to physical activity.

It is interesting that residents have such low awareness and poor knowledge of the content of the Canadian Physical Activity Guidelines. Earlier studies identified a lack of physical activity guidelines as an important barrier to exercise prescription for Canadian family physicians, and reported clear guidelines would be helpful in supporting exercise counselling for family physicians.[36] The current Canadian Physical Activity Guidelines have since been developed, are widely acknowledged as important population health targets, have consistency between many countries and governing bodies. (www.csep.ca/guidelines), (http://www.heart.org/HEARTORG/GettingHealthy/PhysicalActivity/FitnessBasics/American-Heart-Association-Recommendations-for-Physical-Activity-in-Adults_UCM_307976_Article.jsp), (http://www.cdc.gov/nccdphp/sqr/pdf/sqrfull.pdf),
However, despite this, residents have very low knowledge of these evidence derived recommendations.

**Residents’ knowledge of the Canadian Physical Activity Guidelines for children**

It is concerning that fewer than 22% of UBC residents identified the recommended level of physical activity for children. Even more concerning is that the large majority (over 78%) of residents selected a lower level of physical activity than the medical evidence indicates children need for optimal health and development. Additionally, with the abundance of literature on the obesity epidemic affecting children and youth, the efforts of multiple organizations to increase children’s physical activity, decrease inactivity and decrease screen time (http://www.activecanada2020.ca/), (http://www.activehealthykids.ca/), (http://www.participaction.com/), (www.csep.ca/guidelines),{Tremblay:2012jk, Tremblay:2012wr, Janssen:2007vy, Janssen:2010wl, Janssen:2010ch} resident physicians’ lack of awareness for the pediatric population for whom they will care and advise, is concerning.

**Residents’ knowledge of the Canadian Physical Activity Guidelines for strength in older adults**

Fewer than one-third of residents identified the correct number of times a week a form of muscle strength/resistance exercise is recommended for older adults (>65 years of age). Interestingly, this was the only physical activity guideline that residents were close to answering correctly, and the majority actually over-estimated the frequency of participation. This may be a reflection of the fact that
muscle strength and balance has been incorporated into the teachings of bone health and osteoporosis management of the geriatric population for years. Muscle strengthening, weight bearing activity and proprioception have been included in the osteoporosis guidelines, and the academic curriculum for years. This may demonstrate that when specific physical activity or exercise recommendations are included in the curriculum, there is uptake.

These findings suggest there is an important gap in the current curriculum educating residents on the recommended levels of physical activity for improved population health for patients of all ages. There was no significant difference in the knowledge score between prescribers and non-prescribers. This suggests that despite knowledge being a key barrier to exercise prescription, as reported in the literature, it is certainly not the only important factor. Many residents indicate exercise prescription will play an integral role in their future practice, despite their current knowledge deficit.

Knowledge, or specifically lack of knowledge, is a well documented barrier to exercise counselling and prescription in clinical practice. The objective and therefore the design of this study was to assess factors related to exercise prescription, as opposed to focusing on the barriers to exercise prescription. The data show there are more important factors than lack of knowledge in determining residents' perception of the importance and relevance of exercise prescription in their future practice. Lack of knowledge may be more closely related to residents' low levels of current physical activity counselling and exercise prescription, rather than the perceived importance of exercise prescription in their future practice. It appears future exercise prescription was more closely related to residents' views about the role of exercise in health, physical inactivity in disease, and the importance of exercise in their own life, compared to their current skill set to enable exercise prescription. When residents gain more autonomy in a clinical setting, more control over their patient encounters and schedules, and are free from any direct and indirect program related constraints, the data suggests they
will be more inclined to prescribe exercise. This may be worthwhile to study further.

EXERCISE PRESCRIPTION SELF-RATED COMPETENCE

Residents who indicated a high importance of exercise prescription in their future clinical practice rated themselves higher across all six skills, with the exception of prescribing aerobic activity to patients with chronic disease. The pattern of competence was the same between prescribers and non-prescribers, with both groups identifying their being most comfortable prescribing aerobic exercise, and least comfortable with strength/resistance exercise prescription. Since clinical assessment is similar to performing the medical (and exercise) history, with a physical examination, which residents have been performing since medical school, it is surprising that clinical assessment was ranked second of the three skills in competence for both prescribers and non-prescribers. It is possible that residents were unsure of what clinical assessment specifically entailed, despite there being no confusion in the pilot testing of the questionnaire. Clinical assessment tools do exist and are widely available, such as the physical activity readiness questionnaires (PAR-Q) (PAR-Q+) (ePARmed-X+) (CSEP physician clearance form) (http://www.csep.ca/english/view.asp?x=698) (http://parmedx.appspot.com/#pub/home) at both patient and health care practitioner levels of detail, but it is likely that, similar to other tools and resources pertaining to exercise prescription, they remain unknown to residents. (Goodman:2011bk, Chilibeck:2011gk, Warburton:2011ka, Riddell:2011eo, Thomas:2011cp, Charlesworth:2011hq, Warburton:2011wk) Not surprisingly, both groups rated themselves at a higher competence across all three skills for patients who were healthy, compared to patients with pre-existing chronic disease. To our knowledge this is the first study assessing resident competence in these essential skills of exercise prescription. Our findings of residents’ overall low level of competence are similar to a study of
graduating medical students, which reported students rated themselves at a lower levels of competence in exercise prescription than their perceived importance of the same. {Vallance:2009dx}

The data clearly indicate residents feel neither competent nor comfortable prescribing exercise, and show high rates of incompetence similar to the high rates of Canadian family physicians, reported as alarming by the authors. {Kennedy: 2003jm}

Despite the overall competence score (the sum across the six exercise prescription skills) reaching statistical significance, the improvement accrued over the duration of residency training was so marginal that there was no statistical increase in score for any one exercise prescription skill assessed in isolation. The level of competence and comfort in exercise prescription skills remains low, even among our graduating residents. This begs the question, if we are not adequately preparing our residents with the skills and tools essential for effective exercise prescription, how can we expect them to prescribe exercise?

Strength/resistance exercise prescription has not been previously assessed in residents or medical students, and very few studies have examined this in practicing physicians. It has been reported that physicians who participate in strength training are more likely to discuss and counsel patients on the health benefits of engaging in resistance exercise, and similarly doctors who engage in aerobic activity, are more likely to counsel patients on the benefits of aerobic exercise. {Abramson:2000wn} With fewer than 25% of residents engaging in regular strengthening physical activity, it is not surprising that UBC residents rated this skill the lowest in terms of comfort and competence of the three exercise prescription skills for both healthy patients and those with chronic disease.
OBJECTIVE 2:

Assessing Residents' perceptions of their training in exercise medicine and exercise prescription during family medicine residency:

Residents' perspectives on their training in exercise medicine and exercise prescription

One of the most important findings of this study is residents' impression of their training in exercise medicine and exercise prescription. Only 18.6% of residents agree that they have received an adequate amount of education and training in exercise medicine and exercise prescription. This perception is representative of all residents, with no difference between prescribers and non-prescribers, nor residents at different stages of training.

Residents' perspectives on whether or not they desire more training in exercise medicine and exercise prescription

Equally important, 9 in 10 residents (91%) indicate they would like to receive more training in exercise medicine and exercise prescription. Again, this view was of all residents, with no difference between prescribers and non-prescribers, nor residents at different stages of training.

The data demonstrate an important incongruity between residents' perceived importance of exercise prescription in future practice, and the adequacy of their training to prepare them with the knowledge and skills required to enable them to provide patient-tailored exercise prescription. This discrepancy between desire to prescribe exercise with inadequate training, knowledge and skills to do so, has consistently been reported in physicians at all stages of their career, from medical

An important finding in our study is the inconsistency between what residents desire to do, and what they are currently doing. An enormous discrepancy exists between the perceived importance of exercise prescription, with 98.5% of the residents valuing exercise prescription in their future practice, and the low current rates of exercise counselling and exercise prescription residents are providing. With the large majority of residents indicating that they desire more training in exercise prescription and exercise medicine, it is possible residents are not addressing exercise with patients because they do not feel adequately prepared to do so. It is also possible that residents lack the important role models for prescribing exercise in their preceptors and attending physicians, which may warrant further future study. The research of Tsui and Jacobson supports this connection, reporting that both residents and their attending physicians were poor in exercise counselling, and suggesting that there was a need to create an intervention in residency for both residents and attending physicians, in order to educate them all in the skills of exercise prescription and physical activity counselling.\cite{Tsui:2008we}

There is a distinct dichotomy between the importance residents attribute to their own exercise and the lack of control they feel over it, likely contributing to the decrease and relatively low levels of residents’ current physical activity. This inconsistency parallels the discrepancy between residents’ beliefs that programs should encourage residents to be physically active, and the lack of support and encouragement of being physically active they perceive from their own program.

Our findings show that residents recognize the value of physical activity in health, strongly believe that doctors have a responsibility to promote and discuss physical activity with patients, and indicate that exercise prescription will be an important
part of their future practice. However, residents’ current exercise counselling and prescription behaviors, knowledge related to exercise medicine, skills and competence prescribing exercise, neither reflect the importance they attribute to physical activity, nor provide them with an adequate foundation of expertise to enable them to provide patients with exercise prescription.
OBJECTIVE 3:

*The perceived importance of exercise prescription in future practice of three cohorts of residents at different stages over the course of residency*

With respect to the primary outcome measure, there was no statistically significant difference between stage of training in residency regarding the importance of exercise prescription in future clinical practice. Although there was not a statistically significant change over time as residents progressed through residency, a possible trend warrants observation. The number of residents classified as “prescribers” decreased at each time point from entering to completing residency, and the number of non-prescribers simultaneously increased as trainees progressed through residency. Similarly, the overall mean score (7-point Likert scale) decreased as the new physicians advanced in their training, with incoming residents attributing the highest importance to exercise prescription and graduating residents reporting the lowest importance of exercise prescription in their future practice. These trends are similar to those of medical students who indicated decreasing relevance of physical activity counselling as they progressed from first year to fourth year medical school.\cite{Vallance:2009dx} It has been reported in the medical student population that implementing a lifestyle intervention, with both educational and practical components, increased the uptake of physical activity among medical students, attenuated the decline of personal physical activity often observed in clerkship, and increased their rates of physical activity counselling and other health related behaviours.\cite{Frank:2007vh} This combined two-pronged approach may warrant future investigation in the resident population to possibly inform a future exercise medicine intervention. Implementing both academic curriculum and supporting a culture of exercise, physical activity and health, may produce new graduate physicians with a stronger conviction to prescribe exercise to their patients.
STRENGTHS AND LIMITATIONS

Limitations

The limitations of this study include potential social acceptability bias, response and non-response bias. This risk of response and non-response bias, is mitigated by the large 80.6% response rate, therefore including residents less interested in the topic, helping ensure the data is representative of all UBC residents. Possible leading question bias was mitigated by including previously used questions from prior peer reviewed research. The research tool in its final electronic form did not separate St. Paul's Hospital International Medical Graduate (SPH-IMG) program as designed, but was unintentionally combined with the other St. Paul's residency program. There was however SPH-IMG representation, confirmed by optional comment fields at the conclusion of the survey. While this may impact site specific sub-analysis, site location did not impact any of the three outcome measures of the study.

A risk of designing a questionnaire to assess an area of medicine about which very little known is the limited availability of validated tools. Development of questions was required to test concepts that had not previously been assessed. Internal reliability was not formally tested initially, and instead related questions testing similar concepts were identified by the pre-testing participants as repetitive, adding unnecessary length to the questionnaire. Therefore, it was agreed among expert panel to eliminate these questions in an effort to obtain a higher response rate of completed questionnaires, due to the population of study being particularly vulnerable to survey fatigue. In retrospect, it would have been a useful marker of internal reliability. However, a Cronbach’s alpha was calculated for the final questionnaire administered for the overall attitude and belief score, which did show an acceptable level of internal validity of 0.703.
**Strengths**

The strengths of this study are several. The high response rate (>80%), balanced representation of residents at different stages of training, participation of both genders and program wide representation of all 14 residency sites made for a highly representative sample.

The research tool was carefully constructed incorporating as many questions as possible from published peer review studies and validated tools, including the well-established IPAQ to assess physical activity levels. There is little known on this topic, particularly in this population, and this study has the potential to contribute in numerous areas with respect to exercise prescription. Additionally, there are also few Canadian studies of medical students or physicians in this area, with a nearly negligible number assessing residents. No other study in Canada to our knowledge has assessed exercise prescription and its related factors in this level of detail.

The findings of this study will be able to contribute to several gaps in the literature regarding exercise prescription, as well as medical education regarding exercise medicine. No prior study to our knowledge has assessed perceived importance of exercise prescription as comprehensively, assessing personal engagement in aerobic and strength activities, sedentary time, current activity levels compared to previous levels, the importance of personal exercise and control over it, attitudes and beliefs of exercise in health and disease, knowledge and awareness of the physical activity guidelines, self competence prescribing different types of exercise to patients and further differentiating between healthy patients and those with chronic disease. No other study, to our knowledge, has assessed current exercise prescription behaviours compared to desired future prescription behaviour (intention) or differentiated between physical activity counselling and exercise prescription in the context of medical education. It is also the first study to
examine the relationship between desired and perceived levels of program engagement and support of residents being physically active, and the first to assess residents’ perceived and desired training received in exercise medicine and exercise prescription.

Much of the data accrued in the present study, contributes new information to the existing body of literature pertaining to physical activity counselling, exercise prescription and medical education. Despite the research being carried out specifically on UBC family medicine residents, the findings may be largely generalizable to other family medicine residency programs in Canada.

The findings may prove to be generalizable to other primary care residency programs including pediatrics, general internal medicine, psychiatry and geriatrics. Making the research tool available to other researchers would allow other residency training programs in Canada and abroad to assess trainees, and possibly facilitate useful comparisons to more efficiently and effectively catalyze curriculum and program change. The research tool could also be used to assess medical students and practicing physicians currently engaged in clinical practice. This would facilitate opportunities for comparisons not only between residency programs, but also allow comparisons for different stages of training along the medical continuum and ultimately advance the literature in exercise prescription and train physicians most effectively in exercise medicine.

It is the authors’ hope that the results of this study will be used to inform positive change at the curriculum and program levels or, at the very least, be used to guide further areas of study required to evolve UBC family medicine residency to better prepare the next generation of physicians in using exercise as medicine.
CONCLUSIONS:

Our findings reinforce previous studies’ concerns that a discrepancy exists between current practice and desired practice with respect to physical activity counselling and exercise prescription. Our data further substantiate the fact that current academic training and medical education do not provide residents with adequate knowledge and skills to sufficiently prepare them to counsel and prescribe exercise.

Despite the high level of importance of exercise prescription in future practice, low levels of knowledge in exercise medicine, poor awareness of physical activity guidelines, low competence in exercise prescription skills and low current counselling and exercise prescription behaviours underscore the need for education and training in exercise medicine and exercise prescription during residency. In addition to exercise counselling and prescription skills, the findings indicate program support and leadership are also important in fostering positively ingrained beliefs in the importance of exercise in health, which the data show is strongly correlated with residents’ intentions to prescribe medicine in future practice.

The goal of getting patients active to improve their own health would contribute towards decreasing both the health and economic burden of chronic NCD. Therefore, prescribing exercise needs to become a more standard and frequent behaviour of physicians, and ultimately the standard of care. Currently, we are not adequately preparing our new physicians with the knowledge or skills for this challenge.

In addition to teaching fundamentals to enhance knowledge and skills in exercise medicine, the findings of this study highlight the importance of creating a culture of physical activity within the residency program. Ideally, programs would provide direct and indirect support by encouraging residents to be physically active.
themselves and demonstrating leadership at the levels of instructors, preceptors, faculty and directors, in both being physically active and prescribing exercise. In addition to providing a knowledge base this would concurrently increase resident well-being and ingrain a deeply rooted belief in the importance of exercise in health, which our data indicate are strongly related to residents’ level of intention to prescribe exercise in their future practice. Residents are the doctors of tomorrow and the future of our healthcare. We need to educate, prepare and empower the next generation of physicians to enable them to step up, counsel and prescribe exercise most effectively, and lead by example.
REFERENCES


73. Tremblay MS, LeBlanc AG, Carson V. Canadian sedentary behaviour guidelines for the early years (aged 0–4 years). Applied physiology. 2012.


APPENDIX A

QUALITATIVE DATA FROM RESIDENTS’ OPEN TEXT WRITTEN COMMENTS

Excellent topic, identifying a definite area of deficiency in our training program! Perhaps a speaker could be engaged at one of our academic half-days in Kelowna, or by teleconference from a central UBC Vancouver site.

Medical training has been a very unhealthy experience for me; the end of residency for me brings hope of re-establishing by prior activity level.

I learned most of what I know about S&EM in my undergrad degree, and from playing varsity sports. Since med school I have chosen to read about exercise prescription but know my peers feel very uncomfortable with this subject. I have personally become less active in residency, disappointingly. This is an important topic - would be interested in your results!

It is sad and disappointing how little emphasis there is in residency to maintain a healthy physical lifestyle, the most we have received is a quick obligatory question during our periodic reviews. There are little to no supports to encourage taking time to exercise. So far we have not received any information on prescribing exercise to our patients.

While I believe it is more difficult to find time for exercise during residency due to irregular schedules, I don't think this should be used as an excuse as I believe if it is important to you, you will make time for exercise. I do also think that more guidance in exercise restrictions and prescriptions for healthy adults and those with chronic diseases will help us promote exercise to our patients.

I feel motivated after this to read some guidelines so that I know how much to prescribe for exercise and assess patients safety for exercise - thank you.
I would like to spend a little more time exercising but depends on schedule and work hours. Sessions on Rx for fitness and show to assess for exercise would be helpful and interesting!

I have had to work very hard to be fit and eat well during my training often at the compromise of socializing with friends and family and sometimes studying. It was a challenge and required a lot of planning.

I strongly feel that exercise prescription should be a much bigger part of curriculum in medical school and residency!

Thanks for this! We need practical tips to tell our patients!

My physical activity and overall fitness has decreased dramatically during residency. Ironically, it's a very unhealthy lifestyle that we are forced into living. I plan on returning to living a healthy lifestyle when I finish residency, though.

Very important I want to have time to exercise. Very hard in residency.

I would like to say that the difference between being able to stay fit throughout medical school versus residency is SUBSTANTIAL!! I would love it if there was more opportunity to be more fit throughout residency.

Please teach us how to prescribe exercise and clear for exercise. Please make an online module that family physicians can do.

Thanks. Interesting topic and ++ important.

Important to lead by example.
Important topic. We could use more training within curriculum and also lifestyle wise - beneficial to have more flexibility within program and training sites to support resident health and physical activity... which I think is key to good resident mental health and being able to effectively prescribe and coach your patients.

This is fantastic research especially given recent global recommendations regarding obesity. There is certainly not enough exercise teaching in medical school or residency, and it’s particularly important for FP training and education. I would hugely appreciate guidance for counselling patients on exercise habits, conducting specific exams for exercise safety and readiness, and followup.

Hard to find time to exercise during residency!

This is so vitally important, thank you for doing this study. If everyone exercised at the guidelines, most disease would be entirely preventable. I prescribe exercise to almost every patient I see, but more options for creative ways to present this to my patients. This is probably the biggest deficit in healthcare currently and we need to lead by example.

I think they should add exercise to our half day like the Rheum residents in Vancouver. More encouragement is needed from our program to find the time.

Exercise should be part of academic days/half-days!

We need more information and lectures regarding physical fitness.

It would be great to find time amongst residency and family to exercise. I used to do hot yoga, ski etc, no time now. It would be great to have at least VAC session on Physical health.
Before I started residency I did weight training 4 times a week and ran (I have run two marathons). During residency the random calls disrupts schedules significantly. I play mens league soccer but the nights are regular and due to on call commitments and having to be away for course and electives etc I have missed lots of games which I find undesirable.

It is super important to do physical exercise regularly even we have not much time. We all need to find time to do so like eating meals every day.

I was physically fit before my medical training and am excited to be done so I can finally have some time to incorporate exercise back into my life.

Comment in regards to the first section - exercise over the past 7 days. Each of my weeks during residency is different, so my answer would vary depending on week. Ie) last week I was dealing with a sick family member and was on call for the weekend for ICU, so exercise was 0! I strongly agree with including physical activity for residents within the program. One suggestion would be providing gym or recreation passes. If we are more familiar with local programs we may be more likely to promote them! Finally, I would very much appreciate more training in exercise prescription. Particularly in determining fitness to exercise and how to prescribe best to those with chronic conditions.

Thank you for conducting this research. I feel these days that there is a great deal of negative language and primary focus on BMI and obesity rather than the more positive and preventative measures of aiding both patients and ourselves in finding ways to keep physically active.

Medical school and residency as well as having a baby basically stopped all physical activity. Currently I am recovering from breast cancer and need to get back at it, I used to a very high level athlete and now I don't do anything. I hope to improve this in the future and be a better role model for patients.
I would love more education on appropriate exercise regimens for different ages / health statuses. I think prescribing exercise is a great idea! I am pregnant right now so gave pre-pregnancy activity levels.

Great survey, thanks!

No other training- there was no option to select this i am from img st pauls program- again no option to choose this.

It is also important to consider the role of knowing about other health disciplines that specialize in exercise prescription (e.g. physiotherapy and kinesiology) and that we have a role as FP to refer patients to appropriate healthcare providers.

Despite the fact that I strongly believe exercise is one of the best things I can do to maintain my own physical and mental health, I just can't seem to fit it on a regular basis because of my hours.

Great study! Glad these issues are finally being brought to attention!

It's very interesting doing this survey: I don't exercise and yet it's very important to me, and very important to my patients. How contrary! Good food for thought. I'm a hypocrite and a fool.

great study! thanks for doing!

I hope that the data accumulated in this surgery is used to change things for the better! Good luck!

I feel like I'm constantly making exercise the last item on my to do list and it never gets done as a result. I "know" what I should be doing but I find it very difficult to "do".
Maintaining exercise has really been a struggle for me in residency because of the work hours and fatigue during time off. However, many of my colleagues do have an exercise routine that they successfully maintain, so I know this is not an excuse. Since the end of exams and our research project, I have started running again in attempt to bring myself back to a good level of fitness. At this point in my life, I don't need exercise to maintain my weight, as I am naturally very slim. But this has led to a lack of external motivation, which is not good, since body weight is only one small component of physical fitness and health.

In 3rd year clerkship I found it near impossible during the heavy rotations to find time OR energy to exercise and put it by the wayside. It wasn't until the half of the year with simpler workdays and no call that I could go back to exercising regularly. Ideally for me, my CV exercise would come in the form of sport, and thus I am currently looking for opportunities to join a intramural sport activity with some fellow residents as a means of staying healthy.

I feel as though we get very little formal teaching on physical activity, especially with regards to prescribing exercise. I have also found that many of my preceptors have been uncomfortable with the topic, and therefore choose to be less specific about exercise prescription. I think that all of our patients would benefit from increased emphasis on building competence with exercise prescription during medical school and residency.

I think prevention was neglected in my med degree and would love to emphasize prevention and physical activity in my learning now - great idea.

Very interesting research - I hope this translates into more exercise medicine in the curriculum.
Thank you for doing this research/survey. I believe that there is a considerable lack of education in medical school about the merits of preventative medicine and physical activity. Further, I believe that the rigours of medical school (particularly clerkship), make it difficult for us as future doctors, to stay physically active. Even though I am an ex-world triathlon competitor and a current keen medical student, I do not feel comfortable prescribing appropriate physical activity.

I think it's a great idea to include training in exercise prescription and encourage residents to be physically fit themselves! I've endeavored to keep physically fit myself, coming from a kinesiology background. But it is pretty embarrassing that I don't remember how to prescribe exercise or how to properly assess patients prior to prescribing exercise, because I've never had to do it in medical school.

Just want to make sure that whoever is doing this survey knows we have been on vacation for the week leading up to this so therefore a lot more time for exercising. Also, I was sick over the last week so my numbers are skewed.

I had never really thought about exercise as formal prescription. We've had no training in this field during my undergrad!

Since the time I started medical school, I have always had something to study for everyday. I have always felt that there is not enough time to study everything that I want to study for. Even if I find some time, I would rather read something. And on top of that family and kids. Unless it is a mandatory thing, I will probably not have the time to go do exercise while in residency!

Regular running/ work out groups among residents is a great idea to follow on each year of residency! We should just form our own running group.

Excellent survey that made me reflect on my own life and future practice.
Physicians, especially those in training often do not have enough time for regular physical activity. It would be an asset to any residency program to implement such an initiative, and allocate specific time during the working day (often >10 hour days) for some form of exercise (group or individual).

Very important stuff. Difficult to motivate some patients.

I'd love to learn of ways to help motivate patients to be physically active. I try to keep it as part of my daily routine, but I know cost of a gym membership or equipment can be a barrier (even for us!).

I don't believe doctors have to be physically fit to provide good information and counselling. If anything, a candid awareness of challenges to building in a physically fit lifestyle is more valuable than being told by someone who is already likely integrated into a culture of fitness.

I believe it is very important to encourage healthy living in all our patients - both healthy and with chronic disease. I would appreciate if there was more training and/or education revolving this, particularly in patients who have co-morbidities such as osteoarthritis, etc.

Physical activity/active lifestyle is a crucial part of overall health and wellness. It is important to also include the effects of exercise/activity on mental health especially as there is good evidence for benefit in areas like depression. The social aspects that activity generates are also an important part of overall health. As the fund of knowledge has grown, it appears that many physicians are less informed about exercise prescription, especially in light of the many others (personal trainers, kinesiologists, physiotherapists, etc) who are more well versed than doctors.

I'd love to get more information about degree of physical activity in different age groups! I also found CSPE guidelines very helpful!
I would like to learn more about prescribing exercise. Also I find that in this transition from medical school to residency, exercise has not been as forefront personally, as I am looking into a new gym, options in the area, etc and that highlights to me the importance of considering that for patients who are in the midst of location changes and other major changes and the impact on exercise.

I have a toddler that keeps me on my toes...lifting twenty-something pounds several minutes to hours a day, does that count as exercise?

Health and balance are encouraged in medical school/residency, but as a parent and student/resident, the reality of regular exercise with work/study demands is that it isn't easy/is often left to last, even if I know better.

I don't feel my residency program cares about my health or about me as a person at all, so this may be a confounding factor. Additionally, I don't think learning about physical activity and it's impact on health is a bad idea, but UBC has proven, in my experience, to be exceptionally bad at teaching all topics.

Residency is a busy time, but I have definitely noticed a decline in my physical fitness already. Not only do we not have a lot of free time for fitness, but up north here, the days get short, so I am only free in the dark, which means that I will have to pay a lot of money to join a gym etc because day lit activities will soon be limited. Also mental exhaustion makes it hard to be motivated, even though I know I would feel better when I get out, there is always guilt that I should be looking things up, spending time with partner or contributing to housework rather than spending the time on myself.
More teaching surrounding physical activity prescription in chronic disease as well as the general population would be very helpful. I think it would be helpful to distribute a brief summary of this teaching to residents in the form of a video tutorial. This would be flexible to accommodate busy resident schedules, and residents could refer back to the video at any point as a refresher.

I would love to learn more about how to carefully and properly assess someone for "clear to exercise" including child (healthy, chronic illness) and adult (healthy, chronic illness). I would also like to know more about the evidence for supporting physical activity to share with my patients. However, the biggest challenge I find is in motivating patients and finding ways to follow up and encourage them without becoming someone they feel is scolding them when they can't exercise enough.
APPENDIX B

RESEARCH TOOL: EXERCISE IN FUTURE PRACTICE QUESTIONNAIRE

Custom Report
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IN THE LAST 7 DAYS: How many DAYS did you do MODERATE physical activities? Think only of those activities that you did for AT LEAST 10 MINUTES at a time.

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**IN THE LAST 7 DAYS: How many DAYS did you WALK for AT LEAST 10 MINUTES at a time.**

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<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
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<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
<td>(0.0%)</td>
</tr>
</tbody>
</table>

In the last 7 days: I’ve performed at least 20 minutes of resistance exercises/strength training (free weights, calisthenics, nautilus, kettle balls) on _____ days.

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Total Responses</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Please rank from Strongly Disagree to Strongly Agree

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being physically active/exercising regularly is important to me</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>I have control over whether or not I am physically active</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

During a TYPICAL OFFICE encounter:

<table>
<thead>
<tr>
<th></th>
<th>Never &lt;5%</th>
<th>Rarely 5-20%</th>
<th>Occasionally 21-40%</th>
<th>Sometimes 41-60%</th>
<th>Frequent 61-80%</th>
<th>Nearly Always 81-95%</th>
<th>Always &gt;95%</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I COUNSEL patients on physical activity ___ __% of the time:</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I PRESCRIBE EXERCISE (Activity + Dose + Intensity, Time) ___ __% of the time:</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Please Rank from Strongly Disagree to Strongly Agree

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel confident in my skills to prescribe exercise</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>I feel successful at getting my patients to start exercising</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>Prescribing physical activity to my patients will be an important part of my FUTURE medical practice</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>
Please Rank from Strongly Disagree to Strongly Agree

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that regular PA is integral to my patients’ CURRENT health</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>Prevention is NOT as interesting to me as treatment</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>I believe sedentary behaviour is harmful to my patients’ health:</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>I will be able to provide more credible and effective counselling if I exercise and stay fit</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>I believe physicians have a responsibility to promote physical activity to their patients</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>Residency programs should encourage their residents to practice physically active lifestyles</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>My residency program encourages residents to exercise and be physically active</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Are you familiar with the Canadian Physical Activity Guidelines?

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Don’t know</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

Total Responses: 0
Adults (18-64 yo) should accumulate at least ____ minutes of moderate intensity physical activity each week:

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>90</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>120</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>180</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>210</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Total Responses</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Children (5-17) should accumulate at least ____ minutes of moderate to vigorous physical activity each week:

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>30min x 5 days=150</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>30min x 7 days=210</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>45min x 5 days=225</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>45min x 7 days=315</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>60min x 5 days=300</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>60min x 7 days=420</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Total Responses</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Older adults (>65 yo) should perform strength training:

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days/wk - it's contraindicated in this population</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>at least 1 day/wk</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>at least 2 days/wk</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>at least 3 days/wk</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>there is no evidence specific to strength training in the population</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>there are no guidelines around strength training in this population</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Total Responses</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Rank the following RISK FACTORS in DESCENDING order of IMPORTANCE to CHRONIC DISEASE DEATHS according to World Health Organization data: From 1 (Most important/Greatest contribution) to 7 (Least important/Least contribution)

<table>
<thead>
<tr>
<th>Rank</th>
<th>HTN</th>
<th>Smoking</th>
<th>Impaired Glucose</th>
<th>Physical Inactivity</th>
<th>Overweight/obesity</th>
<th>Hyperlipidemia/a high cholesterol</th>
<th>Excessive alcohol use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>2</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>3</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>4</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>5</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>6</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>7</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

For a HEALTHY ADULT PATIENT

<table>
<thead>
<tr>
<th>Conducting CLINICAL ASSESSMENT to clear for exercise</th>
<th>Highly Incompetent/Not at all Comfortable</th>
<th>Incompetent/Uncomfortable</th>
<th>Somewhat Incompetent/Somewhat Uncomfortable</th>
<th>Neutral</th>
<th>Somewhat Competent/Somewhat Comfortable</th>
<th>Competent/Comfortable</th>
<th>Highly Competent/Totally Comfortable</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRESCRIBING AEROBIC exercise (frequency, intensity, duration, type)</th>
<th>Highly Incompetent/Not at all Comfortable</th>
<th>Incompetent/Uncomfortable</th>
<th>Somewhat Incompetent/Somewhat Uncomfortable</th>
<th>Neutral</th>
<th>Somewhat Competent/Somewhat Comfortable</th>
<th>Competent/Comfortable</th>
<th>Highly Competent/Totally Comfortable</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRESCRIBING RESISTANCE or STRENGTH exercise (frequency, reps, sets, type)</th>
<th>Highly Incompetent/Not at all Comfortable</th>
<th>Incompetent/Uncomfortable</th>
<th>Somewhat Incompetent/Somewhat Uncomfortable</th>
<th>Neutral</th>
<th>Somewhat Competent/Somewhat Comfortable</th>
<th>Competent/Comfortable</th>
<th>Highly Competent/Totally Comfortable</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>
For an ADULT PATIENT WITH CHRONIC DISEASE (Cardiovascular disease, Chronic Respiratory Disease or Diabetes)

<table>
<thead>
<tr>
<th></th>
<th>Highly Incompetent/Not at all Comfortable</th>
<th>Incompetent/Uncomfortable</th>
<th>Somewhat Incompetent/Somewhat Uncomfortable</th>
<th>Neutral</th>
<th>Somewhat Competent/Somewhat Comfortable</th>
<th>Competent/Comfortable</th>
<th>Highly Competent/Totally Comfortable</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducting CLINICAL ASSESSMENT to clear for exercise</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>PRESCRIBING AEROBIC exercise (frequency, intensity, duration, type)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>PRESCRIBING RESISTANCE or STRENGTH exercise (frequency, reps, sets, type)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

Please Rank from Strongly Disagree to Strongly Agree

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have received an adequate amount of training in exercise as medicine</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>I would like to receive more education/training in exercise prescription</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

Stage of Training

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming R1 - Beginning</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Graduating R2 - End</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>R1 - Midway</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>R2 - Midway</td>
<td></td>
<td>0.0%</td>
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</tr>
<tr>
<td>Total Responses</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Please indicate your FP residency program:

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Responses</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Please indicate if you’ve had any previous training in the following: (check all that apply) (extensive curriculum in medical school (indicate the amount of training received +/- University))

<table>
<thead>
<tr>
<th>Response</th>
<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>elective course in preventative medicine/health</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>elective course in sports and/or exercise medicine</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>human kinesiology undergraduate course</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>coaching certification</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>extensive curriculum in medical school (indicate the amount of training received +/- University)</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>other (please specify)</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total Responses</td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Please indicate if you’ve had any previous training in the following: (check all that apply) (other (please specify))

<table>
<thead>
<tr>
<th>#</th>
<th>Response</th>
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</thead>
</table>

Sex

<table>
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<tr>
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<th>Chart</th>
<th>Percentage</th>
<th>Count</th>
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</thead>
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<td>0</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.0%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total Responses</td>
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<td></td>
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</table>

Year of Birth

There are no responses to this question.

Please answer the following:

<table>
<thead>
<tr>
<th>Response</th>
<th>No</th>
<th>Somewhat</th>
<th>Yes</th>
<th>Prefer not to answer</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would you describe yourself as a healthy body weight? (Healthy BMI)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>Would you describe yourself as physically fit?</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Your thoughts + opinions are important! Please feel free to comment:

There are no responses to this question.
APPENDIX C

ELICITATION INTERVIEW QUESTION GUIDE

PART A: OUTCOME MEASURE - ASKING PATIENTS ABOUT PHYSICAL ACTIVITY:

BELIEFS/ATTITUDES

A1 (a/b) What do you believe the advantages/disadvantages are in asking patients about their physical activity (levels)?

(a) ADVANTAGES:

1. 
2. 
3. 
4. 
5. 

(b) DISADVANTAGES:

1. 
2. 
3. 
4. 
5. 

A1 (c) Is there anything else you associate with your views about asking patients about their physical activity (levels)?

1. 
2. 
3. 
4. 
5.
SOCIAL NORMS

A2 (a/b) Who influences you on whether you ask or don’t ask about physical activity levels? (individuals, groups, governing bodies)

(a) ASK:
1.
2.
3.
4.
5.

(b) DO NOT ASK
1.
2.
3.
4.
5.

A2 (c) Is there anyone else you consider an important influence on whether or not you ask about physical activity levels?
1.
2.
3.
4.
5.
PERCEIVED BEHAVIOURAL CONTROL

A3(a) What would enable you/ or make it possible for you to ask patients about their physical activity levels?

(a) ENABLE
1. 
2. 
3. 
4. 
5. 

A3(b) What would make it difficult/ or impossible for you to ask a patient about their physical activity levels?

(b) HINDER
1. 
2. 
3. 
4. 
5. 

A3(c) Is there anything else you associate with your (own) ability to ask or not ask patients about their physical activity levels?
1. 
2. 
3. 
4. 
5.
PART B: OUTCOME MEASURE - PRESCRIBING PHYSICAL ACTIVITY TO PATIENTS

BELIEFS/ATTITUDES

B1(a/b) What do you believe the advantages/disadvantages are in prescribing physical activity to patients?

(a) ADVANTAGES:
1. 
2. 
3. 
4. 
5. 

(b) DISADVANTAGES:
1. 
2. 
3. 
4. 
5. 

B1(c) Is there anything else you associate with your (own) views about prescribing physical activity to patients?
1. 
2. 
3. 
4. 
5. 
SOCIAL NORMS

B2 (a/b) Who influences you on whether you prescribe or don’t prescribe physical activity to your patients? (individuals, groups, governing bodies)

(a) PRESCRIBE:
1. 
2. 
3. 
4. 
5. 

(b) DO NOT PRESCRIBE:
1. 
2. 
3. 
4. 
5. 

B2 (c) Is there anyone else you consider an important influence on whether or not you ask prescribe physical activity?
1. 
2. 
3. 
4. 
5.
PERCEIVED BEHAVIOURAL CONTROL

2C (a) What would enable you/ or make it possible for you to prescribe physical activity to your patients?
(a) ENABLE:
1.
2.
3.
4.
5.

2C (b) What would make it difficult/ or impossible for you to prescribe physical activity to your patients?
(b) HINDER
1.
2.
3.
4.
5.

2C (c) Is there anything else you associate with your ability to prescribe or not prescribe physical activity to a patient?
1.
2.
3.
4.
5.

ANY OTHER COMMENTS OR THOUGHTS?
APPENDIX D

PARTICIPANT RECRUITMENT: LETTER OF INVITATION TO PARTICIPATE

Dear UBC Resident Colleagues:

I am a UBC R3 in Family Practice and graduated from the UBC Family Medicine program.

You to have the opportunity to share your perspective on UBC residency training in physical activity and exercise medicine.

As an incentive for participating you are eligible to win an iPad mini!

The survey takes 5 -10 minutes. All responses are anonymous.

Participation is voluntary and you may withdraw from the survey at any time.

Should you have any questions or concerns, please contact me at: UBCexerciseismedicine@gmail.com

Please find the attached consent for further information. If the questionnaire is completed, it will be assumed consent has been given.

The survey is available by clicking on the following link or pasting it in your browser: http://fluidsurveys.com/s/UBCExerciseisMedicine/

Thank you for sharing your thoughts and experiences! Your response may influence changes in the the future of the UBC family medicine residency program!

Sincerely,
Kara Solmundson
(former UBC FP grad)
UBC Master’s student
CONSENT FORM

Exercise and future clinical practice in UBC family medicine residency

Purpose: You are invited to participate in a survey looking at UBC family medicine residents’ views of physical activity/exercise in health and your opinions of your training!

Study:
A 5-10 min online survey. Results will be presented on UBC campus in a master’s thesis defense and at UBC Family Practice rounds, which you are welcome to attend!

Potential Risk:
Minimal or no risk anticipated.

Potential Benefits:
Opportunity to learn about physical activity prescription and potentially influence future UBC family medicine residency training.

Confidentiality:
All responses are completely anonymous and no identifying data is collected.

Privacy:
The privacy policy of Fluidware, the Canadian based web survey company which hosts and stores the data collected on fluidsurveys.com may be reviewed at http://fluidsurveys.com/canada/data-privacy-canada/

Consent:
Participation is entirely voluntary. You may refuse to participate and/or withdraw from the survey at any time. Consent to participate is implied upon completion of the survey.

Contact:
Please contact Dr. Kara Solmundson at UBCexerciseismedicine@gmail.com or if you have any questions or concerns about the study. Kara is a former UBC Family Practice graduate, completed extra training at UBC in sports and exercise medicine, and is an R3 UBC clinical scholar. She is currently pursuing her masters degree studying the medical education of exercise prescription in health and disease.

Your rights:
UBC Office of Research Services provides information about your rights as a research subject at can be reached at 604-822-8598.
APPENDIX E

CANADIAN PHYSICAL ACTIVITY GUIDELINES

THE EARLY YEARS: 0-4 YEARS OLD

For healthy growth and development:
• Infants (aged less than 1 year) should be physically active several times daily – particularly through interactive floor-based play.
• Toddlers (aged 1-2 years) and preschoolers (aged 3-4 years) should accumulate at least 180 minutes of physical activity at any intensity spread throughout the day, including
  o A variety of activities in different environments.
  o Activities that develop movement skills.
  o Progression toward at least 60 minutes of energetic play by 5 years age.
• More daily physical activity provides greater benefits.

CHILDREN: 5-11 YEARS OLD

For health benefits, children aged 5-11 years should accumulate at least 60 minutes of moderate to vigorous intensity physical activity daily. This should include:
  o Vigorous-intensity activities at least 3 days per week.
  o Activities that strengthen muscle and bone at least 3 days per week.
• More daily physical activity provides greater health benefits.
YOUTH: 12-17 YEARS OLD

For health benefits, youth aged 12-17 years should accumulate at least 60 minutes of moderate to vigorous intensity physical activity daily. This should include:

  o Vigorous-intensity activities at least 3 days per week.
  o Activities that strengthen muscle and bone at least 3 days per week.

More daily physical activity provides greater health benefits.

ADULTS: 18-64 YEARS OLD

To achieve health benefits, adults aged 18-64 years should accumulate at least 150 minutes of moderate to vigorous intensity aerobic physical activity per week, in bouts of 10 minutes or more.

  • It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.

More physical activity provides greater health benefits.

OLDER ADULTS: 65 YEARS OLD AND OLDER

To achieve health benefits and improve functional abilities, adults aged 65 years and older should accumulate at least 150 minutes of moderate to vigorous intensity aerobic physical activity per week, in bouts of 10 minutes or more.

  • It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.

  • Those with poor mobility should perform physical activities to enhance balance and prevent falls.

  • More physical activity provides greater health benefits.
APPENDIX F

CANADIAN SEDENTARY GUIDELINES

THE EARLY YEARS: 0-4 YEARS OLD

For healthy growth and development, caregivers should minimize the time infants (aged less than 1 year), toddlers (aged 1-2 years) and preschoolers (aged 3-4 years) spend being sedentary during waking hours. This includes prolonged sitting or being restrained (e.g., stroller, high chair) for more than one hour at a time.

**Screen Time** (TV, computer, electronic games):

Under 2 years old = *not* recommended.

Children 2-4 years = limited to under one hour per day; less is better.

CHILDREN: 5-11 YEARS OLD

For health benefits, children (aged 5-11 years) should minimize the time they spend being sedentary each day. This may be achieved by:

- Limiting recreational screen time to no more than 2 hours per day; lower levels are associated with additional health benefits.

- Limiting sedentary (motorized) transport, extended sitting and time spent indoors throughout the day.

YOUTH: 12-17 YEARS OLD

For health benefits, youth (aged 12-17 years) should minimize the time they spend being sedentary each day. This may be achieved by:

- Limiting recreational screen time to no more than 2 hours per day; lower levels are associated with additional health benefits.

- Limiting sedentary (motorized) transport, extended sitting and time spent indoors throughout the day.