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Formal Exercise Curricula in Canadian Physiotherapy, Nursing, and Medical Schools

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Abstract

Purpose: This study set out to compare physiotherapy (PT), nursing (RN) and medical (MD) program curricula to determine whose students may be best prepared to prescribe exercise within primary care for the purpose of chronic disease prevention and management.

Method: A questionnaire regarding current and future exercise curricula was e-mailed to PT, RN, and MD program directors across Canada. Chi Square analysis with Fisher's Exact Test assessed the main difference in responses, while frequency analysis and t-tests compared the responses directly between PT and RN directors. Written responses were reviewed to illustrate themes that emerged from all participants. Secondly, an Ontario Rehabilitation Programs Application Services (ORPAS) document review was done to assess entering PT students' educational backgrounds in exercise topics.

Results: Findings show that PT students have extensive exercise education, before and during their masters program. All three professional programs teach students general concepts about the benefits of exercise. However, only physiotherapists are trained to prescribe, implement, and modify exercise with all individuals, including those living with chronic disease(s).

Conclusions: We propose that physiotherapists ought to lead the exercise prescription movement for the purpose of chronic disease prevention and management within primary care with nurses and physicians being involved as exercise advocates.

Key Words: Chronic Disease; Exercise; Curriculum; Prevention & control; Disease Management

Introduction

Addressing the leading risk factors of chronic disease means that approximately 80% of leading chronic diseases, such as premature heart disease, stroke, and diabetes could be prevented.[1] Although this is well known and exercise is also recognized as a key cornerstone in chronic disease management, effective implementation of exercise within primary care continues to be a challenge. According to Health Canada,[2] primary care is the element within primary health care that focuses on health care services, including health promotion, illness and injury prevention, and the diagnosis and treatment of illness and injury. While primary health care refers to an approach to health and a spectrum of services, including all services that play a part in health, such as income, housing, education, and environment. Thus, for the purpose of this paper, primary care is the operational definition used to describe the practice context relevant for physicians, nurses, and physiotherapists.

Several recent initiatives, such as exercise guidelines for specific groups, a developing role for kinesiologists and clinical exercise physiologists (still to be fully determined), and the "exercise is medicine" movement have attempted to bridge the gap between knowing exercise is beneficial and incorporating it within primary care.[3-5] In instances with more complex healthcare needs, exercise guideline readers will often be referred to speak with their healthcare provider for additional guidance and support regarding safe and appropriate exercise recommendations within a clinically monitored setting. However there are two assumptions that ought to be recognized within such a referral: 1) the reader will know which primary care provider to turn to for additional exercise recommendations for their unique health needs, and 2) the healthcare professional is prepared to provide appropriate, safe, and effective exercise recommendations.

From the relevant literature, we found that several authors [6-10] made compelling advocacy for including physicians to play a key role in exercise counseling and prescription, while others[11] suggest nurses incorporate exercise recommendations as part of their health promotion role. However, in practice few physicians consider exercise during their examinations,[12] which is not surprising given that medical schools in the United Kingdom and United States have limited (if any) exercise education within their curriculum[13,14] and minimal opportunity to design a specific exercise prescription. 12 Notably, this type of research has not yet been reported for Canadian medical or nursing schools. Thus, given the acknowledged benefits of exercise, along with the initiatives to incorporate exercise prescription within the primary care context, evidence is needed to determine which healthcare provider is formally trained and thus best prepared to implement effective exercise prescription within our present healthcare system.

A two-phase study was conducted to compare physiotherapy (PT), nursing (RN) and medical (MD) program curricula to determine whose students may be best prepared to prescribe exercise within primary care for the purpose of chronic disease prevention and management.. In phase 1 a survey was distributed to compare the formal exercise curriculum offered in Canadian PT, RN, and MD programs. Phase 2 included an in-depth document review of PT programs listed in the Ontario Rehabilitation Sciences Program Application Service (ORPAS) from 2008-2012, in order to determine the typical educational background of students coming into physiotherapy programs.

Methods

We developed a survey for phase 1 based on previous literature[13] and feedback from several researchers with questionnaire experience to cover the basic aspects of exercise knowledge gained during the duration of the professional program. The study has been approved by the appropriate ethics review board(s), informed consent has been obtained for all participants and the study conforms to the Human and Animal Rights requirements of the February 2006 International Committee of Medical Journal Editors' Uniform Requirements for Manuscripts Submitted to Biomedical Journals.

An electronic version of the survey was prepared for distribution to potential study participants following ethics approval. A telephone call was made to 15 PT, 17 MD, and 24 RN schools across Canada, to introduce the study and confirm the most appropriate person who could comment on curriculum details for their respective program. Director is the term used throughout the paper to define this person, even though the official titles varied (e.g., Deans, Program Chairs, Leads, Directors, etc.,). From the initial contact made with the administrator, the appropriate person was secured for 10 PT, 12 MD, and 17 RN programs. Each of these program directors was e-mailed a copy of the study's cover letter, consent, and the electronic uniform resource locator (URL) directing participants to the online survey, which took a maximum of 10 minutes to complete. The URL enabled automatic data collection within the appropriate, electronic, password-protected folders labeled PT, RN, or MD, which helped minimize human error during data tabulation and analysis. One week after the initial contact, a follow-up e-mail was sent to all identified directors, which was subsequently followed by a reminder telephone call one week later. Participants were given eight weeks to complete the survey, with a reminder e-mail sent once per week.

The questionnaire helped quantify participants' responses based on specific questions from eight categories (Table 1), including: 1) beliefs about exercise prescription; 2) the "how" of exercise prescription; 3) safety and exercise prescription; 4) exercise advice, benefits, and physiological effects; 5) current exercise prescription curriculum; 6) future curriculum plans; 7) exercise prescription and chronic disease; and 8) utilization

of specific exercise guidelines. Open-ended free form text boxes were provided for further commentary that participants felt was important to share.

Table 1. Questionnaire categories and respective survey questions used to inform each category.

Category	Question (#, Content)
Beliefs about exercise prescription	1) We believe that giving advice to be physically active is the same as providing a specific exercise prescription 2) We believe that teaching students how to prescribe exercises to clinical populations should be mandatory
The how of exercise prescription	3) We teach students how to design an exercise program for individuals living with medical conditions 4) We teach our students to prescribe exercise(s) using specific criteria (e.g., frequency, intensity, sets, repetitions, duration, etc.,) 5) We teach our students how to implement an exercise program
Safety and exercise prescription	6) We teach our students established exercise precautions 7) We teach our students established exercise contraindications 8) We teach our students what to monitor to ensure safety during exercise
Exercise advice, benefits, and physiological effects	10) Our students are taught how to advise patients about the benefits of exercise 11) We have dedicated lectures to teach our students the physiological effects of exercise on chronic disease(s)
Current exercise prescription curriculum	13) We have at least one course dedicated to teaching students about the benefits of physical activity/exercise 14) Exercise prescription is intergraded within mandatory courses 15) Our curriculum provides a sufficient amount of exercise/physical activity instruction
Future curriculum plans	16) In the next 5 years we plan to have a course dedicated to teaching our students how to prescribe exercise/physical activity to clinical populations [i.e., individuals living with chronic condition(s)]
Exercise prescription and chronic disease*	12) We teach our students how to prescribe exercise to populations living with the following (check all that apply): Type I diabetes; Type II Diabetes; Coronary Artery Disease; Stroke; Multi-System Involvement; Other
Utilization of specific exercise guidelines*	9) In order to teach our students specific physical activity recommendations, we use exercise guidelines from the following (check all that apply): we do not use any established guidelines; American College of Sports Medicine, Canadian Physical Activity Guidelines, Canadian Society for Exercise Physiology, Other.

*These questions had text boxes for participants to provide additional information under "other".

Chi Square analysis with Fisher's Exact Test was done to assess the main difference in responses between PT, RN, and MD program directors. Frequency analysis was completed and t-tests were done to compare PT and RN directors' answers. Data attained from responses given by MD directors were excluded from the t-test analysis due to the low response rate (4/12, 33%). However, word responses were reviewed and their content thematically analyzed[15] to illustrate perspectives shared by directors from all three professional programs.

In phase 2, the Ontario Rehabilitation Programs Application Services (ORPAS) was e-mailed and the request for permission to review and present the data included in their annual report was granted without ethics approval. Information from 2008-2012 was reviewed to assess the formal exercise academic background (i.e., undergraduate degree), of students who chose to attend one of four Ontario-based, professional masters programs in physiotherapy. Similar information about the academic background of students admitted to medical schools was not made available by the Ontario Universities' Application Center (OUAC), as their representative expressed that they do not release these details to anyone who does not have "an ongoing relationship with OUAC". Data on pre-nursing education was also not obtainable, given the heterogeneity of nursing programs across Ontario (i.e., Community/College-based, University-based, or combined and graduate programs at universities).

Results

The results are presented in two main sections, including

Phase 1: Survey Findings and Phase 2: the ORPAS document review.

Phase 1: Survey Findings

Response rate and Chi Square analysis are described first. The rest of the survey findings are presented under the previously introduced questionnaire categories (Table 1). Although the questionnaire was e-mailed across Canada, program directors from different provinces were reached for each professional program with varying response rates (Table 2).

Table 2. Study participants' programs, provinces, and response rates.

Professional Program	Program Directors' Respective Provinces	Response Rate*
Physiotherapy	Alberta; British Columbia; Manitoba; Quebec; Ontario	100%
Nursing	Alberta; British Columbia; Ontario; Saskatchewan	59%
Medicine	Alberta; Ontario; Quebec	33%

*Note: Response rate is based on the responses obtained from program directors whose contact details were secured, not the total number of programs in all of Canada.

Main response difference

Based on the Chi Square analysis using Fisher's Exact Test, a statistically significant ($p<0.001$) difference was noted in the way the questionnaire was answered by PT, RN, and MD directors.

The t-test analysis comparing PT and RN responses for the following 13 Likert-scale survey questions, were statistically significant (range: $p<0.001$to $p=0.008$). A table with response frequencies can found in appendix A, while the t-test analysis table is shown in Appendix B. Despite the low response rate and exclusion of MD director responses from the t-test analysis, their contributions are included to illustrate key trends. Study participants' comments are briefly presented in the findings and further elaborated in the discussion section of this paper.

Beliefs about exercise prescription

Question 1 and 2 from the survey (Table 1) assessed participants' beliefs about exercise prescription. A majority (90%) of the directors for the PT and RN professional programs disagree or strongly disagree that advice to be physically active is the same as a specific exercise prescription. The trend from MD directors' responses was similar to those of PT and RN, with only 1 of 4 (25%) reporting that these two concepts are the same. Furthermore, all PT directors believe that teaching students how to prescribe exercise to clinical populations (defined in the survey as individuals living with chronic conditions) be mandatory. The varied RN opinions substantially differ from PT responses as shown in Figure 1.

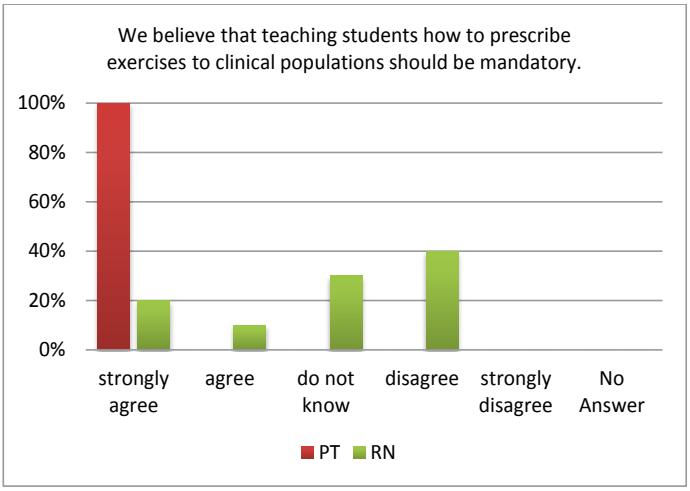

Figure 1: Program directors' belief that teaching students how to prescribe exercise to clinical populations should be mandatory; PT=physiotherapy; RN=nursing.

The how of exercise prescription

Questions 3, 4, and 5 (Table 1) comprise the how of exercise prescription section of the survey. All PT directors strongly agree, while the majority (90%) of RN directors disagree or strongly disagree that their students are taught how to design an exercise program for individuals living with medical conditions. Also, all PT directors strongly agree, while the majority (90%) of RN directors disagree or strongly disagree that as part of their curriculum students are taught how to prescribe exercise(s) using specific criteria such as frequency, intensity, repetitions, etc. In addition, all PT and only 10% of RN directors agree or strongly agree that as part of their curriculum students are taught how to implement an exercise program.

Similar to RN, MD directors' responses show similar trends where they predominantly disagree or strongly disagree (90%) that their students are taught how to design an exercise program for individuals living with medical conditions, and all felt that their students would not know how to implement an exercise program or how to prescribe appropriate exercise(s) by using specific criteria.

Safety and exercise prescription

Questions 6, 7, and 8 respectively, informed the safety and exercise prescription category of the survey (Table 1). All PT directors strongly agree that students are taught established exercise precautions and contraindications, while 50% of RN directors agree and 50% disagree with this statement. In addition to teaching students about established exercise precautions and contraindications, 100% of PT directors strongly agree, while 60% of RN directors agree or strongly agree that their students are taught what to monitor to ensure safety during exercise. For MDs, response trends suggest that medical students are not taught about exercise precautions, but some suggest teaching students about exercise contraindications. There is also a divide on whether exercise prescription should be mandatory in medical schools' curriculum (see frequency details in Appendix A).

Exercise advice, benefits, and physiological effects

Survey questions 10, and 11 informed the exercise advice, benefits, and physiological effects category. Most PT directors (90%) strongly agree and 80% of RN directors agree or strongly agree that their students are taught how to advise patients about the benefits of exercise. Ten percent of PT directors did not answer this question, while 10% of RN directors disagree that their students are taught how to provide advice on the benefits of exercise. Furthermore, majority (60%) of RN directors agree and 90% of PT directors strongly agree that they offer lectures dedicated to the physiological effects of exercise on chronic disease. Trends from MD responses are similar to those of PT and RN (see frequency details in Appendix A).

Current exercise prescription curriculum

Questions 13, 14, and 15 informed the current exercise prescription curriculum category in the questionnaire. A majority (90%) of PT directors agree or strongly agree that there is at least one course dedicated to teaching students about the benefits of exercise, while 80% of RN directors disagree or strongly disagree that they offer such a course(s). Another 70% of PT directors agree and 60% of RN directors disagree that exercise prescription is integrated within mandatory courses. Responses from MD directors show similar trends to PT (Appendix A).

When asked whether the curriculum provides a sufficient amount of exercise instruction, 60% of PT directors strongly agree that they did, while another 40% of them did not provide an answer. Forty percent of RN directors disagree, while another 40% do not know, and only 20% agree or strongly agree that their students receive sufficient amount of exercise instruction. The MD directors were divided here: 50% disagree or strongly disagree that they have sufficient instruction regarding exercise (Appendix A).

Future curriculum plans

When asked if there is a plan to provide a course on exercise prescription in five years (Question 16-Table 1), 80% of PT participants report already having such a course, while 10% will, and 10% do not have plans to include a course on exercise prescription. Some of the comments indicate that exercise prescription is an integral component of all courses, or that it is integrated throughout the curriculum rather than presented in a single course: 1)*"topics are integrated across multiple courses and both years of training, so our program is not conducive to a specific course";* 2) *"all our courses have exercise prescription as an integral component";* 3) *"we have this course, but are planning to increase it to 2 courses".*

On the other hand, 30% of RN directors plan to have an exercise prescription course, while 30% do not know and another 30% have no plans of including such a course within their curriculum over the next five years. None report already having such a course, although one comment reflects that exercise is integrated within the curriculum as a healthy living component within the broader context of health promotion, as shown by the following quote: *"We are reviewing our curriculum and plan to enhance our healthy living components, including self-care for our students as future health care professionals. We advocate a collaborative rather than prescriptive approach to healthy living, for self and working with clients, that considers the complexity of social determinants of health and focuses on empowering, respectful health promotion practice. These components are and will be integrated throughout the curriculum, rather than presented in a single course".*

An MD director commented that exercise is integrated throughout the curriculum, but recognized that there is limited coverage of this topic, which they plan to address by including *"more emphasis on the practical application of knowledge, including exercise prescription".* Another MD director acknowledged the benefit of exercise, but expressed that medical students should not be experts in the field, as evident from the following quote: *"The basic rationale for not including much specific exercise prescription instruction in the curriculum is that an MD, although cognizant of the beneficial effects of exercise, and aware of when exercise would be beneficial or not; cannot expect to also become a kinesiologist/exercise scientist/physiotherapist while they are becoming an MD. At some point, their knowledge of complementary therapies has to reach a limit so as not to compromise the completeness of their basic medical education within the 4 years of the program. Agreed on the importance of exercise, but not that med students should be the experts in this field."*

Exercise prescription and chronic disease(s)

Question 12 was posed to determine what chronic disease(s) are discussed in relation to exercise prescription. Ninety percent of PT directors report teaching students how to prescribe

exercises to individuals living with: chronic obstructive pulmonary disease (COPD), type 2 diabetes mellitus (T2DM), stroke (CVA), coronary artery disease (CAD), while 80% address type 1 diabetes mellitus (T1DM). Participants (30%) also provided "other" conditions including hypertension, multi-system impairments and/or individuals with comorbidities, while one PT director emphasized that there are "*too many [chronic diseases] to list*". Some of the additional conditions that emerged in the PT curriculum included: obesity, cancer, renal disease, fibromyalgia, polio, post-polio, cerebral palsy, osteoarthritis, rheumatoid arthritis, muscular dystrophy and head injury. One quote summarized that the PT curriculum included education about "*all major chronic conditions*".

In comparison, 40% of RN directors report teaching students about exercise and individuals with "*multi-system impairment*", while 30% cover CAD, T2DM, COPD, and 20% discuss CVA and T1DM. Additionally one participant explained: *"We work within a broader focus on healthy living and emphasize collaborating with clients, rather than prescribing to them. Chronic disease management, including lifestyle strategies, are included in the curriculum."*

Finally, one of the MD directors suggested that students are taught about exercises and a *"wide variety of MSK disorders"* while another one stated that their curriculum covered *"individuals living with chronic conditions."*

Utilization of specific exercise guidelines

Question 9 was posed in the survey to determine whether established exercise guidelines are utilized when educating students on exercise recommendations (Table 1). A majority (90%) of PT directors report using the following: American College of Sports Medicine (ACSM) and Canadian Physical Activity Guidelines (CPAG), while another 80% indicate using Canadian Society for Exercise Physiology (CSEP). Additionally, 30% of PT directors report using Canadian Diabetes Association guidelines and another 30% report relying on "*current evidence-based literature*". "Other" guidelines that were highlighted by PT directors include: 1) *"Position statements [from] specific professional groups such as "ATS statement for pulmonary rehab, Canadian Diabetes Association for diabetes management";* 2) *"YMCA protocol, stroke specific guidelines (i.e., Canadian Stroke Best Practice Guidelines)"* 3)*"... Canadian Association of Cardiovascular Prevention and Rehabilitation, Osteoporosis Canada (BoneFit)"*

Several (40%) RN directors report not using any established guidelines, while 30% utilize CPAG. Additionally, 10% report using ACSM and CSEP, while another 10% indicate not knowing whether any guidelines are used to teach exercise specific recommendations to nursing students. Finally, three MD directors report using CPAG, two use both ACSM and CSEP, while one reports not using any established guidelines

Phase 2: ORPAS document review

A document review of ORPAS information on undergraduate programs focusing on exercise education was completed for the year 2008-2012 (Table 3). A majority (53 to 62%) of the students accepted into one of four Ontario PT programs had an exercise-based undergraduate education (i.e., human kinetics/kinesiology, exercise science, physical & health education, and physio/physical therapy).

Table 3. Percentage of students with exercise-focused undergraduate degrees accepted into one of the potential four Ontario-based physiotherapy programs.

Undergraduate Education	2008	2009	2010	2011	2012
Human Kinetics/ Kinesiology	55.4%	53.7%	49.5%	53%	52.1%
Exercise Science	0.7%	1.5%	1.5%	1.4%	1.4%
Physical & Health Education	3.2%	5.2%	5.1%	1.8%	2.8%
Physio/Physical Therapy	0%	1.5%	0.4%	0.7%	0.7%
Other Non-Exercise Based Education	40.7%	38.2%	43.6%	43.2%	42.9%
Total Exercise-Based Education	59.4%	61.9%	56.4%	53%	57.1%

Discussion

This study set out to compare physiotherapy (PT), nursing (RN) and medical (MD) program curricula to determine whose students may be best prepared to prescribe exercise within primary care for the purpose of chronic disease prevention and management. There was a notable difference in response rate (Table 2) between PTs (100%), RNs (59%), and MDs (33%). This difference in response rate might reflect poor timing of the survey (i.e., distributed during the summer term). In addition, the survey might have had greater buy-in from RNs and MDs if a professional from their area of practice administered it, rather than a graduate student pursuing a combined PT/PhD degree. Furthermore, the response rate may also indicate competing research priorities amongst RN and MD program directors, which could have limited their participation. Finally, the response rate from RNs and MDs may indicate a generally lower level of interest in research regarding exercise prescription for chronic disease prevention and management. Despite the varied response rate, informative findings emerged that are further elaborated in this discussion section.

We determined that the three participating groups had an overall statistically significant difference in the way that they responded to the survey questions. Thus, we found an overall

trend that exposure to exercise prescription within their curricula varied. The first section of the survey assessed beliefs about exercise prescription. Findings show that PT and RN program directors believe exercise prescription and general advice for people to be active is not the same thing, with similar trends noted from the limited number of MD responses. Recognizing the distinction between exercise advice and exercise prescription is imperative, since primary care providers should be able to provide general advice by discussing the health benefits associated with exercise and also encourage someone to be/become physically active. However, once a person is prepared to increase exercise levels, they may require additional expertise in order to commence a safe exercise program. Thus, advice initially offered by a healthcare professional for someone to increase his or her activity levels becomes insufficient, because at that point knowledge on *how* to prescribe an exercise program becomes crucial.

In order to guide a person on *how* to exercise, a question was posed whether teaching students how to prescribe exercises should be mandatory. While the findings (Figure 1) show that all PT directors strongly believe that such instruction should be mandatory, the majority of RN's did not know or disagreed with this statement. This difference might partially be explained in how RN's perceive exercise as a lifestyle component within the broader context of health promotion, as supported by one of the RN participants who stated that: "*we work within a broader focus on healthy living and emphasize collaborating with clients*, *rather than prescribing to them*. *Chronic disease management, including lifestyle strategies, are included in the curriculum*".

This comment raises an interesting perspective that this RN director may have on exercise prescription, where the word prescription is perceived as something that's done *to* the client, rather than created *with* the client at the center of the process. From this RN director's perspective, prescription might be viewed as a hierarchical or top-down approach to interacting with clients, rather than a collaborative endeavor. This perspective may be closely linked to the perception of how medication is prescribed. Medical doctors have the knowledge and training to advise clients on appropriate pharmacological interventions. Although this process could be viewed as a one-way interaction, where the physician prescribes medication(s) *to* the patient, ideally, sufficient education about the risks, benefits, and alternatives is discussed with the client and/or their substitute decision maker (SDM). Also, during this interaction the client's concerns and questions should be addressed—the essence of client-centered care.[16] As a result, the ultimate decision to take the medication is left to the now well-informed client/SDM.

Individuals seeking advice from physicians trust that the advice and in turn the medication prescription is correct, as it is provided by a professional with appropriate and extensive training in that area of practice. An exercise prescription ought to be considered in a similar way, where the individual who would benefit from this intervention would receive advice and a specific prescription from the most appropriately trained and qualified healthcare provider. That being said, an exercise prescription ought to be recognized as an iterative process where the individual who would benefit from the prescription is fully integrated and plays a central role throughout the process.

The How of Exercise Prescription

Three questions from the survey aimed to determine the *how* of exercise prescription. Questions from this section asked whether students are taught how to: 1) design an exercise program; 2) prescribe exercise using specific criteria such as frequency, intensity, duration, etc; and 3) implement an exercise program. While all PT directors reported that their students receive this training, the majority of RN directors suggest this content is not included within the nursing curriculum, with MD directors showing similar trends to RN directors' responses.

These findings suggest that although RN and PT directors recognize that advice and giving a specific exercise prescription is not the same, only PT students are taught how to prescribe an exercise program. Also, despite medical schools being encouraged to incorporate exercise into their curriculum[9,13,14] the four MD directors from three different Canadian provinces suggest that their students are not provided with specific education on how to develop, prescribe, or implement a specific exercise program.

Exercise Curriculum Content

Based on the findings summarized within the following categories: 1) safety and exercise prescription; 2) exercise advice, benefits and physiological effects; 3) and current exercise curriculum, it is evident that all three primary care providers are able to discuss the physiological effects of exercise on various chronic disease(s) and advise individuals on the benefits of exercise, but the PT curricula is the only one that incorporates exercise within mandatory courses. This indicates that physicians, nurses, and physiotherapists could all play an important role as advisors to facilitate exercise participation by educating clients about the benefits of exercise. However, once a person is prepared to start exercising, PTs would be the only clinicians formally trained to design, implement, and modify an exercise program to ensure it is appropriate and safe.

Study findings also suggest that current PT programs are the only ones that provide sufficient and extensive exercise content to their students as part of their mandatory curricula. On the other hand, based on RN directors' feedback, it is evident that curricula changes would be required for their students to receive sufficient exercise instruction. Previous researchers

have also called for change within medical programs to ensure future physicians are better informed on how to prescribe exercise to their clients.[13,14,17] However, given the arduous process of changing a curriculum, along with barriers such as lack of time and limited space for exercise implementation within physicians' practice context, resources and energy may be better directed in improving effective exercise prescription by relying on already trained and available primary care providers for this task.

Based on this study, it is apparent that the Canadian primary care system has qualified healthcare professionals—physiotherapists—with extensive knowledge on exercise whose fundamental component of daily practice includes exercise prescription.[18] In addition to the exercise curriculum offered during the PT program, the ORPAS document review from 2008-2012 demonstrates that close to 60% of students pursuing PT have exercise-based undergraduate educations (Table 3), meaning that prior to commencing graduate studies, the majority of students pursuing a degree in physical therapy have a strong exercise science foundation that they can further develop during their professional clinical training. Recognizing that PTs are extensively trained to prevent and manage various injuries that may result from exercise participation further supports PTs as potential leaders for exercise prescription within primary care.

Findings from the survey also demonstrate that PT students are exposed to established evidence-based exercise guidelines and are trained on how to prescribe exercises when working with individuals who have numerous chronic disease(s), including complex and/or multi-system impairments. Additionally, physiotherapists work within environments conducive to exercise implementation with equipment and personnel to ensure monitoring, progression, and maintenance of an appropriate exercise program.[18] From the three primary care providers assessed in this study, it is concluded that physiotherapists are best prepared to prescribe exercise(s) to aid chronic disease prevention and management within the primary care context.

Previous researchers[19] have shown elderly people and those with chronic disease often rely on publicly funded PT services in the community. However, only 6.4 full-time PT's were employed by Ontario's 54 community health centers in 2004, while family health teams did not have any physiotherapy members on their staff in 2011.[20] Additionally, physicians have highlighted that the cost of private care results in fewer referrals to PT services, despite being aware of the benefits the clients could receive from timely PT interventions.[19] Limited inclusion of PT services within primary care increases results in poor access to physiotherapy for those that often needed it most (i.e., elderly and individuals with chronic disease). Yet PTs are well prepared to tackle the challenge of incorporating effective exercise prescription within primary care, thus addressing a key corner stone of chronic disease prevention and management.[19] Similarly to previous research,[20] findings from this study support policy implications to increase funding for PTs in primary care to enable access to appropriate interventions for all.

Limitations and Future Research Directions

Future researchers may want to explore formal exercise education of additional primary care or alternative healthcare providers, chiropractors, certified kinesiologists, etc. Given the recent regulation of kinesiologists and their expanding autonomy in clinical practice with potential expansion into primary care, it would be interesting to determine what role they might play with respect to exercise prescription with individuals who are at risk or have chronic disease(s). Kinesiologists were excluded from this study because they recently (in 2013) became a regulated profession in Ontario and their role in the primary care context is yet to fully develop. For example, at the time of this study they were not providers that would receive referrals from community care access centers, who are integral to connecting appropriate healthcare providers with individuals who present with complex healthcare needs in the community, such as those living with chronic disease(s). However, their expanding role and evolution in practice will be important to study in the future.

A second limitation is that findings are not representative of every professional program offered in Canada and as such there are limitations in generalizability of the findings. Additionally, despite reported trends from several MD directors who participated from three different provinces across Canada, caution must be taken in interpreting findings with respect to medical schools due to the low response rate.

The survey takes into account one perspective (i.e., program directors) and is thus at risk of bias to that participant. Additionally, student perspectives were not assessed in this study, but are worth exploring in the future, as it would be valuable to determine whether students and/or recent graduates feel that the exercise curriculum offered in their respective professional programs is sufficient and if it translates well when prescribing exercise in clinical practice.

Finally, RNs and PTs from various practice contexts should also be evaluated to determine their confidence in prescribing exercise with individuals presenting with chronic disease(s). Although, previous researchers[21] have evaluated family physicians' confidence with exercise prescription, to our knowledge RN's and PT's have not been included in such evaluation.

Conclusion

Several novel conclusions emerge from this study. First, arduous curriculum changes in medical or nursing schools to include exercise prescription may be an inefficient use of re-

sources, given that physiotherapists are already primary care providers with extensive formal exercise education. Second, physicians and nurses should advocate for exercise and refer individuals to PTs for detailed exercise prescription to address chronic disease prevention and management. Third, policy changes are needed to ensure physiotherapists are integral members of chronic disease prevention and management teams, such as family health teams, to enable exercise prescription benefits for all.

Therefore, we propose that physiotherapists ought to lead the exercise prescription movement in primary care for the purpose of chronic disease prevention and management, with MDs and RNs participating as exercise advocates.

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