**Research Statement**

My current research program uses exercise to reduce the risk of fractures and rehabilitate fractures in people with osteoporosis or at risk of developing osteoporosis. I have become interested in identifying early signs of fragility fractures and implementing interventions to reduce the risk of the more debilitating fractures of the hip and spine. I plan to improve the quality and quantity of life in people living with osteoporosis. To address this research plan, I will use the research skills and knowledge that I have already acquired and build on my current program of research. At Western University I will progress my research program in people with osteoporosis by conducting studies better identify fragility fractures through a) using ICES data and b) a national survey on previous fractures, age, with and ethnic and diverse lens and c) conduct a national observational study of individuals engaging in exercise programs between the ages of 40-60 to track health outcomes like falls, fractures, and strength. I will progress my research program in falls prevention by a) using technology to assess for home fall hazards and b) creating a national collaboration and Delphi consensus to come up with a calculator to predict the risk of falling. Finally, I will progress my research in knowledge translation by a) develop tools to disseminate exercise recommendations; b) conduct motivational interviewing sessions with older adults interested in making a change to increase their exercise and c) use technology to monitor actual versus perceived activity levels in older adults.

*Previous Training*

My current research program focuses on

1. Exercise interventions for osteoporosis fracture prevention, and recovery

2. Falls prevention strategies

3. Knowledge translation to disseminate exercise for older adults

Sex and gender are cross-cutting themes in my research and have been a considerable focus of my training Sex and gender are important factors in bone health, exercise behaviours and prognosis for osteoporosis outcomes..

I have a positive career trajectory to date having published 24 papers and 19 presentations throughout my academic training, acquiring a competitive CIHR doctoral award to support my training, and completing a variety of knowledge mobilization initiatives. With respect to my research themes, I have conducted a variety of research studies that will form the foundation for my ongoing research program.

For exercise interventions for osteoporosis and fracture prevention I created the Hands Up Program[1], which is an education and exercise intervention for people post distal radius fracture, using evidence to inform the program. For this project, I conducted a survey to understand people with osteoporosis’ exercise preferences[2], which informed the design of the exercise portion of the Hands Up Program. I also conducted interviews to get a better understanding of how knowledge was disseminated to people with osteoporosis [not yet published], and what gaps exist, particularly in non-pharmacological management. I used that information to develop 12 education modules for the Hands Up Program. As well, in my master’s training I published four articles related to exercise in people with osteoporosis. Two were a secondary data analysis to better understand how vertebral fractures and posture affect physical performance measures like the five time sit to stand and four meter walk test[3,4], and the other two publications were qualitative studies to better understand how to disseminate the osteoporosis exercise recommendations.

As part of my PhD thesis work, I took on an additional project, funded by the American Society of Hand Therapists, to provide better access to a home fall hazards. We provided older adults in general as well as older adults that sustained a recent distal radius fracture with a Go Pro camera to conduct a tour of their home, in replacement of the traditional therapist home visit. To inform this work, a questionnaire was developed to help the participants have a directed home tour. The questionnaire was developed by our team, and the psychometric properties were assessed. So far, one of the manuscripts has been published[5] and the other is under review. Data collection is currently ongoing for the home assessment using the Go Pro camera. To gain better insight into whether home hazard assessments are effective at reducing the risk of falling, I undertook a scoping review and a systematic review with a meta-analysis. Both of those studies are published[6,7].

Finally, I have had a strong interest in knowledge translation and behaviour change strategies throughout my masters and PhD training. During my masters I was part of an Ontario-wide initiative to disseminate the osteoporosis exercise guidelines to patients, allied health professionals and physicians, as well as learn how research can better support the knowledge users uptake of the information. This study was funded by the ministry of health and long term care, and resulted in two publications and a published abstract[8-10]. As part of the education portion of the Hands Up RCT, I created two education modules related to behaviour change, in an effort to encourage long term adoption of exercise and safe movement for these high-fracture risk participants. The results are still pending as the trial is ongoing. We will be able to speak to the long-term success of the intervention through a fitness calendar all the participants were asked to complete. This study was supported by the CIHR doctoral award and through ancillary grants held by Dr. MacDermid.

All of my research has considered sex and gender and used some component of evidence synthesis. My interest in sex and gender was stimulated by my supervisor, a past CIHR Sex and Gender Chair and current CIHR Sex and Gender Champion. I have used sex and gender-based analysis in my research studies and have conducted work to promote better understanding of the important role that sex and gender play in health research, and health outcomes. I have published a manuscript understanding how sex and age influence the recovery trajectory in people post distal radius fracture[11]. I am also conducting several literature reviews to capture whether surgical and rehabilitation focused randomized control trials (RCT) account for sex and gender when designing, implementing, or reporting on an RCT. In terms of evidence synthesis, I have developed skills in a variety of evidence synthesis techniques including different study designs (effectiveness, prognosis, and outcome measurement) through a variety of evidence synthesis methods (systematic reviews[12,13], scoping reviews[7,14], overviews of systematic reviews[15] and narrative reviews[16]), or analytical techniques (meta-analyses). I have published 12 literature reviews that reflect these different methodologies.

Beyond my work in people with osteoporosis I have also been involved in several other projects studying aging and older adults: 1) manual therapy and stretching and the potential risk of fracturing[16] 2) diagnostic testing for carpal tunnel syndrome[17]; 3) barriers and facilitators for using joint protection program in people with hand osteoarthritis 4) assessment of chronic pain in people post total joint replacement[18] and 5) a narrative review to determine whether strength training can have cardiovascular effects[19]. I have also developed clinical skills through working as a part-time physiotherapist in a private practice clinic.

*Proposed Research Program*

*Years 1-5*

1. Exercise interventions for osteoporosis fracture prevention, and recovery

To progress my research theme of exercise interventions for osteoporosis, fracture prevention and recovery I propose to conduct three studies in the first 5 years of my term as the Canada Research Chair in Activity and Aging. Firstly, I have already begun a fellowship to become an ICES scientist under the supervision of Dr. Joy MacDermid (Western University) and Dr. Susan Jaglal (University of Toronto). I will apply for funding from the Bone and Joint Institute Catalyst Grant Program at Western University. Using ICES data I will answer the question among adults in Ontario, what is the incidence of first fragility and traumatic upper extremity fractures? The secondary question will be: what are the associated comorbid health, health service use, and sociodemographic profiles of these different types of fractures. Using this information, I would like to conduct a national survey to understand whether those individuals aged 40+ that engage in regular physical activity have a reduced fracture and fall rate compared to those that do not. In this survey, I would like to include guided equity, and diversity questions to better understand demographic profiles of those that are fracturing and falling. For this survey, I will apply for funding from Osteoporosis Canada to support a trainee in this project. A secondary analysis, using Structural Equation Modelling will help to determine factors that contribute to falls and fractures. Finally, I would like to develop the Hands Up Program into a national randomized controlled trial to better understand if an exercise and education program after a distal radius fracture can improve health outcomes. For this project, I will apply to a CIHR Project grant.

1. Falls Prevention Strategies

To address my research pillar of fall preventions strategies I will integrate the use of technology and approach leading experts in the field of falls research to better identify fall risk factors and reduce the risk of falling. My first fall prevention program will be to expand on the Go Pro project by using smartphones to assess home and community fall risk factors. A major limitation with using the Go Pro camera is that it is not a live stream, and although the Go Pro camera may be more accessible than a therapist home visit, there is a cost associated with the device. For this project, I propose using smartphone technology to allow for live assessment of the home, or community. The first question will be to determine whether this is a feasible option and if older adults have access to use a smartphone. I will apply for funding through the Canada Foundation for Innovation to support the use of technology for fall prevention strategies in older adults. Secondly, I would like to create a national team of experts in falls research to develop a fall risk calculator. Using evidence synthesis and a Delphi consensus I will determine important variables that contribute to a participant’s increase risk of falling. I will then conduct a national survey to determine which factors have contributed to actual falls in Canadians. Through a propensity score the factors can be weighted to give an overall risk of falling. The idea is to have a similar calculator to that used by people with osteoporosis, FRAX, <https://www.sheffield.ac.uk/FRAX/tool.aspx?country=19>. I am already part of a CIHR Network Grant for Bone Health, so I will use that network to progress this project. However, to fund this project I will also be applying to the CIHR project grant.

*5-10 years*

Given the option to renew my position as a Tier 2 Chair, I would progress the research from the previous 5 years. Within the next 5-10 years I believe it will be important to expand my current research pillar of knowledge translation. In the first five years of my term, I will be developing and progressing knowledge. It will be important to shift the focus of the second term as a Canada Research Chair to translate and disseminate the knowledge to all Canadians. For the first project, I would like to create tools to disseminate exercise recommendations and findings from the fall prevention work. I will create videos, brochures, one-page handouts and online materials to share the knowledge. My involvement in previous knowledge translation studies have indicated a variety of tools to is important when considering dissemination of research to multiple knowledge users such as patients, allied health professionals, physicians, and other professionals. It will be a high priority to disseminate the findings to policy makers to evoke long term change. All of the tools will be translated in the top 5 languages spoken in Canada and include both text and figures to improve accessibility of the knowledge. I will once again apply for funding from Osteoporosis Canada to support a trainee in this project.

Next, I would like to conduct a study to determine if motivational interviewing improves exercise adherence in older adults. Through Western University I have completed all three levels of motivational interviewing training. For this project, I will apply to Western’s Strategic support for CIHR success program, to allow for preliminary findings and support and application to CIHR for a larger trial.

Finally, I will once again apply to the Canada Foundation for Innovation to use technology to assess the accuracy of actual versus perceived activity levels in older adults. I would like to use the participants at the CCAA to rate their exertion in an exercise class and their weekly activity, and then compare to an activity monitoring device to assess their actual effort. A knowledge translation strategy will be conducted to inform older adults about exercise intensity to align with the Canadian and osteoporosis physical activity guidelines of meeting 150 minutes of moderate to vigorous intensity exercise weekly.

*Pursuing my Research at the Western University in the Faculty of Health Sciences*

My research program fits well within Western University’s Faculty of Health Sciences strategic research plan as it aims to define health through the social determinants of health, uses technology to encourage exercise and physical activity and contributes to the change of health services and systems. My program of research aligns with the strategic plan of to promote inclusion, collaboration, and innovation. I have already demonstrated that my research is inclusive by considering sex and gender, but I will continue to consider equity, diversity, and inclusivity throughout all my research projects. I already have strong collaborations with Western University, the University of Toronto, and the University of Waterloo, which will be valuable to drive forward innovative research programs for older adults in general, and people with osteoporosis, as it relates to physical activity and exercise. I can conduct my research with very little infrastructure needed, as the projects I’m proposing can be conducted online and with the infrastructure already put into place at the CCAA, however, I will apply to the Canada Foundation for Innovation to support any additional infrastructure required. To support my research program, I have already discussed several funding opportunities that I will apply to, but I will also apply to the Early Researcher Award through the Government of Ontario, as well as use the research stipend offered through the Canada Research Chair to fund my research program.

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