Specialized Geriatric Services Use by Older Home Care Clients

by

Sophie Erica Hogeveen

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Public Health and Health Systems (Aging, Health and Well-being)

Waterloo, Ontario, Canada, 2019

Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Dr. Andrea Moser Assistant Professor, Department of Family and Community Medicine University of Toronto
Supervisor(s)	Dr. John Hirdes Professor, School of Public Health and Health Systems University of Waterloo
Internal Members	Dr. George Heckman Associate Professor, School of Public Health and Health Systems University of Waterloo
	Dr. Heather Keller Professor, Department of Kinesiology University of Waterloo
Internal-external Member	Dr. Tejal Patel Assistant Professor, School of Pharmacy University of Waterloo

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Background: Geriatric medicine specialists are experts in the care of vulnerable, older adults with complex medical and psychosocial needs. In Canada, their scope of practice and expertise is communicated through the 5M Framework, and includes the following domains: mind, mobility, multicomplexity, medications, and what matters most to patients. Specialized geriatric resources are limited in Ontario, with an estimated shortage of the full time equivalent of over 100 geriatricians. Beyond simply a lack of resources, there is poor integration, communication, and collaboration between specialized geriatric services (SGS), and other community-based health services, such as home care services, primary care, and outpatient specialist care. The Regional Geriatric Programs of Ontario (RGPO) and the Ontario Ministry of Health and Long-term Care (MOHLTC) expressed an interest in developing a mechanism to assist in the allocation of limited resources by targeting older adults who would most benefit and improving integration between these care sectors.

To date, however, there has been little literature published on the practice patterns of geriatric medicine and the determinants of contact with this specialist discipline by community-dwelling older adults. Geriatric organizations and associations in Canada and the United States have published statements on the role and target population of geriatric medicine but there is a lack of empirical evidence on this topic. Standardized assessments in home care provide a wealth of health information that may be linked to service use data to investigate this topic. As older home care clients represent a complex and high needs subset of the general population of community-dwelling older adults, this is an appropriate population to study and target for SGS. While there is interest in examining the broader use of community-based SGS, it is not captured in administrative services data. However, it is possible to examine contact with geriatric medicine as a component of specialized geriatric care.

Objectives: The objectives of this dissertation are: 1) to investigate patterns of health care services use by older, home care clients in Ontario, with a focus on contact with geriatric medicine; 2) to identify determinants of contact with geriatric medicine; and 3) to examine determinants of frequent use of community-based physician services as a proxy for need for specialized geriatric care.

Methods: The sample included long-stay, community-dwelling, home care clients, 60 years of age and older, in Ontario (N=196,444). For each unique client, their Resident Assessment Instrument – Home Care (RAI-HC) admission assessment was linked to Ontario Health Insurance Plan (OHIP) billing records (contact with physician services on an outpatient basis), National Ambulatory Care Reporting System records (NACRS; unplanned emergency department visits), and the Discharge Abstract Database (DAD; hospital admissions). Service use was counted in the 90 days pre-assessment, 90 days post-assessment, and six months post-assessment. Descriptive statistics were used to describe the frequency of contact with various services and to compare home care clients with and without geriatric medicine contact. Logistic regression was used to examine the associations between home care client characteristics and contact with geriatric medicine on an outpatient basis (one or more contacts in 90 days post-assessment), and frequent contact with all physician disciplines on an outpatient basis (nine or more contacts in 90 days post-assessment).

Results: While almost half of the sample (49.6%) had contact with physicians four or more times in the 90 days post-assessment, only 5.2% of older home care clients had any contact with geriatric medicine during that time period. Nonetheless, almost half of the sample had multiple needs within the domains of the expertise of geriatric medicine according to the 5M Framework. While family medicine plays a gatekeeping role in the Ontario health care system, increased frequency of contact with family medicine did not result in much of an increase in any subsequent contact with geriatric medicine. Home care clients who had contact with geriatric medicine had lower odds of subsequent acute care services use than those without contact. However, the benefit varied when stratified by

client characteristics. There appeared to be less benefit for those who were acutely ill, complex and unstable, and more benefit for those who were cognitively and functionally impaired. These findings may indicate the need for a more upstream approach whereby geriatric medicine is involved in a client's care before acute issues lead to functional decline and risk of caregiver distress and institutionalization.

In simple logistic regression analyses, functional and cognitive impairment, mental health conditions, risk of caregiver distress and institutionalization were found to be significantly associated with higher odds of geriatric medicine contact while pain, medical instability and complexity, and risk of unplanned ED visits were associated with lower odds. However, provincial experts in the care of older adults have identified all of the above as important for referral to SGS. In the final multivariable model, adjusted for regional effects, female sex, difficulties accessing the home, impaired locomotion outside of the home, good prospects of recovery, diagnosis of hemiplegia/hemiparesis, and cancer were associated with lower odds of geriatric contact. Age, worsening of decision-making, dementia, hallucinations, Parkinsonism, osteoporosis, and risk of caregiver distress and institutionalization (MAPLe score) were associated with higher odds of geriatric contact.

Frequent contact with outpatient physicians in general was expected to be a proxy for need for SGS as these home care clients likely had multiple, unmet needs and would benefit from the holistic, patient-centred approach of geriatric medicine. Interestingly, many of the factors driving frequent attendance were the same factors associated with lower odds of geriatric medicine contact. In the final multivariable model, adjusted for regional effects and age, married status, functional improvement potential, congestive heart failure, irregularly irregular pulse, cancer, treatments changed in last 90 days, nine or more medications, medical complexity and instability (CHESS), and at risk for unplanned ED visits (DIVERT) had higher odds of frequent attendance. Female sex, impaired locomotion outside of the home, cognitive impairment, dementia, stroke, multiple sclerosis,

Parkinsonism, hip fracture, unusually poor hygiene, older age, and need for urgent referral (AUA) were associated with lower odds of frequent attendance.

Conclusions: This dissertation provides empirically-based insight into the current practice patterns and determinants of community-based geriatric medicine use in Ontario and highlights the need for a decision support mechanism to rationally and equitably identify older home care clients who may benefit from referral to SGS in a timely manner. As a result of this research, a decision support tool is proposed which incorporates insights from historical practice patterns, in addition to provincial expertise in the care of older adults, and the 5M Framework, used nationally to describe the scope and expertise of geriatric medicine. According to the proposed tool, home care clients at risk for caregiver distress and institutionalization (based on current practice patterns), with medical instability and complexity (based on provincial expertise), and needs within multiple domains of the 5M Framework should be identified through regular home care assessment for consideration for referral to SGS. A tool that is compatible with standardized assessments within home care and other care sectors will allow for allocation of resources more rationally and equitably, and enhance communication and integration across care providers, sectors, and agencies. Future research should evaluate the proposed tool and explore implementation considerations.

Acknowledgements

This PhD would not have been possible without the support of those around me. Thank you to Dr. John Hirdes for your mentorship over the past six years. You encourage me, challenge my thinking, and continue to create opportunities for me to grow as a health services researcher. You have taught me to see the big picture and think at a systems-level, yet always remember the people who are at the heart of my work. Thank you to my committee members for their support. Dr. George Heckman, your guidance and insight have been invaluable as I navigated the world of geriatric medicine. Dr. Heather Keller, thank you for your perspective and feedback throughout to ensure that my research was thorough and rigorous yet focused.

Thank you to the Ontario Ministry of Health and Long-Term Care (MOHLTC), and the Regional Geriatric Programs of Ontario (RGPO) for providing financial support for this research. Thank you to the steering committee members (Ms. Debra Bell, Dr. Jo-Anne Clarke, Dr. George Heckman, Ms. Leslie Eckel, Ms. Maria Gruending, Dr. John Hirdes, Ms. Kelly Kay, Ms. Jane McKinnon-Wilson, Ms. Janet McMullan, Ms. Karen-Lee Miller, Dr. Frank Molnar, Ms. Amy Olmstead, Ms. Linda Petersen, Ms. Jessica Riehm, Ms. Ann Schrager, and Dr. Samir Sinha) for their commitment to this process. I am also grateful for the key informants who shared their clinical knowledge and experience with me.

Special thanks to Kelly Milne for his support and encouragement in my work with the RGPO. Melissa Ziraldo, you were such a huge help in putting together the final RGPO report and I am grateful. Aein Zarrin was also instrumental in preparing and analyzing the expert insight that informed this work. I would like to thank the team at the MOHLTC Department of Home and Community Care, and Jessica Riehm in particular, for their commitment to my research.

I am thankful for the faculty, staff, and students in the School of Public Health and Health Systems who have supported me over the years. To the interRAI Canada staff and students, past and present, you have made this experience so much more meaningful and enjoyable. Thank you to Julie Koreck for always looking out for me and keeping me organized, you have been a lifesaver on countless occasions. I am grateful to Nancy Curtin-Telegdi and Leslie Eckel for introducing me to the interRAI universe and helping me to better understand the intersection of research, practice, and policy. Your advice, for my career and life in general, has been so valuable. Thank you to Micaela Jantzi and Jonathan Chen. It might have taken me years longer to get to this point without your SAS help. My fellow students, thank you for going through this experience with me. I have enjoyed laughing, eating snacks, commiserating, traveling, teaching, and working through tough research problems with you. A special thanks to Joanna Sinn, my constant office neighbour and friend. Your calm presence and positive attitude has kept me grounded through all the ups and downs of #gradlife.

I am extremely blessed to have amazing friends who have filled my life with fun, love, and laughter. To my Waterloo Pentecostal Assembly family, thank you for praying for me, encouraging me, and reminding me that there is much more to life than this research. I thank God for using you to strengthen and sustain me, and to point me to Him throughout this process. To my Waterloo Christian Scholar friends, it has been such a blessing to share grad school life with you over the past year.

Last but not least, thank you to my family for your unconditional love and support. I love you so much. You may not have always understood what I was doing or why, but you have always been there for me. Special thanks to my last-minute proofreaders: Sheila, Joanne, Shelley, Erica, and Kyle. Mom and Dad, thank you for always being a safe place in the midst of the stress. Claire and Erin, thank you for reminding me not to take myself too serious and for being my best friends for life.

Dedication

I dedicate this dissertation to my grandparents, who have always pointed me to the One with whom nothing is impossible.

"Surely God is my help, the Lord is the One who sustains me."

Psalm 54:4

Table of Contents

List of Figures

List of Tables

List of Abbreviations

ADL Activity of Daily Living

ADLH Activities of Daily Living Hierarchy Scale

AUA Assessment Urgency Algorithm

CAP Clinical Assessment Protocol

CHESS Changes in Health, End-Stage Disease, Signs, and Symptoms Scale

CIHI Canadian Institute for Health Information

COE Care of the Elderly

CPS Cognitive Performance Scale

DAD Discharge Abstract Database

DIVERT Detection of Indicators and Vulnerabilities for Emergency Room Trips

DRS Depression Rating Scale

FTE Full-Time Equivalent

HQO Health Quality Ontario

HSSO Health Shared Services Ontario

IADL Instrumental Activities of Daily Living

IADL-C Instrumental Activities of Daily Living Capacity Scale

ICES Institute for Clinical Evaluative Sciences

interRAI HC interRAI Home Care Assessment

LHIN Local Health Integration Network

MAPLe Method for Assigning Priority Levels

MOHLTC Ontario Ministry of Health and Long-Term Care

NACRS National Ambulatory Care Reporting System

OHIP Ontario Health Insurance Plan

PGLO Provincial Geriatric Leadership Office

RAI-HC Resident Assessment Instrument for Home Care

RGPO Regional Geriatric Programs of Ontario

SGBA Sex- and gender-based analysis

SGS Specialized Geriatric Services

Chapter 1
Introduction

1.1 Overview

As the Canadian population ages, a growing emphasis has been placed on the importance of the role of community-based health services to ensure the sustainability of the health care system. With the push towards aging at home, many older adults are remaining in their homes for longer. The high prevalence of chronic diseases among the growing population of older adults is putting increasing pressure on the Canadian health care system (Canadian Institute for Health Information, 2011). In 2008, over three quarters of Canadians aged 65 and over reported at least one chronic condition and nearly one quarter reported three or more chronic conditions (Canadian Institute for Health Information, 2011). Nevertheless, older adults are more heterogeneous in their health status compared to younger age groups (Lacas & Rockwood, 2012; Rougé Bugat, Cestac, Oustric, Vellas, & Nourhashemi, 2012). Some older individuals are robust and independent while others are more frail and vulnerable, requiring assistance with some or all daily activities. Comorbidities in older adults often present alongside interacting geriatric conditions that result in higher health services use (Canadian Institute for Health Information, 2009, 2011; Fisher et al., 2016; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Gruneir, Markle-Reid, et al., 2016).

Geriatricians are experts in the care of older adults with frailty and multimorbidity (Heckman, Molnar, & Lee, 2013). However, due to limited resources, it is not feasible nor is it necessary to enroll all older adults, or even all home care clients, in a specialized geriatric program. It is generally accepted that geriatric medicine should be targeted to the most vulnerable rather than the general population (Lacas & Rockwood, 2012). Even with a targeted approach, there remain too few geriatricians or multidisciplinary geriatric teams to manage every vulnerable older adult (Beauchet, Launay, Merjagnan, Kabeshova, & Annweiler, 2014; Lacas & Rockwood, 2012).

Home care services support individuals and their caregivers in the community and are key points of contact with the health care system for many older adults (Auditor General of Ontario, 2015). Home care organizers are in a good position to identify clients who may benefit from community-based physician services, particularly specialized geriatric services (SGS). The interRAI assessments that are widely used in home care in Ontario can be used as a common language to improve collaboration, sharing of data, and transitions between community-based care providers (Gray et al., 2009; Hirdes et al., 1999; Hirdes, Ljunggren, et al., 2008). The use of standardized assessments with embedded decision support tools may help to ensure that those who need and would benefit from physician services obtain access in a timely manner.

While numerous studies have examined health services utilization in various populations, none were found that considered the use of geriatrician services by home care clients specifically. Further, the only decision support tool compatible with interRAI assessments that exists to identify home care clients in need of specialized geriatric care is a simple algorithm based on a very limited set of measures. The first sections of this dissertation will examine patterns and outcomes of health services use by older home care clients. Subsequent sections will explore determinants of geriatric medicine contact and frequent use of physician services in general. Finally, a decision support tool based on these findings will be proposed to assist in identifying home care clients who may benefit from referral to more specialized geriatric care. The following sections (Chapters 1-3) provide a background for this study, including a description of a theoretical framework, expert perspectives on the role and target population of SGS in Ontario, the study rationale, and the literature review methods used to guide the research process.

1.1.1 Canadian Population and Health Workforce

The population in Ontario is growing, and is projected to increase by 30.2% between 2017-2041 (Ontario Ministry of Finance, 2018). The number of older adults in particular is projected to double from 2.4 million, or 16.7% of the population in 2017, to 4.6 million, or 24.8% of the population by 2041 (Ontario Ministry of Finance, 2018). This trend is not unique to Ontario, but is expected across Canada, with the population of seniors projected to grow in every province and territory (Canadian Institute for Health Information, 2017).

Nationally, the number of physicians has been growing for the past five years. In 2017, there were 86,644 physicians in Canada, which was a 3.1% increase over 2016 (Canadian Institute for Health Information, 2019). The overall growth in the number of physicians actually outpaced the growth in population between 2013 and 2017 (Canadian Institute for Health Information, 2019). There is currently the highest number of physicians ever recorded, with 234 physicians per 100,000 population (Canadian Institute for Health Information, 2019). Compared to the number of physicians in other countries within the OECD, Canada is below the average of 3.4 physicians per 1,000 population and ranks 29th out of 35, ahead of countries such as the United States (US), Japan, and Poland (OECD, 2017).

About half of physicians in Canada are family physicians and their numbers have also been increasing over time (Canadian Medical Association, 2018a). There were 43,500 family medicine or general practice physicians in Canada in 2018, 14,747 of whom were in Ontario (Canadian Medical Association, 2018d). These figures equate to 119 family physicians per 100,000 population nationally, and 103 family physicians per 100,000 population provincially (Canadian Medical Association, 2018a).

Family medicine is the main primary care physician specialty in Canada (Canadian Medical Association, 2018a). This specialty is responsible for delivering services across the spectrum of care to all patients, regardless of age, sex, and conditions. Family physicians typically handle earlier stage clinical problems, including acute illness, chronic conditions, and emotional difficulties. They are key players in health promotion and disease prevention. They act as a medical home and gatekeeper, coordinating and advocating for care with other health professionals (Canadian Medical Association, 2018a).

Some family physicians have further education and training in caring for more frail and complex older adults through care of the elderly (COE) programs (Frank & Seguin, 2009). In 2019, it was estimated that 143 physicians in Ontario had completed this training (Borrie, Seitz, Basu, Cooper, & Kay, 2019). These specialized family physicians play an important role in the care of older adults in the provincial health care system.

While very few older adults (2% of those aged 65 years and older) are without a regular family physician or place of care compared to other age groups, there remain issues of access to care for this group (Canadian Medical Association, 2016; Statistics Canada, 2019). Same day or next day access to family physician care is low compared to some other countries such as France, New Zealand, and Germany (Osborn, Moulds, Squires, Doty, & Anderson, 2014). Older adults in Canada are also less likely to see a specialist in a timely manner following referral compared to seniors in nine other countries (includes Australia, France, Germany, Netherlands, New Zealand, Sweden, Switzerland, US, and the United Kingdom [UK]) (Osborn et al., 2014). Consequently, older adults in Canada are more likely to visit the emergency department (ED) than older adults in other countries (Osborn et al., 2014). Of unique ED users in Ontario, 21.2% were adults 65 years or older (Canadian Institute for Health Information, 2018). Of the total number of ED visits, 23.2% were made by adults 65 years and older. Frequent ED users are characterized by four or more visits to the ED within the fiscal year.

About 30% of all unique frequent ED users in Canada are adults 65 years or older (Canadian Institute for Health Information, 2018). While the ED is sometimes the most appropriate setting for care for an individual in particular circumstances, some older adults may end up in the ED and admitted to hospital when they could have been cared for elsewhere. In addition to issues of access to care, older adults in Canada are also more likely to experience difficulties with coordination of care than older adults in several other countries (Osborn et al., 2014).

Geriatric medicine is a subspecialty of internal medicine that specifically manages the care of older adults, including prevention, diagnosis, and treatment (Canadian Medical Association, 2018c). Its overarching specialty, internal medicine, is broad and has its foundations in primary care (Canadian Medical Association, 2018b). While geriatric medicine has its focus on care of the elderly, internal medicine has its focus on managing adult patients of all ages with advanced illness in multiple organ systems. In order to become a geriatrician, a physician must be certified in internal medicine and complete two additional years of approved residency in geriatric medicine and 6 to 12 months of approved clinical or laboratory research training relevant to geriatric medicine (Canadian Medical Association, 2018c). Internal medicine specialists provide care in the hospital, in office settings, and on a continuing ambulatory basis, although most practice in inpatient settings (Canadian Medical Association, 2018b). Geriatricians provide care in acute hospitals, long-term care facilities, and in community settings (including home visits), although only 18.5% reported being community-based in the 2014 National Physician Survey (Canadian Medical Association, 2018c; The College of Family Physicians of Canada, Canadian Medical Association, & The Royal College of Physicians and Surgeons of Canada, 2014).

In 2018, there were 3,034 general internal medicine physicians in Canada, with 1,196 in Ontario (Canadian Medical Association, 2018b). There are far fewer geriatric medicine physicians, or geriatricians, in Canada, although the number per 100,000 population has been increasing since 1995.

In 2018, there were 304 geriatricians nationally (0.8 per 100,000 population) and 129 (0.9 per 100,000 population) in Ontario (Canadian Medical Association, 2018c). The actual number of geriatricians that would be necessary to meet needs of the Canadian health care system is unclear, although some estimates range up to 700 (Heckman, Molnar, et al., 2013). As a comparison, reports from the US and the UK suggest that there are 2.1 geriatricians and 2.4 geriatric medicine consultants per 100,000 population, respectively (American Geriatrics Society, 2018; The Royal College of Physicians, 2018; The World Bank, 2018).

1.1.2 Role of Geriatric Medicine

The origin of the word 'geriatrics' is Greek, coming from two roots: (1) 'ger', meaning old age; and 'iatro', meaning physician or healer (Finucane, 2004). While the word 'geriatrician' can be simply defined as a physician for elderly patients, the role of geriatricians has not been well understood by the wider field of medicine, and sometimes not even by geriatricians themselves. Gordon (2011) noted that there was and likely still is a lack of recognition for the specific knowledge and skillset possessed by geriatric medicine specialists (Gordon, 2011). This lack of recognition may be one of the reasons for the low hours of geriatric content taught in undergraduate and graduate medical programs and other challenges facing the field as a whole (Gordon, 2011; Huber et al., 2008). It is not surprising, therefore, that the general public has little awareness or understanding of geriatric medicine. Most older adults are never cared for by a geriatrician and those who do seek their care likely do not know what to expect from one (Campbell, Durso, Brandt, Finucane, & Abadir, 2013). Campbell et al. (2013) surveyed a convenience sample of individuals in Baltimore to investigate the public's awareness or lack thereof around the term 'geriatrician' (Campbell et al., 2013). Only eight of the 82 people surveyed understood the term immediately, while nine were able to guess correctly. The individuals within the sample who were unfamiliar with the term included older adults and their caregivers, nurses, and an advisor for pre-medical students (Campbell et al., 2013). While this study had a small non-representative sample and simple methods, its findings may resonate with perceptions in the field.

The specialized training of geriatricians may actually translate into improved quality of care and outcomes for some older adults as they are better equipped to manage complex patients. Older adults are more heterogeneous in their health status, are more likely to be frail, to have cognitive impairment, and to have several chronic conditions, often rely on others for help, and are more likely to die in the next few years (Finucane, 2004). Older patients have different needs than younger patients and this fact should translate into differences in care and the physicians who care for them (Finucane, 2004). Phelan and colleagues (2008) reported that fellowship-trained geriatricians performed better compared to generalist physicians in avoiding inappropriate prescribing and identifying geriatric syndromes (Phelan, Genshaft, Williams, LoGerfo, & Wagner, 2008). Nevertheless, family medicine and internal medicine still have important roles to play in the care of older adults within the health care system. However, it is necessary to accurately distinguish patients who have needs that can be met by other disciplines from patients who require careful specialized geriatric care (Finucane, 2004). Geriatric services are often targeted to the most frail older adults who are the highest users of health care services (Chun, 2011).

Multiple articles have been written by geriatricians discussing their role, distinguishing themselves from other specialties, and calling geriatricians to action as leaders within the health care system (Chun, 2011; Finucane, 2004; Heckman, Molnar, et al., 2013; Leipzig et al., 2014; Morley, 2017; Phelan et al., 2008; Simpson, Leipzig, Sauvigne, & Reynolds, 2017; Tinetti, 2016b; Warshaw, Bragg, Fried, & Hall, 2008). As recently as 2016, Tinetti argued that the field of geriatrics still needs to agree on and let the world know who they are and what they do (Tinetti, 2016b). Geriatricians have a unique role and skillset that set them apart from other physicians. They have training in age-related physiological changes, managing geriatric syndromes, and multiple chronic conditions (Cantor, 2017;

Fried & Hall, 2008). Geriatricians take a holistic, patient-centred approach that places an emphasis on function and is guided by patient and family goals, preferences, and personal values (Cantor, 2017; Chun, 2011; Fried & Hall, 2008). They are able to balance the benefits and harms of medications and interventions accordingly. Team-based, interdisciplinary, coordinated care is a key component of geriatric medicine (Cantor, 2017; Chun, 2011; Fried & Hall, 2008).

Geriatrician groups in both the US and Canada have published statements on their roles and which patients they should be seeing (Leipzig et al., 2014; Molnar & Frank, 2019; Molnar, Huang, & Tinetti, 2017; Tinetti, 2016a; Warshaw et al., 2008). In the US, the Directors of Geriatric Academic Programs published a consensus statement describing which patients would most benefit from geriatrician care (Warshaw et al., 2008). There was consensus that the care provided by family physicians, general internists, and geriatricians would not differ for healthy, older adults. However, individuals aged 85 years and older, with moderate or severe functional impairment, complex biomedical or psychomedical conditions, frailty or geriatric syndromes, or those requiring end of life or palliative care would benefit greatly from care by a geriatrician (Warshaw et al., 2008). There is agreement in the field that geriatricians should care for the most complex and most vulnerable (complex multiple health conditions, frailty, disability, need for end-of-life care) older adults (Chun, 2011; Fried & Hall, 2008; Warshaw et al., 2008). Fried and Hall suggested targeting care to the top 25%-30% most vulnerable older adults (Fried & Hall, 2008). The remaining older adults who are healthier and better functioning may be cared for by family physicians or internal medicine specialists who have general skills and knowledge in geriatric principles and an understanding of when and how to involve geriatricians in care.

However, there are key differences in geriatric medicine between the US and Canada. In the US, physicians may become certified in geriatric medicine as a subspecialty of either family medicine or internal medicine (Warshaw et al., 2008). Some geriatricians practice as primary care providers specifically for older adults, in the same way as pediatricians act as primary care providers for children (Cantor, 2017). Fried and Hall (2008) suggested targeting geriatric care to the top 25%-30% most vulnerable older adults through primary care provided by a geriatric specialist. They also recommended that less vulnerable older adults be provided with geriatric medicine care as needed on a consultant-basis. In Canada, geriatricians tend to practice as consultants. They are trained as a subspecialty of internal medicine only and are not expected to act as primary care providers (Patterson, Hogan, & Bergman, 2012). However, family physicians with the COE designation may both function as primary care providers with expertise in care of older adults in Canada and as a consultant comparable to geriatricians (Frank & Seguin, 2009).

The Canadian Geriatrics Society launched the 5Ms, which is a simplified communication framework that is meant to describe the core competencies in geriatrics and thus communicate the services offered (Molnar et al., 2017; Tinetti, Huang, & Molnar, 2017). The 5Ms can be used by family physicians and care providers to determine whether a patient should be referred to specialists in care of the elderly or geriatrics (Molnar & Frank, 2019). They are currently being used to guide care in several sites in Canada, the US, Australia, and New Zealand. The 5Ms are a merging of a 4Ms framework developed in Ottawa (Molnar, 2016) with a similar framework developed in the US (Tinetti, 2016a). This initiative began at the University of Ottawa, Division of Geriatric Medicine, and the Regional Geriatric Program of Eastern Ontario, as SGS sought to market themselves using the 4Ms rather than focusing on comprehensive geriatric assessment (CGA, described in section 1.1.4). The 4Ms developed in Ottawa included the following features: (1) mind: dementia, delirium, depression; (2) mobility: falls, near falls, balance issues, trauma prevention; (3) medications: multiple interacting medications, optimal prescribing and deprescribing; and (4) multiple interacting diseases: multimorbidity or multicomplexity. The 4Ms considered by some health care systems and medical schools in the US included the following features: (1) mentation; (2) medications; (3) mobility; and

(4) what matters: patient's health outcome goals and care preferences in the face of trade-offs (Tinetti, 2016a). Tinetti proposed merging both separate 4Ms to become one 5M framework (Tinetti, 2016a). The final 5M Framework, launched by the Canadian Geriatrics Society, includes the following: (1) mind: mentation, dementia, delirium, depression; (2) mobility: impaired gait and balance, fall injury prevention; (3) medications: polypharmacy, de-prescribing, optimal prescribing, adverse medication effects, and medication burden; (4) multicomplexity: multimorbidity, complex bio-psycho-social situations; and (5) matters most: each individual's own meaningful health outcome goals and care preferences (Molnar et al., 2017).

1.1.3 Specialized Geriatric Services (SGS)

'Specialized geriatric services' is a term used in Ontario to describe a spectrum of hospital and community-based health services that deliver CGA (The Regional Geriatric Programs of Ontario, 2016). SGS are interdisciplinary teams of geriatric health care providers (including mental health providers) that are trained to recognize and treat frail older adults with multiple, complex needs (The Regional Geriatric Programs of Ontario, 2016). These teams may include physicians, nurses, social workers, physiotherapists, occupational therapists, dietitians, pharmacists, and other health practitioners. Their target patient population is frail, older adults whose health, dignity, and independence are at risk due to: (1) multiple complex medical and psychosocial problems; (2) recent unexplained decline in health or level of function, or; (3) loss of capacity for independent living (The Regional Geriatric Programs of Ontario, 2016). Although SGS exist in many forms across Ontario, offering different baskets of services, they all collaborate with primary and community care and deliver CGA. Outreach teams, outpatient geriatric clinics, geriatric day hospitals, geriatric emergency management teams, inpatient consultation teams, acute geriatric units, acute care of the elderly units, geriatric assessment and treatment units, geriatric rehabilitation units, and geriatric mental health services are all examples of SGS in Ontario.

It appears that access to SGS in Ontario differs across the province. There are no standardized provincial eligibility criteria for referral. Nevertheless, services are generally geared towards vulnerable older adults with complex medical and social problems (Michael Garron Hospital, 2019; North Simcoe Muskoka Specialized Geriatric Services, 2019; North York General, 2019; Providence Care, n.d.; Seniors Care Network, 2019; St. Joseph's Health Care London, 2019; The Regional Geriatric Program of Eastern Ontario, 2019). Depending on the region and program, the referral processes and specific eligibility criteria differ. For some regions and programs, referral must be made by a physician, while in other instances home and community care organizations, informal caregivers, or the individual themselves may refer. Several regions have centralized intake services to facilitate referrals and triage care (e.g. Champlain (City of Ottawa), North Simcoe Muskoka, and South West) (North Simcoe Muskoka Specialized Geriatric Services, 2019; St. Joseph's Health Care London, 2019; The Regional Geriatric Program of Eastern Ontario, 2019).

1.1.4 Comprehensive Geriatric Assessment (CGA)

Comprehensive geriatric assessment is the main purpose of SGS and "one of the cornerstones of modern geriatric care" according to Pilotto and colleagues (Pilotto et al., 2017). CGA is a multidisciplinary, multidimensional diagnostic and therapeutic process (Ellis et al., 2017; Pilotto et al., 2017; The Regional Geriatric Programs of Ontario, 2016; Wong et al., 2017). Domains assessed include medical, psychological, and functional capabilities and problems. Goals of care, social and environmental context, and advanced care planning are considered. A key feature of CGA is the development of a coordinated and integrated care plan based on the findings of the assessment (Ellis et al., 2017; Palmer & Onder, 2018; Pilotto et al., 2017; Stuck, Siu, Wieland, Adams, & Rubenstein, 1993; The Regional Geriatric Programs of Ontario, 2016; Wong et al., 2017).

Different models of CGA exist in different organizations, provinces, and countries (Ellis et al., 2017; Parker et al., 2017; Stuck et al., 1993). In Ontario, CGA is provided in specialized geriatric inpatient, outpatient, and community settings (The Regional Geriatric Programs of Ontario, 2016). Inpatient settings include specialist ward-based, consultation service, mobile units, emergency department, and surgical perioperative care. Outpatient and community settings include home assessment, outpatient assessment, and post-discharge assessment. With advances in technology, there is now the possibility of virtual teams providing CGA. The assessment may be completed by different members at different times in different locations and the team may communicate electronically or over the telephone (Pilotto et al., 2017). CGA may also vary in intensity, depending on its provider and its purpose. CGA may be used as an approach for screening or as an approach for thorough diagnostic assessment and management (Pilotto et al., 2017).

CGA has been demonstrated to have an impact on multiple patient and system-level outcomes, such as functional decline, prevention of avoidable emergency department use, alternate level of care, hospital admissions, and premature institutionalization (Kay et al., 2017; Pialoux, Goyard, & Lesourd, 2012; The Regional Geriatric Programs of Ontario, 2016; Wong et al., 2017). CGA assists clinicians in diagnosing patients, identifying need for treatment, and optimizing care plans (Kay et al., 2017; The Regional Geriatric Programs of Ontario, 2016). While there is an ongoing Cochrane review of CGA for community-dwelling, high-risk, frail older adults (Briggs et al., 2017), much of the research evaluating CGA has been conducted in hospital-based settings (Ellis et al., 2017; Parker et al., 2017). A Cochrane review that examined hospital-based CGA for older adults with unplanned admissions found with a high certainty of evidence that compared to those who received usual care, those who received CGA were more likely to be living at home and less likely to be institutionalized at the end of the study period (Ellis et al., 2017). The same review found that CGA for older adults with unplanned hospital admissions may not impact functional dependence or mortality risk. The study authors were not able to draw any conclusions about the impact on cognition or hospital length of stay (Ellis et al., 2017). There is some evidence from meta-analyses suggesting in-home CGA is effective in reducing functional decline and overall mortality but there is less clear evidence of the impact of outpatient CGA consultation on outcomes (Kuo, Scandrett, Dave, & Mitchell, 2004; Pilotto et al., 2017).

Despite the demonstrated impact of CGA, there appears to be little to no evidence for routine comprehensive assessment for unmet needs in older adults at the population level (De Lepeleire, Iliffe, Mann, & Degryse, 2009). CGA has not been found to have much benefit for improving quality of life or health outcomes for the general population of older adults (De Lepeleire et al., 2009). A subgroup of the population that is neither too sick nor too well may be the most likely to benefit from a treatment plan and intervention developed by a multidisciplinary team based on CGA (Sternberg, Schwartz, Karunananthan, Bergman, & Clarfield, 2011). Therefore, approaches are needed to target specific patients, such as older adults with multiple complex conditions, frailty, or acute illness who would most benefit from CGA and the involvement of a geriatric medicine specialist in their care (Parker et al., 2018, 2017).

1.1.5 interRAI and the Home Care Sector

Teams conducting CGA use a variety of assessments and diagnostic protocols to assist in their assessment and care planning. Depending on the setting, the level of standardization in these tools varies (Parker et al., 2017). The interRAI suite of assessments provides a standardized tool for the CGA process within the home care sector in multiple provinces in Canada.

Home care services enable individuals with complex needs to live in their own homes as independently as possible (Auditor General of Ontario, 2015). In Ontario, Local Health Integration Networks (LHINs) currently fund and coordinate home care services in defined geographic regions. Clients are referred from hospitals, family physicians, or referred by themselves or their families. The majority of clients are older adults, but all must be insured under the Ontario Health Insurance Plan (OHIP) in order to be eligible for services (Canadian Home Care Association, 2013). Once a referral is made, care coordinators (registered health professionals who are LHIN employees) determine if an individual qualifies for publicly-funded services using a pre-screener tool. If the person appears to require further assessment and is expected to require services for 60 days or more, the care coordinator will conduct a comprehensive, in-home assessment. The care coordinator then creates a care plan detailing the type and amount of services the clients may receive and continues to monitor client status and reassess periodically. Service providers are contracted to provide services such as nursing, therapy, and personal support directly to clients. Care coordinators may also refer clients to community support service organizations for services such as Meals on Wheels, transportation, homemaking, and respite. A care coordinator’s role includes collaborating with their clients’ other care providers and helping clients navigate between services and care settings, such as rehabilitation and primary care (Auditor General of Ontario, 2015).

interRAI is a collaborative network of researchers and health/social service professionals in over 30 countries that promotes evidence-informed clinical practice and policy decisions (Carpenter & Hirdes, 2013; Gray et al., 2009, 2016; Steel, 1999). They develop comprehensive assessments that identify the strengths, preferences, and needs of vulnerable persons with complex health conditions. The applications of the instruments include care planning, outcome measures, quality indicators, resource allocation, best practices identification, and decision- and policy-making at the individual and organizational levels (Hirdes, Mitchell, Maxwell, & White, 2011). These standardized assessments are extensively evaluated before they are implemented for widespread use to ensure validity and reliability. Each assessment instrument is developed for a particular population but they are collectively designed to be compatible and form an integrated health information system. Compatibility of standardized information systems enables collaboration and communication, and supports continuity of care for individuals with complex needs across service agencies and sectors (Gray et al., 2009; Hirdes et al., 1999; Hirdes, Ljunggren, et al., 2008).

The Resident Assessment Instrument – Home Care (RAI-HC) is used to evaluate needs, determine service eligibility, develop care plans, and contract home care services for long-stay home care clients (Canadian Home Care Association, 2013). The reliability and validity of the RAI-HC have been evaluated and reported in numerous papers in the peer-reviewed literature (Hirdes, Ljunggren, et al., 2008; Hirdes, Poss, Mitchell, Korngut, & Heckman, 2014; Landi et al., 2000; Morris et al., 1997). Until 2018, this assessment was mandated in Ontario for use with all adult home care clients expected to be requiring services for 60 days or more (Canadian Home Care Association, 2013; Hirdes, 2006b). RAI-HC assessments were administered on admission and every 6 to 12 months, or when a significant change in health status had been observed. In 2018, the interRAI Home Care (HC) replaced the RAI-HC as the mandated home care assessment in Ontario. It has the same purpose and application as the RAI-HC, but is fully compatible with assessments in long-term residential care, acute care, post-acute care, palliative care, assisted living, supportive housing, services for persons with intellectual disabilities, community mental health, emergency psychiatry, and inpatient psychiatry. With some exceptions, all of these assessments contain a core set of about 70 items, including cognitive skills for daily decision making, activities of daily living (ADLs), mood, behaviour problems, falls, and health symptoms. The reliability of the interRAI HC has also been evaluated and reported in the peer-reviewed literature (Hirdes, Ljunggren, et al., 2008).

The RAI-HC, and its successor, the interRAI HC, are standardized clinical assessments that consider the domains within the CGA and are used by the home care sector for care planning and case management. These instruments are not diagnostic tools and do not replace the expertise or insight provided by a specialist in geriatric medicine. The decision support applications provided by the RAI-HC and interRAI HC may be used to identify when a client would benefit from the involvement of a geriatric medicine specialist to provide additional expertise and insight into the complex issues affecting older adults.

1.1.6 Approaches to Target Geriatric Medicine Care

Many tools to identify frailty and disability among older adults have been described and evaluated in the literature (e.g., see Bongue et al., 2017; Daniels, van Rossum, Beurskens, van den Heuvel, & de Witte, 2012; Gobbens, van Assen, Luijkx, & Schols, 2012; Lee et al., 2017; Metzelthin et al., 2010; Peters, Boter, Buskens, & Slaets, 2012; Pialoux et al., 2012; Steverink, Slaets, Schuurmans, & van Lis, 2001). Fewer studies have focused on identifying older adults who require more comprehensive assessment, although some examples include the abbreviated CGA (Overcash, Beckstead, Extermann, & Cobb, 2005), PRISMA-7 (Raîche, Hébert, & Dubois, 2008), and other screening instruments and postal questionnaires (Kerse & Clark, 1994; Maly, Hirsch, & Reuben, 1997). There appear to be very limited tools to identify individuals who would benefit specifically from the involvement of a geriatric medicine specialist in their care.

In one local example, a family health team in Waterloo-Wellington developed a systematic approach (referred to as “C5-75”) to identify frail older adults at high risk of poor health outcomes in order to offer interventions within a multidisciplinary coordinated care model based in primary care (Lee et al., 2018). As part of the C5-75 program screening process, interRAI’s Assessment Urgency Algorithm (AUA), designed to identify urgent need for comprehensive assessment (Costa et al., 2017), was used to recommend consideration of referral to a geriatric medicine specialist. However, the AUA was developed for the interRAI Emergency Department Screener, using a highly condensed set of interRAI items to create a simple screening algorithm (Costa et al., 2017). The ED Screener requires about one minute to complete and may be administered by general nursing or clinic intake staff, either in-person or over the phone. The interRAI HC is a comprehensive assessment that must be completed by a registered health professional in-person. The interRAI HC assessment allows for the creation of a more sophisticated algorithm using a comprehensive set of items to identify older home care clients requiring the involvement of a geriatric medicine specialist. A decision support tool developed for this purpose based on the interRAI HC may better target older adults for referral.

1.2 Policy Context in Ontario

During the last decade, there has been a continuous effort to plan for the needs of an aging population by enhancing the home and community care sector in Ontario. In 2007, the Ontario Ministry of Health and Long-Term Care (MOHLTC) developed the *Aging at Home Strategy*, a provincial strategy that aimed to provide older adults and their families with integrated community-based services across the continuum (Missisauga Halton Local Health Integration Network (LHIN), 2007). The overall objective was to support older adults so that they could remain healthy and continue living in their homes as long as possible. One of the four goals specified the provision of easily accessible care that is ‘senior-centred’. This goal was to be achieved by improving care coordination over a flexible continuum of services and support across sectors, and enhancing SGS (either alone or in partnership with family health teams and community health centres) (Missisauga Halton Local Health Integration Network (LHIN), 2007). In this report, the MOHLTC recognized the importance of the linkage between home and community care, and physician services, such as primary care or specialized geriatrics.

The MOHLTC released the *Ontario Action Plan for Health Care* early in 2012, with a focus on ensuring the right care, in the right place, at the right time (Ontario Ministry of Health and Long-Term Care, 2012b). One key commitment introduced was Health Links, a program that aimed to improve care for older adults and others with complex conditions by promoting collaboration and information sharing. Local groups of primary care providers, community care organizers, and other health care providers were encouraged to form partnerships and submit a business plan to the MOHLTC and their Local Health Integration Network (LHIN) (Ontario Ministry of Health and Long-

Term Care, 2012a). A major component of each Health Links program was the identification of high-needs older adults with complex conditions and the development of personalized care plans shared with various health care providers involved, particularly between the primary care providers and home care coordinators. In 2017, there were 84 active Health Links (Health Quality Ontario, 2017).

As implementation of Health Links began, a need was highlighted for a care coordination tool (CCT) to create, maintain, and share coordinated care plans and send secure messages to providers from different sectors and organizations (Ontario Ministry of Health and Long-Term Care, 2015a). The MOHLTC and Health Quality Ontario (HQO) brought together members of Health Links teams to create a template for the CCT, guided by a literature review by HQO. The final CCT template includes patient identifiers, their goals and care plan, advanced care planning information, care team members, health conditions and issues, social history, assessments, recent hospital visits, social supports, medications, other treatments, key daily routines, and upcoming appointments. Many of these fields are open-ended and non-standardized. Despite many elements in common with the interRAI assessments systems widely used in home and community care, the two systems are not compatible, actually hindering system integration and creating inefficiencies. As of February 2016, the CCT was being piloted and evaluated. In June 2016, 79% of Health Links reported using the standardized CCT and its key output, the Coordinated Care Plan (CCP) (Health Quality Ontario [PDF file], 2016).

The continued need for improved communication between primary care providers, and home and community care was raised by Donner and the Expert Group on Home and Community Care, in their report *Bringing Care Home* (2015). This report and the Health Links model in part informed the MOHLTC's *Patients First Strategy*, introduced in 2015, to strengthen home and community care in Ontario (Ontario Ministry of Health and Long-Term Care, 2015b). Some of the goals of this strategy were to provide more equitable access to the right care for those who need it most across Ontario and to improve quality and consistency of care through standardized tools and supports. The authors recommended better integration of health care services and communication among providers to strengthen home and community care.

The *Patients First Act*, proposed in December 2016 and passed in May 2017, legislated the consolidation of home care coordinating agencies into LHINs, which became responsible for the oversight of home care and primary care planning, in addition to hospitals, long-term care homes, community services, and mental health and addiction services (Ontario Ministry of Health and Long-Term Care, 2016; Waterloo Wellington Local Health Integration Network, 2017). This measure was taken to ensure better connections between local providers, especially home and community care and physicians, in addition to smoother transitions for patients between settings.

In June 2018, a new provincial government was elected in Ontario, which commissioned the Premier's Council on Improving Healthcare and Ending Hallway Medicine. The objective of the committee is to help ensure that the Ontario health care system has the right amount of physical and human resources, and that care is available in an equitable manner to those in need (Devlin et al., 2019). In their report released in January 2019, *Hallway Health Care: A System Under Strain,* the committee found that issues in system integration and coordination are having a negative impact on patient and system outcomes (Devlin et al., 2019). Further concerns include delayed access to specialists (including geriatricians), a lack of early intervention and prevention, and inequitable access to services across the province.

The People's Health Care Act, passed in April 2019, legislated the establishment of Ontario Health Teams and the consolidation of multiple provincial agencies into one – Ontario Health (Ontario Ministry of Health and Long-Term Care, 2019b). The goal of this act is to improve patient experience and provide better connected care in response to the findings of the Premier's Council. Ontario Health Teams are a model of integrated care and funding held accountable for improving patient experience and health. Teams of local health care providers and services will work together to deliver care, understand patients' history and needs, and connect patients to the different types of care needed, such as primary care, specialist care, and home and community care (Ontario Ministry of Health and Long-Term Care, 2019b, 2019a). While the Premier's Council and *The People's Health Care Act* do not exclusively address older adults nor the home and community care sector, they recognize the impact of the aging population and prioritize the importance of equitable access to integrated and coordinated community-based services for the benefit of the patient and the sustainability of the health care system as a whole.

1.3 Theoretical Framework

Throughout this dissertation, the research process was guided by the Behavioural Model of Health Services Utilization, a framework first developed by Andersen as part of his doctoral dissertation in 1968 (Andersen, 1968). It is the most important and most widely cited theory or framework of access to health services (Ricketts & Goldsmith, 2005). The initial model had three objectives: 1) to help understand families' use of health services; 2) to assist in defining and measuring equitable access to health care; and 3) to support the development of policies promoting equity in access to health services (Andersen, 1995). The focus quickly shifted to individuals rather than families, but equity continued to be an important driver in the development and proposed use of the model. This multilevel model was meant to both explain and predict the use of health care services (Andersen, 1995). It considers societal and individual determinants, assuming that the interplay of multiple variables results in the type and amount of health services used by an individual (Andersen & Newman, 1973; Babitsch, Gohl, & von Lengerke, 2012). The model evolved several times in the past five decades. The characteristics of the health care system itself were explicitly included in the second phase (1970's). The health care system was regarded as consisting of resources and organization

(Aday & Andersen, 1974; Andersen & Newman, 1973). Resources included any capital and labour contributing to health care (e.g., personnel, facilities, and equipment). Organization was the term chosen to encompass the coordination and controlling of resources in the provision of services. The external environment was added to the model as a consideration and the interaction of personal health behaviours with the use of formal health services on health outcomes was acknowledged in the next iteration of the model (late 1980's/early 1990's). The subsequent version of the model recognized the dynamic and circular nature of the model of health services use by including feedback loops (Andersen, 1995; Babitsch et al., 2012).

The individual determinants incorporated in the Behavioural Model of Health Services Utilization are divided into three categories: predisposing, enabling, and need (Andersen & Newman, 1973). Predisposing characteristics are those that result in an individual being more or less likely to use health services, although these factors exist prior to the onset of illness and are not directly responsible for their use (Aday & Andersen, 1974; Andersen & Newman, 1973). There are three sub-categories of predisposing characteristics: 1) demographic variables (e.g., age, sex, gender); 2) social structure (e.g., education, head of family status); and 3) attitudes or beliefs (e.g., regarding medicine, physicians, disease, etc.). Enabling characteristics encompass the ability of an individual and the means available to them to act on their values or satisfy their health needs and obtain health services (Aday & Andersen, 1974; Andersen & Newman, 1973). Examples of enabling characteristics include income, health insurance coverage, and having a regular primary care physician. The final category of individual determinants is need, which is the most immediate cause of health services use. Need characteristics consider an individual's illness level, either perceived or evaluated by the health care system (Aday & Andersen, 1974; Andersen & Newman, 1973).

1.4 Sex and Gender-based Analysis

According to the Behavioural Model of Health Services Utilization, sex and gender are considered predisposing characteristics, resulting in an individual being more or less likely to use health services (Aday & Andersen, 1974; Andersen & Newman, 1973). Both sex and gender are known to have an impact on individual health risk, health and care-seeking behaviours, outcomes, and treatments (Butler-Jones, 2012). In fact, inequities in health status and access to care may arise from differences of power and privilege between the groups (Clow, Haworth-Broackman, & Bernier, 2009). While often confused, 'sex' and 'gender' are not synonymous and have unique contributions to health and health services use despite their interconnectedness (Johnson, Greaves, & Repta, 2009). Sex refers to biological and physiological characteristics, including anatomy, physiology, genetics, and hormones, that distinguish males and females (Butler-Jones, 2012; Clow et al., 2009; Johnson et al., 2009). Gender refers to socio-cultural characteristics that societies ascribe to males and females, such as personality traits, attitudes, behaviours, values, roles, relative power, and influence (Butler-Jones, 2012; Clow et al., 2009; Johnson et al., 2009).

Sex- and gender-based analysis (SGBA) is a systematic and iterative process of integrating sex and gender considerations into research, policies, and programs (Butler-Jones, 2012; Clow et al., 2009). In a primer describing approaches to SGBA in health research, Johnson, Greaves, and Rupta recommended ensuring that study samples include both men and women, collecting sex- and gender-sensitive measures, using qualitative research methods to supplement quantitative research methods, considering heterogeneity within sex and gender groups, and using longitudinal and multi-level approaches (Johnson, Greaves, & Repta, 2007). For studies where data have already been collected, they suggested disaggregating results by sex in order to explore similarities and differences.

Chapter 2

Referral to Specialized Geriatric Services: Perspectives of Experts in the Care of Older Adults in Ontario

2.1 Introduction

In Ontario, specialized geriatric services (SGS) are interdisciplinary teams of specialized health care providers trained to provide a spectrum of hospital and community-based health care services to frail, older adults with complex needs (The Regional Geriatric Programs of Ontario, 2016). Teams may include geriatricians, geriatric psychiatrists, other physician disciplines, nurses, social workers, physiotherapists, occupational therapists, dietitians, pharmacists, and other health practitioners. The main purpose of SGS is to deliver comprehensive geriatric assessment (CGA). CGA is a multidisciplinary, multidimensional diagnostic and therapeutic process. It involves the assessment of various domains, such as medical, psychological, functional, social, and environmental, to develop a coordinated and integrated care plan (Ellis et al., 2017; Palmer & Onder, 2018; Pilotto et al., 2017; Stuck et al., 1993; The Regional Geriatric Programs of Ontario, 2016; Wong et al., 2017). CGA varies in intensity, and could be used for screening, or as an approach for thorough diagnostic assessment and management, depending on the setting, provider, and purpose (Pilotto et al., 2017).

In Canada, the role of geriatric medicine and SGS has been communicated via the 5M Framework (Molnar et al., 2017). The 5Ms include:

1) **Mind**: mentation, dementia, delirium, depression;
2) **Mobility**: impaired gait and balance, fall injury prevention;
3) **Medications**: polypharmacy, de-prescribing, optimal prescribing, adverse medication effects, and medication burden;

4) **Multicomplexity**: multimorbidity, complex bio-psycho-social situations; and

5) **Matters most**: each individual's own meaningful health outcome goals and care preferences

This framework may be used by family physicians and other care providers to determine whether a patient should be referred to the care of a geriatrician or SGS team.

2.1.1 Rationale and Objectives

In Ontario, there has been a recognition of the need for improved collaboration and communication between community-based health services, like home care, primary care, and SGS, to care for the aging population. The Regional Geriatric Programs of Ontario (RGPO) partnered with interRAI Canada and the Ontario Ministry of Health and Long-term Care (MOHLTC) to investigate current practices and to develop a mechanism to identify older adults in home care who would benefit from referral to SGS. In order to inform this work, the first phase of the project involved obtaining expert insight into which characteristics are important to consider for referral to SGS, and some potential barriers and facilitators to referral. This chapter aims to summarize the findings of this phase outlined in a more detailed report (Hogeveen et al., 2019) and answer the following research questions:

- What are some barriers and facilitators to referral to SGS, as perceived by experts in the care of older adults?
- Based on stakeholder expertise, which older adults should be referred to SGS?

The results of this work informed subsequent analyses of determinants of geriatric medicine contact (Chapters 4 and 5, also summarized in the report above), and generally provided context for the findings of this dissertation.

2.2 Methods

This is a mixed methods study involving the survey and interview of experts in the care of older adults in Ontario. The research process was guided by a steering committee formed by the RGPO, including representatives from the Provincial Geriatric Leadership Office (PGLO), MOHLTC, interRAI Canada, and several Regional Geriatric Programs (RGPs) (Appendix A). The original protocol called for the Delphi method to be followed in order to obtain consensus on the most important characteristics for referral to SGS. However, as findings emerged during the research process, the steering committee determined that this next phase was not necessary; the expert informants were already in consensus about the importance of the characteristics identified. This study was reviewed and received ethics clearance through the Office of Research Ethics (ORE) at the University of Waterloo (ORE#31345).

2.2.1 Sample and Recruitment

The steering committee nominated health care professionals in Ontario with an interest and expertise in the care of older adults. Experts included individuals involved in SGS (including geriatric medicine, geriatric psychiatry and nursing), primary care (including care of the elderly physicians and family physicians, either practicing solo or as part of a family or community health team), and home and community care coordinators. The steering committee aimed to achieve geographic representation across the province, with an emphasis on gender, indigenous, and French language representation.

Selected experts were sent a recruitment email with an information letter and background questionnaire to be completed electronically. The target sample size was 35 expert informants. Recruitment continued until representation from the majority of the regions in the province was achieved. If expert informants completed and returned the background questionnaire, then they were considered to have provided implied consent to participate in the study and were contacted for a telephone interview. At the beginning of the telephone interview, the interviewer described the study once more, and obtained verbal consent to continue as well as to record the interview.

2.2.2 Data Collection

Data were collected through background questionnaires and semi-structured interviews. The steering committee felt that the term 'SGS' may be unfamiliar or lead to confusion for some of the expert informants and recommended instead using the term 'CGA'. As CGA is the main activity of SGS, need for CGA may be used as a proxy for need for SGS (The Regional Geriatric Programs of Ontario, 2016).

The background questionnaire was conducted electronically and included questions about demographic information, barriers and facilitators to CGA, and the ideal CGA referral process (Appendix B). Interviews were conducted over the phone and recorded, typically lasting for 20 to 30 minutes. The semi-structured interviews included questions about the characteristics of individuals who would benefit from CGA, factors that make for an urgent referral, and combinations of characteristics for referral (Appendix C). The interviewer provided the domains of the 5M as prompts of characteristics to consider. Participants were asked to rate each characteristic on a scale of one ("not at all important") to four ("very important"), in terms of importance or urgency for referral. Participants were also asked to share their thoughts about the CGA referral process in general.

2.2.3 Analysis

Responses to the demographic questions were collated, and themes about the CGA referral process were extracted from the background questionnaires. Notes were made from the interview recordings, and segments of interest were transcribed. Barriers and facilitators to use of CGA were categorized based on commonalities and frequency presented. The ratings given to each 5M characteristic by expert informants during the interviews were noted. Descriptive statistics were used to summarize demographic information and ratings of characteristics. Quotes were used to support this quantitative analysis.

2.3 Results

2.3.1 Description of Expert Informants

Twenty-two expert informants, mostly female, representing most regions of the province, returned the background questionnaire (Table 2.1). Half were physicians, and the rest were mainly nurses, with a few allied health professionals included. More than half were based in an urban area, with only one tenth based in a rural area. The remainder served both urban and rural areas, or the area served was missing. More than one third of participants worked in academic settings. Overall, the expert informants had a mean of 17 years of experience in caring for older adults. A total of 23 expert informants participated in the interview phase of this study. Some participants completed the background questionnaire, but did not continue to the interview phase (n=5). Other participants scheduled and participated in the interview phase without having first submitted the background questionnaire (n=7). A total of 28 expert informants participated in either phase of the study.

Table 2.1. Characteristics of expert informants who completed a background questionnaire (n=22)

Characteristic	**% (n)**
Female	81.8 (18)
Age	
24-34	9.1 (2)
35-44	31.8 (7)
45-54	45.5 (10)
55-64	4.5 (1)
≥65	9.1 (2)
Healthcare provider type	
Physician	45.5 (10)
Nurse, Nurse Practitioner	40.9 (9)
Occupational Therapist	9.1 (2)
Social Worker	4.5 (1)
Areas served	
Urban	54.5 (12)
Rural	9.1 (2)
Both	18.2 (4)
Missing	18.2 (4)
Practice type	
Academic	40.9 (9)
Community	40.9 (9)
Both	13.6 (3)
Missing	4.5 (1)

2.3.2 Barriers and Facilitators to CGA Referral

Expert informants identified a number of potential barriers and facilitators to referral and access to CGA. These were organized according to the following categories: access, effectiveness, integration, efficiency, and appropriate resources; frequency is provided for each barrier (Table 2.2).

Table 2.2 Barriers and facilitators of comprehensive geriatric assessment (CGA) as identified by expert informants in Ontario (n=22)

Barriers	**% (n)**
Access	
Extensive wait times	54.5 (12)
Complicated/onerous referral process	40.9 (9)
Limited access to/availability of experienced clinicians	36.4 (8)
Accessibility issues for client (mobility, transportation)	18.2 (4)
Effectiveness	
Poor understanding of benefits of CGA services	40.9 (9)
Lack of knowledge about availability	27.3 (6)
Primary care provider does not feel it is needed	18.2 (4)
Integration	
Fractured care/no communication between teams	18.2 (4)
Lack of follow-up from community health partners	13.6 (3)
Facilitators	
Access	
Make CGA services easy to access	31.8 (7)
Efficiency	
Improved referral process which can be done by anyone in circle of care	59.1 (13)
Central intake/triage	22.7 (5)
Integration	
Establish collaboration/integrated care between community partner & referral sources	63.6 (14)
Appropriate Resources	
Education/capacity building	31.8 (7)
Increase awareness of CGA effectiveness/benefits	13.6 (3)

* (respondents were able to indicate more than 1 barrier and/or facilitator)

2.3.2.1 Barriers

Many expert informants identified access issues as barriers hindering referral or access to CGA. Wait times were identified by more than half of expert informants as an important barrier, with one health care provider remarking:

> *Clients may not be referred as programs that have longer wait times and referral source may feel "why bother, the wait is too long". (Clinical Nurse Specialist)*

Other examples of access issues raised were a complicated referral process and a limited availability of specialized geriatric care providers.

> *There appears to be a shortage of geriatricians and geriatric psychiatrists in Ontario which might also deter people from referring as there may be a perceived difficulty with accessing service. (Geriatric Psychiatrist)*

Accessibility issues for older adults (e.g., limited mobility, or lack of transportation to act on referral) were also described as barriers.

> *Patients have physical limitations creating barriers to seek services and may need specialized transportation. Patients may not have the financial means to arrange transportation. Distance and time are also factors. Some clients have farms and livestock that they cannot leave for extended times. Some do not have psychosocial support and there are no family/friends to attend visits with them. (Nurse Practitioner)*

There was some concern among expert informants that there was a lack of awareness, understanding, and appreciation of CGA and its benefits, and its availability among non-geriatric specialized care providers.

> *Assessment often stops short of identifying interventions, following through with changes/interventions/treatments, reassessment and follow-up. Many clinicians call what they do a CGA or think it represents a comprehensive assessment when really it is screening. Conversely clinicians do not understand what a CGA is or its value. (Social Worker)*

Some expert informants identified poor integration and communication between care providers as another barrier, describing care providers and agencies operating in silos with no follow-up.

> *I think there is some reluctance to refer because once the assessment is done, necessary follow-up or recommendation implementation is not available. (Family Physician)*

2.3.2.2 Facilitators

Expert informants also identified a variety of facilitators that improve access and referral to CGA, including solutions that involve taking advantage of technology, such as e-consultations and the Ontario Telemedicine Network (OTN). More than half of expert informants raised the need for an improved referral process, whereby any member of the circle of care may refer a client for CGA. One quarter even recommended a central intake, or triage system, for community-based SGS. More than half of participants suggested that better collaboration, two-way communication, and information sharing between community care providers would facilitate access to CGA.

A strong relationship between primary care, acute care, community agencies would facilitate early and appropriate referrals to specialty programs. (Geriatric Psychiatrist)

Finally, a minority of expert informants suggested that education and capacity-building in caring for older adults as well as an increased awareness of CGA would improve referrals and access.

It would be beneficial to mentor new clinicians and those who want to incorporate [CGA] into practice as well as implement an evaluation metric to certify [clinicians] in CGA. Provide standardized training in CGA and accept it as best practice to assess/treat older adults in the community/hospital/LTC settings. (Director, Specialized Geriatric Services)

2.3.3 Important Characteristics and Circumstances for Referral to CGA

Cognition was the most highly rated characteristic for referral to CGA, with a mean rating of 3.9, or "very important" (Table 2.3). The majority of characteristics identified were highly rated, including recent or significant decline/potential for reversibility, multiple acute care visits, frailty, mobility (includes falls), medications, multimorbidity, acute illness, caregiver distress, mental health, and risk of institutionalization. Need for proactive referral was the only characteristics that had a rating of less than three.

Table 2.3 Important characteristics/circumstances for CGA referral) as identified by expert informants in Ontario (n=23)

Characteristic/circumstance	Mean (SD)
Cognition	3.9 (0.35)
Recent or significant decline/potential for reversibility	3.8 (0.38)
Multiple acute care visits	3.8 (0.58)
Frailty	3.8 (0.48)
Mobility (includes falls)	3.6 (0.50)
Medications	3.4 (0.70)
Multimorbidity	3.4 (0.85)
Acute illness/events triggering major change	3.4 (0.73)
Caregiver distress	3.2 (0.50)
Mental health	3.0 (0.00)
Risk of institutionalization	3.0 (0.77)
Need for proactive referral	2.3 (1.25)

Cognition was rated as "very important" for referral to CGA. Participants suggested that early intervention may help to slow rapid cognitive decline. Recent and significant decline or potential for reversibility were also considered important as referral to CGA may reduce unnecessary, unplanned visits to the emergency department (ED). Recent decline was considered more important for referral than chronic decline or chronic disease management. Multiple acute care visits were considered important for referral if driven by unresolved, misunderstood issues. If multiple visits are a part of appropriate, managed care, then CGA may be less important. There was general agreement that individuals with two or more visits to the ED in the last three to six months should be referred to CGA. Some respondents also suggested that multiple visits to primary care warranted referral to CGA.

> *If presenting to a [primary care provider] twice or more for the same issue with no resolution, then a CGA would be beneficial. (Nurse Practitioner)*

Expert informants tended to agree that falls and mobility should be considered in the context of other factors, such as medications and caregiver status. The number of falls warranting cause for concern differed by expert informant, ranging from daily or multiple times per week, to twice per year. Expert informants suggested that if the underlying reasons for falls were unknown, then it was more important to consider CGA than if the individual had multiple falls but the cause was known.

> *It's important to look at an unexplained falls, a pattern of falls, a fall with injury, a fall that might be an indication that a chronic disease is not well managed (diabetes, blood pressure), sudden acute onset with some other factor (confusion, delirium), and not being able to explain the fall and what happened. (Director, Specialized Geriatric Services)*

Medications and multimorbidity were both considered important for referral by expert informants. In terms of medications, the appropriateness, potential for complications, and prescribing cascade must be considered rather than simply the number. Similarly, multimorbidity must be considered within the context of other factors, including medications, caregiver status, mental health, and its impact on functioning. Like medications, multimorbidity is a more important cause for referral when complex and not well managed.

> *CGA is needed when patients are suffering from diseases that are prone to exacerbation, limit functionality, and medications have side-effects that might affect the patient's cognition, nutrition, and mobility. (Physician)*

Expert informants suggested that acute illness itself was not sufficient for referral to CGA, but that referral depended on whether the condition would resolve on its own or not. Expert informants also rated caregiver distress and social support as important considerations for referral to CGA. Further, the underlying reason for caregiver distress and whether known or not has an impact on its importance. Nevertheless, caregiver distress is important to consider as context for the other issues previously discussed. Client mental health was also highly rated, but expert informants suggested that its importance depends on other factors, such as access to services support, interaction with cognitive impairment, and whether the issue is chronic or emerging.

> *As people get older, sometimes cognition interferes with the mental health component so sometimes it's difficult to distinguish if the behaviour is related to mental health or cognition. It is important to try and see what the causes are (before) it results in an emergency admission. (Regional Manager, Home & Community Care)*

Risk of institutionalization was considered important by expert informants due to CGA's potential to prevent unnecessary admission to long-term care facilities.

> *Adequate CGA could create an opportunity to reduce the waiting lists and reduce the pressure on long term care facilities. CGA [should be] done on everyone above a certain age, just like a checkup. (Clinical Nurse Specialist)*

However, some participants noted that the importance of this characteristic depends on the individual's level of support, context, and the potential to improve the care plan. Pro-active or pre-operative referral had a lower mean rating in terms of its importance. Depending on individual complexity, expert informants suggested that referral in these circumstances could help minimize rates of institutionalization, readmission, and hospitalization.

We have tried to (get) geriatrician and surgeon together to be able to ensure there is an assessment before surgery so we have baseline information and we are identifying red flags (past history, unmanaged chronic/unstable illness, cognition changes, supports at home, undiagnosed depression) and having input into what the (post-operative) care path looks like. (Director, Specialized Geriatric Services)

Beyond characteristics prompted for rating by the interviewers, safety issues were raised as important by almost half of the expert informants. Wandering, and other behavioural issues, elder abuse, financial difficulties, and home environment issues were considered as warranting referral to CGA.

Any characteristic that puts the patient at a higher risk for themselves or others must warrant a CGA". (Regional Manager, Geriatric Assessment)

Expert informants were also asked to describe a combination of characteristics that were most important for referral, as a starting point in considering a decision support tool. However, expert informants generally rated all of the characteristics highly and no distinct combinations were identified.

2.4 Discussion and Conclusions

The expert informants surveyed and interviewed in this study represented both academic and community settings, and urban and rural regions across Ontario. Experts in the care of older adults were generally in agreement in terms of the characteristics and circumstances that warrant referral to CGA, and by extension, referral to SGS. Of the 5M characteristics probed, almost all were considered important or very important. There was very little disagreement among experts, which is why the Delphi method to achieve consensus was not considered necessary. The factors rated as important by expert informants were consistent with the literature published on the target population and role of geriatric medicine (Leipzig et al., 2014; Molnar & Frank, 2019; Molnar et al., 2017; Tinetti, 2016a; Warshaw et al., 2008). In 2008, the Directors of Geriatric Academic Programs in the United States published a consensus statement articulating that individuals aged 85 years and older, with moderate or severe functional impairment, complex biomedical or psychomedical conditions, frailty or geriatric syndromes, or those requiring end-of-life or palliative care would benefit from geriatrician care (Warshaw et al., 2008). These factors were highly rated by the participants in this study. The 5M Framework is used in Canada to communicate the role and expertise of geriatric medicine, and SGS in general (Molnar et al., 2017; Tinetti et al., 2017). The expert informants rated the domains within the 5M Framework as highly important for referral to CGA, demonstrating the relevance of this framework to stakeholders in the care of older adults in Ontario.

The barriers impeding referral to CGA that were identified by the expert informants were also consistent with what is known about the current context of geriatric services in Ontario. Expert informants raised the issue of lack of awareness, understanding, and appreciation of CGA. This finding is consistent with the literature which has reported that the role and expertise of geriatric medicine are not well recognized, either by health care providers or the general public (Campbell et al., 2013; Gordon, 2011). However, the number of geriatricians in Canada is low, with the number required to meet the needs of the country unclear (Heckman, Molnar, et al., 2013). It has been estimated that there is a current deficit of about 120 full-time equivalent (FTE) geriatricians in Ontario alone (Borrie, Seitz, et al., 2019). Increased awareness and appreciation of CGA, SGS, and geriatric medicine will not improve access if the health system does not have the capacity to handle an increase in the number of referrals. The RGPO is continuing to explore the current landscape of geriatric medicine in Ontario through a mapping of SGS resources across the province to inform capacity planning (Borrie, Seitz, et al., 2019; Kay, 2019).

The insights obtained through this study from experts in the care of older adults in Ontario provide interesting and valuable direction and context for this dissertation. Characteristics identified as important by experts in the field were tested for their association with actual historical use of geriatric services. Their operationalization of certain concepts, such as multimorbidity, frequent falls, and frequent acute care visits, informed the definition of these variables in the statistical analyses. Expert perspectives on the barriers and facilitators to referral and access provide insight to inform the interpretation of the results of this dissertation.

Chapter 3
Study Rationale

The importance of the intersection between home care and physician services, such as specialized geriatric services, has clearly been recognized in Ontario. Multiple strategies and action plans have highlighted the need for better integration, collaboration, and information sharing. Transparency, consistency, and equitable access across the province through the use of standardized tools and supports have also been emphasized as priorities. In recognition of the aging population and the shortage of geriatric specialists in Ontario, there are ongoing efforts to gain a better understanding of the current landscape of SGS (Borrie, Seitz, et al., 2019; Kay, 2019). However, the patterns and determinants of SGS and geriatric medicine services use among community-dwelling older adults have not been extensively explored. It is difficult to study contact with the broader spectrum of community-based SGS among home care clients in provincial-level administrative services data due to a lack of identifiers for SGS care. However, contact with geriatric medicine, as a component of SGS, may be studied using provincial physician billing data. The results of this work will contribute to these efforts by helping to understand which older, home care clients have contact with geriatric medicine. This work suggests which factors to consider when identifying home care clients who would benefit from specialized care.

This dissertation contains the following studies:

Chapter 4: Patterns and Outcomes of Health Care Services Use by Older, Home Care Clients in Ontario

Chapter 5: Determinants of Contact with Geriatric Medicine by Older Home Care Clients in Ontario

Chapter 6: Determinants of Frequent Contact with Physicians on an Outpatient Basis by Older Home Care Clients in Ontario

This dissertation concludes with the proposal for a decision support tool to assist in identifying home care clients who would benefit from the involvement of SGS in their care. There is currently no decision support tool for this purpose that takes full advantage of the comprehensive nature of interRAI assessment systems. Ultimately, the goal is to ensure better access to SGS for older adults living in the community who are most in need. Further, the implementation of this tool provincially will support more equitable and transparent access to care and promote the integration of SGS with home care. A decision support tool for referral to SGS that is compatible with the interRAI suite of assessment may be implemented seamlessly into existing assessment systems and may help enhance communication across sectors.

The Regional Geriatric Programs of Ontario (RGPO) have declared an interest in this project and contributed clinical expertise and feedback. The MOHLTC has demonstrated an interest in this area of research through the creation of *The People's Health Care Act*, with the goal of improving equitable access to care (Devlin et al., 2019). interRAI Canada has partnered with the MOHLTC to support them in achieving their goals, partly informed through the results of my dissertation. The involvement of the MOHLTC and RGPO ensures that the proposed research is relevant to key stakeholders. Further, the results will be used to inform policy decisions related to the care of older adults living in the community to promote better access and quality of care for those who need it most in an equitable manner across Ontario.

3.1 Literature Review Methods

Pubmed, Scopus, and Google Scholar were searched using relevant title/abstract keyword search terms and Medical Subject Heading [MeSH] terms. Results were restricted to the English language and included both primary and review articles within the peer-reviewed literature. Articles were screened based on their titles and abstracts and retained upon review of the full text. The references of articles that met inclusion criteria were reviewed for additional relevant articles. Searches of Google were used to identify relevant grey literature such as government and organizational reports.

Chapter 4
Patterns and Outcomes of Health Care Services Use by Older, Home Care Clients in Ontario

4.1 Introduction

The use of health services by older adults in Canada and internationally has been documented to different degrees according to the various types of services. In Ontario alone, several publications describe the use of primary care, emergency departments, and inpatient hospital services by older adults (Bronskill, Corbett, Gruneir, & Stevenson, 2011; Fisher et al., 2016; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Gruneir, Markle-Reid, et al., 2016; Manski et al., 2013; Nie et al., 2010; Vegda et al., 2009). Many of these articles distinguish contact with specialist physicians from contact with family physicians. However, none of the Ontario studies described contact with individual specialties, but rather reported contact with specialist physicians in general. There does not appear to be any literature, either in Canada or internationally, that specifically reports contact with outpatient geriatric medicine by community-dwelling older home care clients.

Geriatric medicine is a physician subspecialty of internal medicine, with a focus on the care of older adults. Geriatricians have expertise in age-related physiological changes and managing geriatric syndromes and multiple chronic conditions through a holistic, patient-centred approach with an emphasis on function (Cantor, 2017; Chun, 2011; Fried & Hall, 2008). The majority of geriatricians provide care in acute hospitals and long-term care facilities, although there is a minority (less than 20%) that report practicing mainly in the community (The College of Family Physicians of Canada et al., 2014).

In Ontario, some geriatricians practice within specialized geriatric services (SGS) teams. These are interprofessional teams of health care providers specialized in the treatment of frail, older adults with multiple, complex needs (The Regional Geriatric Programs of Ontario, 2016). SGS is a term used to describe a spectrum of health care services that deliver comprehensive geriatric assessment (CGA). CGA is a multidisciplinary diagnostic and therapeutic process that considers multiple domains, including medical, psychological, and functional capabilities and problems in the development of a coordinated and integrated care plan (Ellis et al., 2017; Palmer & Onder, 2018; Pilotto et al., 2017; Stuck et al., 1993; The Regional Geriatric Programs of Ontario, 2016; Wong et al., 2017). While little is known empirically about contact with geriatric medicine or outcomes of such contact, much has been published on the use and outcomes of CGA. It has been demonstrated to prevent functional decline, avoidable emergency (ED) use, hospital admissions, and premature institutionalization (Ellis et al., 2017; Kay et al., 2017; Parker et al., 2017; Pialoux et al., 2012; The Regional Geriatric Programs of Ontario, 2016; Wong et al., 2017). However, the emphasis has been on CGA in hospital-based settings rather than outpatient CGA.

There is currently a shortage of geriatricians in Canada, with only 304 geriatricians reported nationally (0.8 per 100,000 population) and 129 reported in Ontario (0.9 per 100,000 population) in 2018 (Canadian Medical Association, 2018c). Another 2018 estimate placed the number of full-time equivalent (FTE) geriatricians in Ontario at 144.9 (Borrie, Kay, & Seitz, 2019; Hogan et al., 2012). Based on the current population aged 65 years and older, it is estimated that there is a deficit of 119.5 FTE geriatricians in Ontario (Borrie, Kay, et al., 2019). As a comparison, reports from the United States (US) and the United Kingdom (UK) suggest that there are 2.1 geriatricians and 2.4 geriatric medicine consultants per 100,000 population, respectively (American Geriatrics Society, 2018; The Royal College of Physicians, 2018; The World Bank, 2018).

Due to the shortages experienced not only in Canada but also in the United States, experts suggest that geriatricians should care for the top 25%-30% of the most complex and vulnerable older adults, such as those with multiple health conditions, frailty, disability, and need for end-of-life care (Chun, 2011; Fried & Hall, 2008; Warshaw et al., 2008). There is significant overlap between the purported target population for geriatric medicine care and the population served by home care services. In Ontario, home care services allow vulnerable individuals with complex needs, such as those described above, to remain living in the community for as long as possible (Auditor General of Ontario, 2015). Individuals who are referred to home care services and expected to receive services for 60 days or more, are assessed with a standardized, clinical assessment. These clinical data, linked to administrative services data, provide an excellent opportunity to examine the use of health services by the most vulnerable, community-dwelling older adults. It is difficult to identify use of broader community-based SGS in the administrative services data due to a lack of clear identifiers. However, it is possible to study the use of different physician disciplines and geriatric medicine in particular using physician billing data. These also provide the opportunity to explore the association of contact with geriatric medicine with subsequent acute care services use.

4.1.1 Rationale and Objectives

To the best of my knowledge, patterns and outcomes of outpatient geriatric services use by home care clients in Canada have not been examined in the literature. The purpose of this chapter is to examine patterns and outcomes of outpatient geriatric services use by older, home care clients in Ontario, and to relate this use to the use of other health services. More specifically, this chapter will aim to answer the following research questions:

- What is the frequency of contact with outpatient geriatric medicine, other physician disciplines, and acute care services?
- What are the characteristics of home care clients who had contact with geriatric medicine compared to those who did not?
- What is the relationship between geriatric medicine contact and other physician specialties?

- Which home care clients have higher odds of geriatric medicine contact?
- What is the association of geriatric medicine contact with subsequent acute care services use?

4.2 Methods

4.2.1 Study Design

This is a retrospective cohort study conducted using secondary health information and administrative datasets. This study was reviewed and received ethics clearance through the Office of Research Ethics (ORE) at the University of Waterloo (ORE#31345).

4.2.2 Secondary Data Sources

Home care assessment data were linked to administrative services use data. The data for this study were obtained from five sources through the Institute for Clinical Evaluative Sciences (ICES): (1) Resident Assessment Instrument – Home Care (RAI-HC); (2) Registered Persons Database (RPDB); (3) Ontario Health Insurance Plan (OHIP) billing records; (4) National Ambulatory Care Reporting System (NACRS); and (5) Discharge Abstract Database (DAD).

4.2.2.1 Resident Assessment Instrument – Home Care (RAI-HC)

The RAI-HC is a comprehensive, clinical assessment instrument containing over 300 items in multiple domains (Canadian Home Care Association, 2013; Morris, Bernabei, et al., 1999). This instrument has embedded scales, including measures of functioning, cognitive performance, health issues, mental health, and decision support applications (Hirdes et al., 2011). Its purpose is to assess the needs, strengths, and preferences of vulnerable individuals with complex medical, functional, and psychosocial needs. The instrument is used to determine service eligibility, to develop care plans, and to contract home care services. Assessments are conducted on admission and every six to twelve months, or upon significant change in health status (Canadian Home Care Association, 2013).

Until 2018, the RAI-HC assessment was mandated for use in Ontario with all adult home care clients expected to require services for 60 days or more (i.e., long-stay clients) (Canadian Home Care Association, 2013). The interRAI HC is a newer version of the RAI-HC, with the same purposes and applications. In 2018, it replaced the RAI-HC as the mandated home care assessment used in Ontario. The reliability and validity of these instruments have been evaluated and reported in several articles within the peer-reviewed literature (Hirdes, Ljunggren, et al., 2008; Hirdes et al., 2014; Hogeveen, Chen, & Hirdes, 2017; Landi et al., 2000; Morris et al., 1997). These assessments belong to a suite of standardized assessments that use common language and are designed to be compatible across various sectors and services to form an integrated health information system and support continuity of care (Gray et al., 2009; Hirdes et al., 1999; Hirdes, Ljunggren, et al., 2008). RAI-HC data were supplied to ICES by Health Shared Services Ontario (HSSO), a provincial agency that supports the Local Health Integration Networks (LHINs), the regional health authorities in Ontario, which coordinate home care services.

4.2.2.2 Registered Persons Database (RPDB)

The RPDB is a database that contains demographic information on individuals registered with the Ontario Health Insurance Plan (OHIP) and individuals who are eligible for the Ontario Drug Program (Ontario Ministry of Government and Consumer Services, 2017). For the purposes of this study, data elements included age (five year range), sex, and LHIN (encrypted to avoid identification).

4.2.2.3 Ontario Health Insurance Plan (OHIP) Billing Records

The OHIP billing records database contains records of claims made by physicians in Ontario for services provided to patients covered by OHIP. For the purposes of this study, data elements include encrypted physician number, physician specialty, date of service (in reference to date of RAI-HC assessment), and location of service.

4.2.2.4 National Ambulatory Care Reporting System (NACRS)

NACRS is a national database developed by the Canadian Institute for Health Information (CIHI). It contains data about hospital and community-based emergency and ambulatory care visits, including visits to day surgery and outpatient clinics. In Ontario, it is mandated for these data to be collected on a routine basis and submitted to CIHI. Data collected includes demographic, clinical, administrative, financial, and service-specific information (Canadian Institute for Health Information, 2012b). CIHI supplies this database to ICES.

4.2.2.5 Discharge Abstract Database (DAD)

DAD is also a national database that was developed by CIHI. It captures all of the “separations” from acute care facilities, including discharges, deaths, transfers, and sign-outs (Canadian Institute for Health Information, 2012a). Hospitals submit an electronic record to CIHI after an individual is discharged from their care. The data that were collected include diagnostic, intervention, patient demographic and administrative information. For the purposes of this study, data elements include type of hospital stay, date of admission (in reference to date of RAI-HC assessment), and encrypted institution number. CIHI supplies this database to ICES.

4.2.3 Sample

The study sample included long-stay home care clients, 60 years of age and older, with admission assessments within the study period (first quarter of 2012 to the second quarter of 2015) in Ontario. This included individuals living in private homes or apartments but excluded individuals living in board and care, assisted living, group home, or residential care facility settings. The sample was also restricted to individuals who were assessed in the community, and excluded individuals assessed in the hospital. As it was necessary to have a unique client identifier to link home care assessment data to health services use data, assessments for individuals missing a client identifier were excluded. The final sample included 196,444 unique home care clients with admission assessments (Figure 4.1).

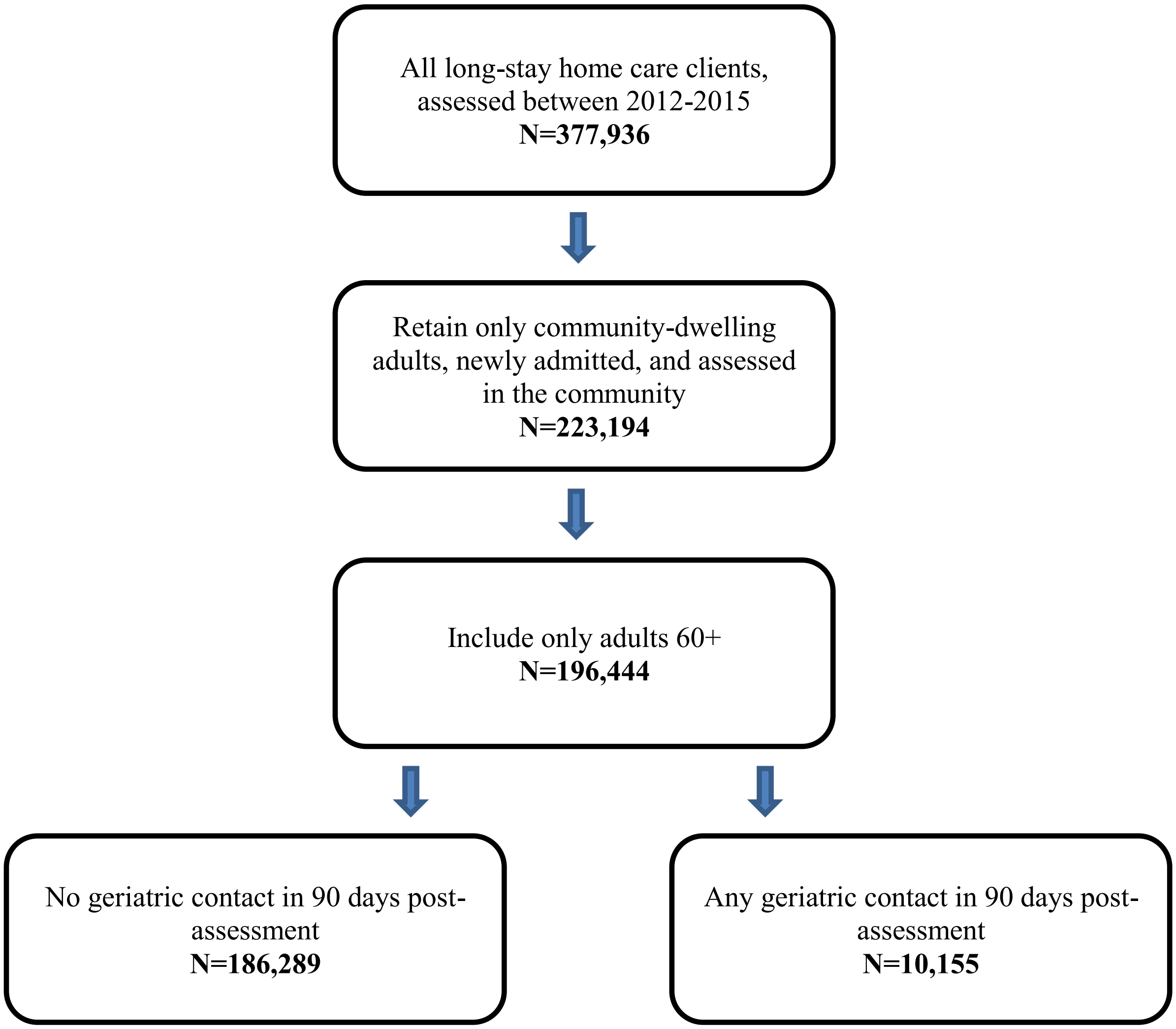

Figure 4.1 Flow diagram of study sample

4.2.4 Measures

4.2.4.1 Individual characteristics

The first RAI-HC assessment during the study period was considered the index assessment. Individual characteristic measures were obtained from the RPDB and the index admission assessment. RPDB items of interest included age, sex, and encrypted LHIN. RAI-HC items of interest included demographics (i.e., marital status, living arrangement, and education), cognition, communication, hearing, vision, mood and behaviour, social functioning, informal support services, physical functioning, continence, disease diagnoses, health conditions, nutrition and hydration status, environment, and medications. RAI-HC scales and other composite outputs were also used as measures of individual characteristics, and included the Activities of Daily Living Hierarchy (ADLH) scale; Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS); Cognitive Performance Scale (CPS); Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT); Depression Rating Scale (DRS); Instrumental Activities of Daily Living Capacity (IADL-C) scale; Method for Assigning Priority Levels (MAPLe); Pain scale; and 5M Framework (5Ms).

4.2.4.1.1 Activities of Daily Living Hierarchy (ADLH)

The ADLH scale clusters activities of daily living (ADLs) based on the stage of the disablement process in which they occur. Dressing and other early loss ADLs receive a lower score, while eating and other late loss ADLs, receive a higher score. This scale ranges from zero (no impairment) to six (total dependence) (Morris, Fries, & Morris, 1999).

4.2.4.1.2 Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS)

CHESS measures medical complexity and health instability. It is made up of items such as vomiting, dehydration, weight loss, shortness of breath, edema, end-stage disease, and decline in cognition and function. This scale ranges from zero (not at all unstable) to five (highly unstable, more complex). Higher levels of CHESS are predictive of adverse outcomes such as mortality, hospital admission, pain, caregiver distress, and poor self-rated health (Hirdes, Frijters, & Teare, 2003; Hirdes et al., 2014).

4.2.4.1.3 Cognitive Performance Scale (CPS)

Components of the CPS include daily decision-making, making oneself understood, and short-term memory recall. This scale ranges from zero to six, with higher scores indicating greater degree of cognitive impairment. CPS is highly correlated with the Mini Mental State Exam (Landi et al., 2000; Morris et al., 1994, 2016).

4.2.4.1.4 Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT)

DIVERT identifies the risk of unplanned emergency department use among frail, community-dwelling older adults. Main component items include previous emergency department use, cardio-respiratory symptoms, and cardio-respiratory conditions. This scale ranges from one (lowest risk) to six (highest risk) (Costa et al., 2015).

4.2.4.1.5 Depression Rating Scale (DRS)

The DRS is a scale measuring the signs and symptoms of depression. It ranges from zero (no symptoms of depression) to 14 (all symptoms exhibited daily or almost daily). A score of three or more indicates the possible presence of depression. The DRS was validated based on a comparison with the Hamilton Depression Rating Scale and Cornell Scale for Depression (Burrows, Morris, Simon, Hirdes, & Phillips, 2000; Szczerbińska, Hirdes, & Życzkowska, 2012).

4.2.4.1.6 Instrumental Activities of Daily Living Capacity (IADL-C)

IADL-C is the sum of three items measuring capacity for meal preparation, ordinary housework, and phone use. This scale ranges from zero (no difficulty in any) to six (great difficulty in all three). IADL-C is based on an individual's capacity to perform IADLs rather than their performance.

4.2.4.1.7 Method for Assigning Priority Levels (MAPLe)

MAPLe categorizes individuals according to their risk for adverse outcomes, based on functional impairment, cognitive impairment, wandering and other behaviour problems, and problems in their environment. This scale ranges from one (low risk) to five (high risk). It is predictive of risk of institutionalization and caregiver distress (Hirdes, Poss, & Curtin-Telegdi, 2008; Mitchell et al., 2015).

4.2.4.1.8 Pain Scale

The Pain Scale was created from two items measuring the frequency and severity of pain. It ranges from zero (no pain) to three (daily severe pain). The Pain Scale was validated against the Visual Analogue Scale and shown to be predictive of pain (Fries, Simon, Morris, Flodstrom, & Bookstein, 2001).

4.2.4.1.9 5M Framework (5Ms)

The 5Ms is a simplified communication framework launched by the Canadian Geriatrics Society that is meant to describe the care issues that fall within the expertise of geriatric medicine (Molnar et al., 2017; Tinetti et al., 2017). The 5Ms include mind, mobility, medications, multi-complexity, and 'matters most'. Since no operational definitions were specified by the original authors, the 5Ms were operationalized for this study using items, scales, and composite measures from the RAI-HC. See Table 4.1 for a description of the 5Ms and RAI-HC measures used.

Table 4.1 Operationalization of Geriatric 5Ms using measures from the RAI-HC

Domain[1]	Description[1]	RAI-HC measure	Coding
Mind	Mentation, dementia, delirium, depression	CPS	CPS ≥1 (any impairment)
		Alzheimer's or other dementia diagnosis	j1g OR j1h ≥1 (diagnosis present)
		Delirium clinical assessment protocol (CAP) triggered	Delirium CAP =1 (triggered)
		DRS	DRS ≥3 (possible signs of depression)
Mobility	Impaired gait and balance, fall injury prevention	Unsteady gait	K6a =1 (yes)
		Impaired in locomotion	H2c OR h2d ≥2 (supervision or more support required)
		Fear of falls	K6b =1 (yes)
		Three or more falls	K5 ≥3 (3 or more falls)
Medications	Polypharmacy, deprescribing, optimal prescribing, adverse medication effects and medication burden	Nine or more medications	Q1 ≥9 (9 or more medications)
		Appropriate medications clinical assessment protocol (CAP) triggered	Medications CAP =1 (triggered)
Multicomplexity	Multimorbidity, complex biopsychosocial situations	Three or more disease diagnoses	Count of diagnoses ≥3
		Loneliness	F3b =1 (yes)
		Isolation	F3a ≥2 (client alone for long periods of time or all the time)
		Anger/conflict	F1b =1 (yes)
		Decline in social activities	F2 =2 (distressed by decline in social activities)
		Caregiver distress	G2a or G2c =1 (yes)

Domain[1]	Description[1]	RAI-HC measure	Coding
		Economic trade-offs	P7 =1 (yes)
		Potential signs of abuse or neglect	Abuse CAP ≥1 (triggered)
		Home environment issues	Home environment CAP =1 (triggered)
Matters most	Each individual's own meaningful health outcome goals and care preferences	Self-rated potential for improvement	H7a or h7b =1 (yes)
		Self-reported health	K8a =1 (poor self-rated health)
		Better off living elsewhere	O2b =1 (yes)

[1]Adapted from Molnar et al., 2017

4.2.4.2 Service Use Measures

Information regarding contact with physicians, emergency department (ED) visits, and hospital admissions was obtained from OHIP, NACRS, and DAD, respectively. For each service, a count of contact during specified time periods was created, based on the number of days from the index assessment (RAI-HC admission assessment) to the service date. Frequency of contact was measured in the 90 days pre-assessment, 90 days post-assessment, and six months post-assessment.

4.2.4.2.1 Contact with Physician

Different methods have been used in the literature to count contact with physicians using OHIP billing records based on the research question and authors' interests. Some authors restricted physician contact by location (Bastedo et al., 2017; Fridman et al., 2018; Glazier, Hutchison, & Kopp, 2015; Perlman et al., 2019), many restricted by specialty (Aiken, Mahar, Kurdyak, Whitehead, & Groome, 2016; Bastedo et al., 2017; Bronskill et al., 2011; Chan & Schultz, 2005; Glazier et al., 2015; Jaakkimainen & Upshur, 2006; Mahar et al., 2018; Nguyen, Bouchard, & Diong, 2019;

Perlman et al., 2019), some restricted by fee codes indicating type of services provided (Chan & Schultz, 2005; Fridman et al., 2018; Jaakkimainen & Upshur, 2006; Ouellette-Kuntz, Smith, Fulford, & Cobigo, 2018; Perlman et al., 2019), and others restricted by reason for visit using diagnostic codes (Fridman et al., 2018; Mahar et al., 2018; Nguyen et al., 2019; Ouellette-Kuntz et al., 2018; Perlman et al., 2019).

For the purposes of this study, contact with physicians was restricted to locations defined as home, office, or phone, in order to capture contact with physicians in outpatient settings. Certain specialties were not considered relevant contact in terms of the research question and were thus excluded. The list of specialties excluded is a modified version of those excluded by Jaakkimainen and Upshur (2006) in a report published on primary care in Ontario (Jaakkimainen & Upshur, 2006). Billing records where specialty was coded as pediatrics, non-physician lab director, pathology, microbiology, clinical biochemistry, diagnostic radiology, nuclear medicine, alternate health professionals, and non-medical professionals for independent health facilities were not included in counts of contact with physicians. From this point forward, reference to contact with all physicians, disciplines, or specialists/specialties excludes those listed above. There was no restriction placed on diagnostic code as no code exists identifying care for complex, older adults. Further, no restrictions were placed on fee codes. Any contact with a physician was considered to be notable. This is consistent with the methodology reported by Bronskill et al. (2011) in a report on health system use by frail older adults in Ontario (Bronskill et al., 2011). Separate variables were created with a count of the number of visits to each specialty within the specified time periods (90 days pre-assessment, 90 days post-assessment, and six months post-assessment). A count was also created of contact with all physicians and contact with all specialists (excluding contact with family medicine) during the three time periods. In cases where multiple fee codes were billed by the same physician for the same patient on the same day, it was counted as one visit.

4.2.4.2.2 Unplanned Emergency Department (ED) Visits

ED visits were limited to unscheduled, "true" ED visits using the ED visit indicator code. If duplicate registrations were recorded in one day, only one was counted as an ED visit.

4.2.4.2.3 Hospital Admissions

Separate variables were created with a count of the number of elective admissions, urgent admissions, and a combined count of elective and urgent admissions, using the admission category code, during the three time periods specified. In cases where multiple records existed for the same patient admitted more than once on the same day, it was counted as one admission.

4.2.4.2.4 High Service Use (HSU)

The HSU indicator was developed as part of this study to identify home care clients with high service use. Individuals who visited any physician three or more times in the 90 days prior to assessment and also had either one or more hospital admissions or one or more unplanned ED visits were considered HSU.

4.2.5 Analytic Strategy

Frequencies, means, and standard deviations (SD) were used to report the baseline characteristics of the sample. Differences between characteristics of those with geriatric medicine contact and those without were evaluated using chi square tests. The frequency of service use was reported for each physician specialty type and acute care services.

Logistic regression was used to examine the association between home care client characteristics and contact with geriatric medicine. Independent variables included LHIN, baseline characteristics from the RAI-HC, such as DIVERT, CHESS, MAPLe, 5M, and chronic obstructive pulmonary disease (COPD) or heart failure diagnosis. HSU in the 90 days pre-assessment was also included as an independent variable. The dependent variable was any contact with geriatric medicine in the 90 days post-assessment. Unadjusted and adjusted (LHIN, age, and sex) odds ratios (ORs) and 95% confidence intervals (95% CI) were reported. For comparison purposes, the same analysis was repeated with any contact with internal medicine in the 90 days post-assessment as the dependent variable.

Finally, logistic regression was used to explore the association of geriatric medicine contact pre-assessment with subsequent acute care services use. The independent variable was any contact with geriatric medicine in the 90 days pre-assessment. The dependent variables were any unplanned ED visit in the 90 days post-assessment, and any hospital admissions in the 90 days post-assessment. In order to investigate differences in the association within various subgroups of home care clients, this analysis was repeated, stratifying by HSU in the 90 days pre-assessment, DIVERT, CHESS, MAPLe, 5M, and COPD or heart failure diagnosis. Unadjusted and adjusted (LHIN, age, and sex) odds ratios (ORs) and 95% confidence intervals (95% CI) were reported. For comparison purposes, the same analysis was repeated with any contact with internal medicine in the 90 days post-assessment as the independent variable. All analyses were performed using SAS 9.4. In light of the large sample size, the significance level was set at 0.01.

4.3 Results

4.3.1 Description of the Study Sample

The study sample includes 196,444 long-stay home care clients in Ontario, 60 years and older, living in private dwellings in the community. It does not include individuals living in board and care, assisted living, group home settings, or residential care facilities. Slightly over half of the sample were female and over half were 80 years of age or older (Table 4.2). Nearly half of the sample were married, while nearly two-thirds lived with others. Almost one-quarter of the sample had a diagnosis of COPD or heart failure, while one-fifth of the sample had a diagnosis of Alzheimer's or dementia other than Alzheimer's (Table 4.2). Nearly one-tenth of the sample had moderate to severe impairment in ADLs while over three-quarters would have had at least some difficulty or more performing IADLs (Table 4.3). Similar to ADL performance, nearly one-tenth of the sample had moderate to severe cognitive impairment (based on CPS), and about two thirds had any level of cognitive impairment. One-fifth of the sample had moderate to severe symptoms indicating possible presence of depression. Almost one-quarter of individuals had moderate to very high levels of medical complexity and instability (based on CHESS), and nearly half were at moderate to high risk for an unplanned ED visit (based on DIVERT) (Table 4.3). Nearly half of the sample had a 5M score of four or five, indicating that these home care clients had needs within four or five of the domains in which geriatric medicine has expertise and a role to play in caring for them.

4.3.2 Comparison of Home Care Clients with and without Geriatric Medicine Contact

Among home care clients in the sample who had any contact with geriatric medicine in the 90 days post-assessment, there was a higher percentage of males (Table 4.2). The age distribution was shifted to slightly older among those with geriatric medicine contact. Compared to those without any geriatric medicine contact, there was a higher percentage married and a lower percentage living alone among those with geriatric medicine contact (Table 4.2). There was also a lower percentage with a diagnosis of COPD or heart failure and a higher percentage of those with a diagnosis of dementia among those with geriatric medicine contact. All differences were significant at $p<.0001$.

Based on the distributions of selected scales and composite measures, it appears that home care clients who had any contact with geriatric medicine in the 90 days post-assessment were more cognitively impaired (based on CPS), had more severe symptoms indicating the presence of possible depression (based on DRS), and were more at risk of caregiver distress and institutionalization (based on MAPLe), (Table 4.3). Conversely, they had less medical complexity and instability (based on

CHESS), were less at risk for unplanned ED visits (based on DIVERT) and had less pain (Table 4.3). All differences were significant at $p<.0001$.

Table 4.2 Characteristics of older, long-stay, home care clients upon admission RAI-HC assessment, Ontario, 2012-2015 (n=196,444)

Characteristic	Overall sample n=196,444 % (n)	No geriatrician visit 90 days post-assessment n=186,289 % (n)	Any geriatrician visit 90 days post-assessment n=10,155 % (n)	χ^2 statistic (df)	*p*-value
Sex				25.7 (1)	<.0001
Female	59.7 (117,192)	59.8 (111,378)	57.3 (5,814)		
Male	40.3 (79,252)	40.2 (74,911)	42.7 (4,341)		
Age Range				992.2 (6)	<.0001
60-64	6.4 (12,491)	6.6 (12,372)	1.2 (119)		
65-69	8.7 (17,091)	8.9 (16,619)	4.6 (472)		
70-74	11.7 (23,056)	11.8 (22,013)	10.3 (1,043)		
75-79	17.0 (33,442)	16.9 (31,434)	19.8 (2,008)		
80-84	22.9 (44,911)	22.5 (41,959)	29.1 (2,952)		
85-89	20.9 (40,981)	20.7 (38,507)	24.4 (2,474)		
90+	12.5 (24,472)	12.6 (23,385)	10.7 (1,087)		
Married				54.2 (1)	<.0001
No	54.3 (106,622)	54.5 (101,470)	50.7 (5,152)		
Yes	45.7 (89,822)	45.5 (84,819)	49.3 (5,003)		
Lives Alone				101.6 (1)	<.0001
No	64.6 (126,859)	64.3 (119,828)	69.2 (7,031)		
Yes	35.4 (69,585)	35.7 (66,461)	30.8 (3,124)		
Education				80.7 (2)	<.0001
High school or more	35.8 (70,376)	35.9 (66,837)	34.8 (3,539)		
Less than high school	27.6 (54,208)	27.8 (51,703)	24.7 (2,505)		
Unknown	36.6 (71,860)	36.4 (67,749)	40.5 (4,111)		
Diagnosis of COPD or Heart Failure				226.8 (1)	<.0001
No	75.2 (147,752)	74.9 (139,476)	81.5 (8,276)		
Yes	24.8 (48,692)	25.1 (46,813)	18.5 (1,879)		
Diagnosis of Dementia				5637.7 (1)	<.0001
No	78.1 (153,335)	79.7 (148,458)	48.0 (4,877)		
Yes	21.9 (43,109)	20.3 (37,831)	52.0 (5,278)		

Table 4.3 Distribution of older, long-stay home care clients upon admission RAI-HC assessment, Ontario, 2012-2015 (n=196,444)

Scale	Overall sample (n=196,444) % (n)	No geriatrician visit 90 days post-assessment (n=186,289) % (n)	Any geriatrician visit 90 days post-assessment (n=10,155) % (n)	χ^2 statistic (df)	*p*-value
ADLH				177.0 (3)	<.0001
0	62.5 (122,834)	62.8 (116,982)	57.6 (5,852)		
1-2	27.6 (54,252)	27.3 (50,919)	32.8 (3,333)		
3-4	8.1 (15,942)	8.1 (15,079)	8.5 (863)		
5-6	1.7 (3,416)	1.8 (3,309)	1.1 (107)		
CHESS				13.6 (2)	0.001
0	16.9 (33,207)	16.9 (31,415)	17.6 (1,792)		
1-2	61.1 (120,026)	61.1 (113,756)	61.7 (6,270)		
≥3	22.0 (43,211)	22.1 (41,118)	20.6 (2,093)		
CPS				3195.7 (3)	<.0001
0	36.2 (71,111)	37.5 (69,909)	11.8 (1,202)		
1-2	54.2 (106,512)	53.4 (99,492)	69.1 (7,020)		
3-4	7.4 (14,432)	6.9 (12,932)	14.8 (1,500)		
5-6	2.2 (4,389)	2.1 (3,956)	4.3 (433)		
DRS				219.1 (2)	<.0001
0	53.8 (105,686)	54.2 (100,884)	47.3 (4,802)		
1-2	25.9 (50,840)	25.8 (48,041)	27.6 (2,799)		
≥3	20.3 (39,918)	20.1 (37,364)	25.2 (2,554)		
DIVERT				235.8 (3)	<.0001
1	9.0 (17,643)	8.8 (16,429)	12.0 (1,214)		
2-3	44.1 (86,694)	43.9 (81,854)	47.7 (4,840)		
4-5	38.5 (75,615)	38.8 (72,200)	33.6 (3,415)		
6	8.4 (16,492)	8.5 (15,806)	6.8 (686)		
IADL Capacity				218.7 (3)	<.0001
0	4.2 (8,222)	4.2 (7,910)	3.1 (312)		
1-2	18.2 (35,680)	18.4 (34,223)	14.3 (1,457)		
3-4	24.4 (47,974)	24.5 (45,667)	22.7 (2,307)		
5-6	53.2 (104,568)	52.9 (98,489)	59.9 (6,079)		
MAPLe				1185.8 (2)	<.0001
1	16.0 (31,431)	16.5 (30,748)	6.7 (683)		
2	8.9 (17,548)	9.2 (17,161)	3.8 (387)		
≥3	75.1 (147,465)	74.3 (138,380)	89.5 (9,085)		
Pain				328.8 (2)	<.0001
0	32.2 (63,224)	31.8 (59,214)	39.5 (4,010)		
1-2	53.5 (105,053)	53.6 (99,937)	50.4 (5,116)		

Scale	Overall sample (n=196,444) % (n)	No geriatrician visit 90 days post-assessment (n=186,289) % (n)	Any geriatrician visit 90 days post-assessment (n=10,155) % (n)	χ^2 statistic (df)	*p*-value
3	14.3 (28,167)	14.6 (27,138)	10.1 (1,029)		
5Ms				221.7 (5)	<.0001
0	0.7 (1,349)	0.7 (1,340)	0.1 (9)		
1	4.3 (8,449)	4.4 (8,242)	2.0 (207)		
2	15.0 (29,377)	15.0 (27,965)	13.9 (1,412)		
3	30.5 (59,811)	30.4(56,657)	31.1 (3,154)		
4	34.2 (67,257)	34.1 (63,472)	37.3 (3,785)		
5	15.4 (30,201)	15.4 (28,613)	15.6 (1,588)		

ADLH: Activities of Daily Living Hierarchy scale; *CHESS*: Changes in Health, End-stage Disease, Signs, and Symptoms; *CPS*: Cognitive Performance Scale; *DRS*: Depression Rating Scale; *DIVERT*: Detection of Indicators and Vulnerabilities for Emergency Room Trips; *IADL-C*: Instrumental Activities of Daily Living Capacity scale; *MAPLe*: Method for Assigning Priority Levels; *5Ms*: 5M Framework

4.3.3 Frequency of Health Services Use

More than 90% of the sample had at least one contact with a physician in the 90 days pre-assessment, 90 days post-assessment, and six months post-assessment (restricted to contact located in home, office, or over the phone) (Table 4.4). About half of the sample had four or more instances of contact with a physician in the 90 days pre-assessment and 90 days post-assessment, while almost three-quarters of the sample made four or more visits in the six months post-assessment.

Family medicine was the specialty with the most contact, with over 80% of the sample having contact with a family physician in the 90 days pre-assessment and 90 days post-assessment, and over 20% of the sample having four or more instances of contact during those time periods. More than two-thirds of clients had any contact with a specialist (including geriatric medicine and excluding family medicine) in the 90 days pre-assessment and post-assessment. Just over 5% of the sample had any contact with geriatric medicine in the 90 days pre-assessment (5.5%) and post-assessment (5.2%). Excluding family medicine, the disciplines most commonly seen in the 90 days pre- and post-assessment were internal medicine (~20%), ophthalmology (~11%), and orthopedic surgery (~10%).

Genetics, emergency medicine, clinical immunology, cardiothoracic surgery, thoracic surgery, neurosurgery, and infectious diseases were among the specialties least commonly seen (less than or equal to 1%) by older home care clients on an outpatient basis (home, office, or phone).

Few clients had any elective hospital admissions (7.6% in 90 days pre-assessment, 2.7% in 90 days post-assessment) while urgent hospital admissions were more common (36.8% in 90 days pre-assessment, 19% in 90 days post-assessment) (Table 4.5). Combined, 41.5% of the sample had any hospital admission in the 90 days pre-assessment and 20.7% had any hospital admission in the 90 days post-assessment. Unplanned ED visits were more common than hospital admissions, with over half of the sample visiting the ED in the 90 days pre-assessment and almost one–third visiting the ED in the 90 days post-assessment (Table 4.5). In general, health services use tended to be lower in the 90 days post-assessment than in the 90 days pre-assessment.

Table 4.4 Frequency of outpatient physician services use by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Number of visits	Contact during 90 days pre-assessment % (n)	Contact during 90 days post-assessment % (n)	Contact during 6 months post-assessment % (n)
All physicians			
0	7.6 (14,824)	8.5 (16,693)	4.1 (7,957)
1	12.8 (25,219)	13.6 (26,613)	6.7 (13,222)
2	14.2 (27,816)	14.8 (29,145)	8.3 (16,272)
3	13.2 (25,954)	13.6 (26,630)	8.9 (17,453)
≥4	52.2 (102,631)	49.6 (97,363)	72.1 (141,540)
Family medicine			
0	19.3 (37,858)	20.3 (39,897)	11.4 (22,392)
1	24.2 (47,625)	24.2 (47,488)	14.3 (28,051)
2	19.8 (38,817)	19.7 (38,704)	15.4 (30,158)
3	14.0 (27,589)	13.6 (26,737)	13.6 (26,753)
≥4	22.7 (44,555)	22.2 (43,618)	45.4 (89,090)
All specialists			
0	32.0 (62,916)	34.5 (67,705)	24.1 (47,378)
1	21.2 (41,547)	21.9 (42,984)	16.7 (32,882)
2	14.6 (28,584)	14.7 (28,787)	13.2 (25,882)
3	10.1 (19,754)	9.9 (19,363)	10.4 (20,452)
≥4	22.2 (43,643)	19.1 (37,605)	35.6 (69,850)
Geriatrics			
0	94.5 (185,656)	94.8 (186,289)	91.8 (180,264)
1	4.5 (8,891)	4.3 (8,509)	6.0 (11,703)
2	0.7 (1,402)	0.6 (1,225)	1.6 (3,132)
3	0.2 (307)	0.1 (263)	0.4 (813)
≥4	0.1 (188)	0.1 (158)	0.3 (532)
Other specialists			
Anesthesia			
0	93.1 (182,792)	96.8 (190,148)	94.7 (186,044)
1	5.8 (11,449)	2.7 (5,297)	4.3 (8,352)
≥2	1.1 (2,203)	0.5 (999)	1.0 (2,048)
Cardiology			
0	91.0 (178,694)	91.3 (179,286)	87.4 (171,759)
1	6.4 (12,486)	0.2 (339)	0.2 (339)
≥2	2.7 (5,264)	8.6 (16,819)	12.4 (24,346)
Cardiothoracic surgery			

Number of visits	Contact during 90 days pre-assessment % (n)	Contact during 90 days post-assessment % (n)	Contact during 6 months post-assessment % (n)
0	98.7 (193,792)	98.9 (194,215)	98.5 (193,454)
1	0.9 (1,766)	0.9 (1,766)	1.1 (2,217)
≥2	0.4 (886)	0.2 (463)	0.4 (773)
Clinical immunology			
0	100.0 (196,396)	100.0 (196,375)	99.9 (196,326)
1	0.0 (35)	0.0 (59)	0.0 (86)
≥2	0.0 (13)	0.0 (10)	0.0 (32)
Community medicine			
0	100.0 (196,438)	100.0 (196,434)	100.0 (196,430)
≥1	0.0 (6)	0.0 (10)	0.0 (14)
Dermatology			
0	96.8 (190,127)	96.9 (190,294)	94.8 (186,160)
1	2.6 (5,156)	2.6 (5,013)	3.7 (7,262)
≥2	0.6 (1,161)	0.6 (1,137)	1.5 (3,022)
Emergency medicine			
0	99.2 (194,907)	99.6 (195,662)	99.4 (195,183)
1	0.7 (1,452)	0.4 (713)	0.6 (1,126)
≥2	0.0 (85)	0.0 (69)	0.1 (135)
Endocrinology			
0	98.4 (193,232)	98.2 (192,949)	97.2 (190,916)
1	1.4 (2,803)	1.6 (3,046)	2.0 (3,976)
≥2	0.2 (409)	0.2 (449)	0.8 (1,552)
Gastroenterology			
0	96.8 (190,140)	97.4 (191,313)	96.0 (188,647)
1	2.3 (4,606)	1.9 (3,768)	2.5 (4,932)
≥2	0.9 (1,698)	0.7 (1,363)	1.5 (2,865)
General surgery			
0	92.0 (180,625)	93.4 (183,397)	90.7 (178,216)
1	4.7 (9,212)	4.2 (8,232)	5.0 (9,846)
≥2	3.4 (6,607)	2.5 (4,815)	4.3 (8,382)
Genetics			
0	100.0 (196,410)	100.0 (196,411)	100.0 (196,368)
≥1	0.0 (34)	0.0 (33)	0.0 (76)
Gynecology			
0	98.4 (193,336)	98.5 (193,553)	97.9 (192,322)
1	1.1 (2,085)	1.1 (2,078)	1.2 (2,260)
≥2	0.5 (1,023)	0.4 (813)	0.9 (1,862)
Hematology			

Number of visits	Contact during 90 days pre-assessment % (n)	Contact during 90 days post-assessment % (n)	Contact during 6 months post-assessment % (n)
0	97.0 (190,502)	97.0 (190,533)	96.2 (188,916)
1	1.4 (2,836)	1.4 (2,813)	1.6 (3,125)
≥2	1.6 (3,106)	1.6 (3,098)	2.2 (4,403)
Infectious disease			
0	98.9 (194,258)	98.9 (194,180)	98.4 (193,335)
1	0.7 (1,461)	0.7 (1,313)	0.8 (1,632)
≥2	0.4 (725)	0.5 (951)	0.8 (1,477)
Internal medicine			
0	77.9 (153,062)	82.1 (161,324)	75.3 (147,986)
1	13.4 (26,288)	11.0 (21,510)	12.6 (24,817)
≥2	8.7 (17,094)	6.9 (13,610)	12.0 (23,641)
Medical oncology			
0	95.7 (187,963)	95.6 (187,744)	94.9 (186,344)
1	1.8 (3,452)	1.8 (3,528)	1.7 (3,389)
≥2	2.6 (5,029)	2.6 (5,172)	3.4 (6,711)
Nephrology			
0	97.3 (191,122)	97.3 (191,153)	96.1 (188,771)
1	2.1 (4,147)	2.1 (4,189)	2.4 (4,722)
≥2	0.6 (1,175)	0.6 (1,102)	1.5 (2,951)
Neurology			
0	94.2 (185,022)	94.3 (185,250)	91.5 (179,796)
1	4.8 (9,345)	4.8 (9,422)	5.9 (11,611)
≥2	1.1 (2,077)	0.9 (1,772)	2.6 (5,037)
Neurosurgery			
0	98.8 (193,991)	98.8 (193,997)	98.3 (193,167)
1	1.0 (1,927)	1.0 (2,009)	1.2 (2,348)
≥2	0.3 (526)	0.2 (438)	0.5 (929)
Nurse practitioner			
0	100.0 (196,434)	100.0 (196,424)	100.0 (196,416)
1	0.0 (7)	0.0 (15)	0.0 (17)
≥2	0.0 (<6)	0.0 (<6)	0.0 (11)
Ophthalmology			
0	88.6 (174,086)	88.7 (174,275)	82.1 (161,262)
1	8.0 (15,758)	8.0 (15,730)	11.3 (22,115)
≥2	3.4 (6,600)	3.3 (6,439)	6.6 (13,067)
Orthopedic surgery			
0	89.3 (175,399)	89.5 (175,717)	87.0 (170,890)
1	5.9 (11,660)	5.6 (10,913)	5.5 (10,886)

Number of visits	Contact during 90 days pre-assessment % (n)	Contact during 90 days post-assessment % (n)	Contact during 6 months post-assessment % (n)
≥2	4.8 (9,385)	5.0 (9,814)	7.5 (14,668)
Otolaryngology			
0	97.0 (190,585)	97.2 (190,960)	95.6 (187,742)
1	2.2 (4,348)	2.2 (4,270)	3.0 (5,878)
≥2	0.8 (1,511)	0.6 (1,214)	1.4 (2,824)
Physical medicine			
0	98.4 (193,366)	98.5 (193,441)	97.7 (192,002)
1	1.3 (2,557)	1.2 (2,369)	1.5 (2,883)
≥2	0.3 (521)	0.3 (634)	0.8 (1,559)
Plastic surgery			
0	98.2 (192,902)	98.4 (193,207)	97.5 (191,621)
1	1.1 (2,105)	0.9 (1,814)	1.2 (2,376)
≥2	0.7 (1,437)	0.7 (1,423)	1.3 (2,447)
Psychiatry			
0	96.4 (189,444)	96.0 (188,535)	94.5 (185,551)
1	2.3 (4,513)	2.6 (5,129)	2.9 (5,604)
≥2	1.3 (2,487)	1.4 (2,780)	2.7 (5,289)
Respiratory disease			
0	96.2 (188,982)	96.5 (189,551)	94.9 (186,430)
1	2.8 (5,432)	2.7 (5,248)	3.2 (6,337)
≥2	1.0 (2,030)	0.8 (1,645)	1.9 (3,677)
Rheumatology			
0	97.9 (192,349)	97.9 (192,303)	96.9 (190,425)
1	1.5 (2,861)	1.5 (2,849)	1.7 (3,328)
≥2	0.6 (1,234)	0.7 (1,292)	1.4 (2,691)
Therapeutic radiology			
0	95.5 (187,643)	95.9 (188,400)	94.8 (186,171)
1	2.4 (4,631)	2.3 (4,422)	2.3 (4,573)
≥2	3.0 (5,910)	2.6 (5,090)	4.0 (7,774)
Thoracic surgery			
0	98.7 (193,789)	99.1 (194,571)	98.8 (194,003)
1	0.8 (1,481)	0.6 (1,248)	0.7 (1,330)
≥2	0.6 (1,174)	0.3 (625)	0.6 (1,111)
Urology			
0	93.2 (183,133)	93.4 (183,380)	90.8 (178,300)
1	4.3 (8,488)	4.4 (8,618)	4.8 (9,456)
≥2	2.5 (4,823)	2.3 (4,446)	4.4 (8,688)
Vascular surgery			

Number of visits	Contact during 90 days pre-assessment % (n)	Contact during 90 days post-assessment % (n)	Contact during 6 months post-assessment % (n)
0	98.4 (193,308)	98.4 (193,252)	97.7 (191,838)
1	1.1 (2,073)	1.1 (2,217)	1.4 (2,831)
≥2	0.5 (1,063)	0.5 (975)	0.9 (1,775)

Table 4.5 Frequency of acute care services use by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Number of visits	Contact during 90 days pre-assessment % (n)	Contact during 90 days post-assessment % (n)	Contact during 6 months post-assessment % (n)
Urgent hospital admission			
0	63.2 (124,175)	81.0 (159,192)	72.4 (142,208)
1	29.1 (57,231)	15.0 (29,360)	19.5 (38,364)
2	6.1 (11,944)	3.1 (6,138)	5.6 (10,912)
3	1.3 (2,449)	0.7 (1,396)	1.7 (3,371)
≥4	0.3 (645)	0.2 (358)	0.8 (1,589)
Elective hospital admission			
0	92.4 (181,475)	97.3 (191,105)	95.4 (187,473)
1	7.0 (13,785)	2.5 (4,947)	4.1 (8,061)
2	0.6 (1,084)	0.2 (356)	0.4 (801)
3	0.0 (85)	0.0 (28)	0.0 (87)
≥4	0.0 (15)	0.0 (8)	0.0 (22)
Urgent and elective hospital admission			
0	58.5 (114,891)	79.3 (155,821)	69.9 (137,234)
1	31.6 (62,156)	15.9 (31,208)	20.7 (40,628)
2	7.4 (14,431)	3.6 (7,069)	6.3 (12,287)
3	2.0 (3,844)	0.9 (1,789)	2.1 (4,123)
≥4	0.6 (1,122)	0.3 (557)	1.1 (2,172)
Unplanned emergency department visit			
0	43.2 (84,890)	66.2 (129,975)	52.7 (103,521)
1	33.9 (66,573)	21.2 (41,660)	24.9 (48,848)
2	13.7 (26,853)	7.6 (14,856)	11.4 (22,415)
3	5.3 (10,448)	2.9 (5,706)	5.3 (10,398)
≥4	3.9 (7,680)	2.2 (4,247)	5.7 (11,262)

4.3.4 Disciplines Involved in Care

Of the overall sample of home care clients, nearly one-third were only in contact with one physician discipline in the 90 days post-assessment, while almost as many were in contact with two disciplines (Table 4.6). 30% of the sample had three or more disciplines involved in their care in the 90 days post-assessment.

Table 4.6 Number of disciplines involved in care of older, long-stay home care clients in the 90 days post-assessment, Ontario, 2012-2015 (n=196,444)

Number of disciplines involved in care in 90 days post-assessment	Overall sample % (n)	No geriatrician visits in 90 days post-assessment (count of disciplines excludes geriatrics) % (n)	Any geriatrician visits in 90 days post-assessment (count of disciplines excludes geriatrics) % (n)	χ^2 statistic (df)	*p*-value
0	8.5 (16,701)	9.0 (16,701)	9.4 (954)	56.2 (5)	<.0001
1	32.5 (63,744)	33.7 (62,790)	36.8 (3,733)		
2	29.0 (56.887)	28.5 (53,154)	27.6 (2,803)		
3	17.0 (33,379)	16.4 (30,576)	15.4 (1,565)		
4	8.2 (16,020)	7.8 (14,455)	6.8 (688)		
≥5	4.9 (9,713)	4.7 (8,613)	4.1 (412)		

Among the subsample of home care clients who had contact with geriatric medicine, less than one-tenth had no other disciplines involved in their care. Over one quarter of this subsample had three or more disciplines involved in their care (Table 4.6). Home care clients who had contact with geriatric medicine in the 90 days post-assessment had a mean of 1.9 (SD 1.3) other disciplines involved in their care.

Home care clients in the sample who had contact with family medicine in the 90 days pre-assessment were less likely to have contact with geriatric medicine during the same time period. As the frequency of contact with family medicine increased, the percentage of the sample with any contact with geriatric medicine decreased (Table 4.7). However, as contact with family medicine increased, the percentage of the sample with any contact with geriatric medicine in the 90 days post-assessment increased very slightly. This trend is more dramatic when considering the association between family medicine and internal medicine. Home care clients in the sample with frequent contact with family medicine in the 90 days pre-assessment are more likely to have any contact with internal medicine in the 90 days pre- and post-assessment. 18.1% of the sample who had any contact with geriatric medicine also had contact with internal medicine, while only 5.2% of the sample who had contact with internal medicine also had contact with geriatric medicine (Table 4.7). This rate is consistent with the rate of contact within the overall sample.

Table 4.7 Relationship of contact with geriatric medicine, family medicine, and internal medicine by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Number of contacts with family medicine (90 days pre-assessment)	Any geriatric medicine contact (90 days pre-assessment) % (n)	Any geriatric medicine contact (90 days post-assessment) % (n)	Any internal medicine contact (90 days pre-assessment) % (n)	Any internal medicine contact (90 days post-assessment) % (n)
0	6.1 (12,042)	5.0 (9,763)	18.7 (36,755)	14.9 (29,349)
1-2	5.6 (10,903)	5.2 (10,254)	20.2 (39,760)	16.3 (32,079)
3-4	5.1 (10,038)	5.2 (10,117)	24.4 (47,952)	19.8 (38,935)
≥5	5.0 (9,901)	5.3 (10,431)	28.8 (56,635)	23.7 (46,557)

4.3.5 Contact with Geriatric Medicine by Region

Actual LHIN was encrypted by ICES to prevent identification. Nevertheless, it is still possible to explore associations between LHIN and contact with geriatric medicine. It is apparent that contact with geriatric medicine differs by LHIN. Some LHINs are associated with higher odds of geriatric medicine contact (e.g., LHIN 6: OR 1.75 (95% CI 1.62-1.87) while other LHINs are associated with lower odds of geriatric medicine contact (e.g., OR 0.19, 95% CI 0.16-0.24) compared to the reference LHIN (LHIN 5, containing the largest percentage of older home care clients in the sample).

Table 4.8 Odds of contact with geriatric medicine by encrypted LHIN among older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Encrypted LHIN (Ref = 5)	Estimate (Standard Error)	χ^2 statistic	*p*-value	Odds Ratio (95% CI)
1	0.35 (0.05)	46.4	<.0001	1.41 (1.28-1.56)
2	-1.65 (0.11)	239.1	<.0001	0.19 (0.16-0.24)
3	0.52 (0.04)	149.1	<.0001	1.68 (1.54-1.82)
4	-0.42 (0.05)	68.6	<.0001	0.66 (0.59-0.73)
6	0.56 (0.04)	232.7	<.0001	1.75 (1.62-1.87)
7	0.60 (0.04)	183.1	<.0001	1.82 (1.67-1.99)
8	-0.04 (0.04)	0.8	0.3859	0.96 (0.89-1.05)
9	0.37 (0.04)	76.7	<.0001	1.45 (1.34-1.58)
20	-1.26 (0.08)	233.6	<.0001	0.29 (0.24-0.33)
22	-0.11 (0.05)	4.9	0.03	0.90 (0.81-0.99)
24	-0.16 (0.06)	6.7	0.01	0.86 (0.76-0.96)
25	0.23 (0.07)	11.6	0.0007	1.26 (1.10-1.44)
27	-0.97 (0.07)	177.1	<.0001	0.38 (0.33-0.44)
88	0.34 (0.42)	0.6	0.43	1.40 (0.61-3.21)

4.3.6 Association of Home Care Client Characteristics with Specialist Contact

A closer examination of the relationship between selected summary scales and composite measures and contact with geriatric medicine and internal medicine provides more insight into service use patterns. Older home care clients who were HSU in the 90 days pre-assessment had lower odds of contact with geriatric medicine than those who were not (OR 0.77 (0.74-0.80) (Table 4.8). Similarly, risk of unplanned ED visit was associated with lower odds of contact with geriatric medicine (Table 4.9). After adjusting for LHIN, age, and sex, those within the sample with a DIVERT score of six had 0.64 (95% CI 0.58-0.71) times the odds of contact with geriatric medicine as those with a DIVERT score of one. In contrast, MAPLe score, indicating risk of caregiver distress and institutionalization and reflecting increased functional and cognitive impairment, was associated with greater odds of contact with geriatric medicine in the 90 days post-assessment (Table 4.9). After adjusting for LHIN, age, and sex, those within the sample with a MAPLe score of five had 4.64 (95% CI 4.25-5.07) times greater odds of contact with geriatric medicine than those with a MAPLe score of one. The same trend is true for the 5M score, indicating care needs that fall within the scope of geriatrics. 5M score was associated with greater odds of contact with geriatric medicine (Table 4.9). After adjusting for LHIN, age, and sex, those within the sample with a 5M score of five had 6.99 (95% CI 3.62-13.51) times greater odds of contact with geriatric medicine than those with a 5M score of zero. Home care clients within the sample with a diagnosis of COPD or heart failure had lower odds of contact with geriatric medicine than those without these diagnoses (OR 0.71, 95% CI 0.68-0.75).

The relationships between the same characteristics and contact with internal medicine tended to be the reverse of what was seen with geriatric medicine. Older home care clients who were HSU in the 90 days pre-assessment had higher odds of contact with internal medicine. CHESS score, indicating medical complexity and instability, was not consistently associated with contact with geriatric medicine, but was associated with greater odds of contact with internal medicine. Similarly, DIVERT score was associated with greater odds of contact with internal medicine (Table 4.10). However, MAPLe score was associated with lower odds of contact with internal medicine (Table 4.10). The relationship between 5M score and internal medicine was less consistent than with geriatric medicine. Home care clients within the sample who had a diagnosis of COPD or heart failure had higher odds of contact with internal medicine.

Table 4.9 Odds of any geriatrician visit in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

	Unadjusted				Adjusted for LHIN, age, sex			
Variable	**Estimate (Standard Error)**	**χ^2 statistic**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	**χ^2 statistic**	***p*-value**	**Odds Ratio (95% CI)**
High service user (Ref = No)								
Yes	-0.24 (0.02)	129.3	<.0001	0.79 (0.76-0.82)	-0.26 (0.02)	155.0	<.0001	0.77 (0.74-0.80)
CHESS (Ref = 0)								
1	-0.06 (0.03)	4.3	0.04	0.94 (0.89-1.00)	-0.08 (0.03)	7.5	0.01	0.92 (0.87-0.98)
2	-0.01 (0.03)	0.0	0.86	1.00 (0.94-1.06)	0.00 (0.03)	0.0	0.94	1.00 (0.94-1.06)
3	-0.15 (0.04)	17.8	<.0001	0.86 (0.80-0.92)	-0.10 (0.04)	7.1	0.008	0.91 (0.85-0.98)
4	0.05 (0.05)	1.00	0.32	1.05 (0.95-1.17)	0.14 (0.05)	6.7	0.01	1.15 (1.03-1.27)
5	-1.57 (0.41)	14.5	0.0001	0.21 (0.09-0.47)	-1.29 (0.41)	9.8	0.002	0.28 (0.12-0.62)
DIVERT (Ref = 1)								
2	-0.15 (0.04)	19.1	<.0001	0.86 (0.80-0.92)	-0.16 (0.04)	20.0	<.0001	0.85 (0.80-0.92)
3	-0.33 (0.04)	73.9	<.0001	0.72 (0.67-0.78)	-0.35 (0.04)	82.2	<.0001	0.70 (0.65-0.76)
4	-0.41 (0.04)	127.4	<.0001	0.66 (0.62-0.71)	-0.39 (0.04)	112.2	<.0001	0.68 (0.63-0.73)
5	-0.51 (0.04)	143.1	<.0001	0.60 (0.55-0.65)	-0.48 (0.04)	125.4	<.0001	0.62 (0.57-0.67)
6	-0.53 (0.05)	117.7	<.0001	0.59 (0.53-0.65)	-0.44 (0.05)	79.0	<.0001	0.64 (0.58-0.71)
MAPLe (Ref = 1)								
2	0.02 (0.06)	0.1	0.81	1.02 (0.90-1.15)	-0.08 (0.06)	1.4	0.23	0.93 (0.82-1.05)
3	0.49 (0.04)	118.9	<.0001	1.62 (1.49-1.77)	0.36 (0.04)	63.0	<.0001	1.43 (1.31-1.56)
4	1.26 (0.04)	911.1	<.0001	3.52 (3.24-3.81)	1.16 (0.04)	758.3	<.0001	3.19 (2.94-3.46)
5	1.65 (0.04)	1390.9	<.0001	5.22 (4.78-5.69)	1.54 (0.04)	1168.5	<.0001	4.64 (4.25-5.07)

Variable	Unadjusted: Estimate (Standard Error)	χ^2 statistic	*p*-value	Odds Ratio (95% CI)	Adjusted for LHIN, age, sex: Estimate (Standard Error)	χ^2 statistic	*p*-value	Odds Ratio (95% CI)
5M (Ref = 0)								
1	1.31 (0.34)	14.9	0.0001	3.72 (1.91-7.27)	1.20 (0.34)	12.3	0.0004	3.33 (1.70-6.52)
2	2.01 (0.33)	36.1	<.0001	7.49 (3.88-14.43)	1.83 (0.34)	29.7	<.0001	6.26 (3.24-12.10)
3	2.11 (0.33)	39.9	<.0001	8.25 (4.29-15.89)	1.90 (0.34)	32.1	<.0001	6.71 (3.47-12.95)
4	2.18 (0.33)	42.5	<.0001	8.84 (4.59-17.02)	1.98 (0.34)	35.0	<.0001	7.28 (3.77-14.05)
5	2.11 (0.33)	39.6	<.0001	8.23 (4.27-15.86)	1.94 (0.34)	33.4	<.0001	6.99 (3.62-13.51)
Diagnosis of COPD or heart failure (Ref = No)								
Yes	-0.39 (0.03)	224.2	<.0001	0.68 (0.64-0.71)	-0.34 (0.03)	163.8	<.0001	0.71 (0.68-0.75)

Table 4.10 Odds of any internal medicine visit in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

	Unadjusted				Adjusted for LHIN, age, sex			
Variable	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**
High service user (Ref = No)								
Yes	0.75 (0.01)	3846.9	<.0001	2.11 (2.06-2.16)	0.70 (0.01)	3276.2	<.0001	2.01 (1.96-2.06)
CHESS (Ref = 0)								
1	0.17 (0.02)	78.6	<.0001	1.18 (1.14-1.23)	0.19 (0.02)	101.6	<.0001	1.21 (1.17-1.26)
2	0.29 (0.02)	229.8	<.0001	1.33 (1.28-1.38)	0.33 (0.02)	302.3	<.0001	1.40 (1.34-1.45)
3	0.55 (0.02)	723.9	<.0001	1.73 (1.66-1.80)	0.62 (0.02)	904.5	<.0001	1.86 (1.79-1.94)
4	0.47 (0.03)	236.7	<.0001	1.60 (1.50-1.69)	0.57 (0.03)	346.9	<.0001	1.78 (1.67-1.89)
5	0.06 (0.12)	0.25	0.62	1.06 (0.83-1.36)	0.09 (0.13)	0.6	0.46	1.10 (0.86-1.40)
DIVERT (Ref = 1)								
2	0.22 (0.03)	63.8	<.0001	1.25 (1.18-1.31)	0.24 (0.03)	78.7	<.0001	1.28 (1.21-1.35)
3	0.49 (0.03)	305.7	<.0001	1.63 (1.54-1.72)	0.50 (0.03)	319.9	<.0001	1.65 (1.57-1.75)
4	0.68 (0.03)	649.0	<.0001	1.97 (1.87-2.08)	0.69 (0.03)	654.1	<.0001	1.99 (1.88-2.09)
5	0.94 (0.03)	1133.9	<.0001	2.57 (2.43-2.72)	0.98 (0.03)	1207.0	<.0001	2.67 (2.53-2.83)
6	1.10 (0.03)	1352.7	<.0001	2.99 (2.82-3.17)	1.14 (0.03)	1423.6	<.0001	3.12 (2.94-3.31)
MAPLe (Ref = 1)								
2	-0.09 (0.02)	13.3	0.0003	0.92 (0.88-0.96)	-0.04 (0.02)	2.3	0.13	0.97 (0.92-1.01)
3	-0.08 (0.02)	19.8	<.0001	0.93 (0.90-0.96)	-0.05 (0.02)	7.7	0.006	0.95 (0.92-0.99)
4	-0.33 (0.02)	357.6	<.0001	0.72 (0.69-0.74)	-0.28 (0.02)	238.6	<.0001	0.76 (0.73-0.78)
5	-0.55 (0.02)	526.2	<.0001	0.58 (0.55-0.61)	-0.46 (0.02)	363.7	<.0001	0.63 (0.60-0.66)

5M (Ref = 0)								
1	-0.23 (0.07)	10.4	0.0012	0.80 (0.70-0.92)	-0.14 (0.07)	4.1	0.0442	0.87 (0.76-1.00)
2	-0.46 (0.07)	48.3	<.0001	0.63 (0.56-0.72)	-0.32 (0.07)	23.6	<.0001	0.72 (0.64-0.82)
3	-0.45 (0.07)	48.3	<.0001	0.64 (0.56-0.72)	-0.28 (0.07)	18.4	<.0001	0.75 (0.66-0.86)
4	-0.33 (0.06)	25.1	<.0001	0.72 (0.64-0.82)	-0.14 (0.07)	4.5	0.0345	0.87 (0.77-0.99)
5	-0.16 (0.07)	6.3	0.0121	0.85 (0.75-0.97)	0.03 (0.07)	0.2	0.6259	1.03 (0.91-1.18)
Diagnosis of COPD or heart failure (Ref = No)								
Yes	0.39 (0.01)	920.0	<.0001	1.48 (1.44-1.52)	0.41 (0.01)	992.2	<.0001	1.51 (1.47-1.55)

4.3.7 Association of Specialist Contact with Acute Care Services Use

Contact with geriatric medicine was associated with lower odds of an unplanned ED visit or hospital admission. After adjusting for LHIN, age, and sex, home care clients in the sample who had contact with geriatric medicine in the 90 days pre-assessment had 0.90 (95% CI 0.86-0.93) times the odds of a visit to the ED (Table 4.11) and 0.82 (95% CI 0.79-0.86) times the odds of being hospitalized (Table 4.12) in the six months post-assessment compared to those without geriatric medicine contact.

In order to investigate which subgroups of the sample most benefitted from contact with geriatric medicine, the relationship between contact with geriatric medicine and acute care services use was stratified by several scales and composite measures. After adjusting for LHIN, age, and sex, home care clients in the sample who were not HSU and had contact with geriatric medicine pre-assessment had lower odds of an ED visit (OR 0.82, 95% CI 0.78-0.87) (Table 4.11) and any hospital admission (OR 0.70, 95% CI 0.65-0.75) (Table 4.12) post-assessment than those without contact with geriatric medicine. For those who were HSU pre-assessment, there was no significant benefit of contact with geriatric medicine in preventing an ED visit or hospital admission.

Only home care clients in the sample with the lowest DIVERT scores, indicating low risk of unplanned ED visits, benefitted from contact with geriatric medicine in terms of preventing unplanned ED visits (Table 4.11) and hospital admissions (Table 4.12). After adjusting for LHIN, age, and sex, those with a DIVERT score of zero who had contact with geriatric medicine pre-assessment had 0.79 (0.70-0.89) times the odds of an unplanned ED visit in the six months post-assessment than those without geriatric medicine contact. After adjusting for LHIN, age, and sex, home care clients within the sample with a DIVERT score of one or two also had lower odds (OR 0.71, 95% CI 0.60-0.84; and OR 0.75, 95% CI 0.68-0.82, respectively) of any hospital admission in the six months post-assessment than those without geriatric medicine contact. Among those with higher DIVERT scores, there was no significant association between contact with geriatric medicine and acute care services use.

Similarly, home care clients in the sample with lower CHESS scores, indicating less medical complexity and instability, and those without a COPD or heart failure diagnosis, benefitted from contact with geriatric medicine in terms of preventing unplanned ED visits (Table 4.11) and hospital admission (Table 4.12) while those at the highest levels of CHESS and those with COPD and heart failure did not.

When stratifying by the MAPLe score, indicating risk of caregiver distress and institutionalization, the findings are less straightforward. Home care clients in the sample at the lowest MAPLe level and the highest two MAPLe levels who had contact with a geriatrician had lower odds of any unplanned ED visit (Table 4.11) or hospital admission (Table 4.12) than those without contact with geriatric medicine. However, among those with MAPLe scores of two or three (mid-range), contact with geriatric medicine pre-assessment was not significantly associated with acute care services use post-assessment.

Only home care clients in the sample with 5M scores within the mid-range (1-4, indicating some areas of care need that fall within the scope of geriatric medicine) who had contact with geriatric medicine pre-assessment had significantly lower odds of an unplanned ED visit (Table 4.10) or hospital admission (Table 4.12) post-assessment compared to those without geriatric medicine contact. For clients at the lowest and highest scores, there was no significant association between geriatric medicine contact and acute care services use. However, estimates of the association between geriatric medicine contact and acute care services use at the lowest level of 5M must be interpreted with caution. Contact with geriatric medicine almost perfectly distinguished clients with and without acute care services use.

For comparison purposes, the same analyses were repeated examining the association between contact with internal medicine and acute care services use. Contact with internal medicine is associated with higher odds of any unplanned ED visits (Table 4.13) or hospital admission (Table 4.14). After adjusting for LHIN, age, and sex, home care clients in the sample who had contact with internal medicine in the 90 days pre-assessment had 1.42 (95% CI 1.39-1.45) times greater odds of a visit to the ED and 1.55 (95% CI 1.51-1.58) times greater odds of being hospitalized in the six months post-assessment compared to those without internal medicine contact. The odds varied when stratified by the same scales and composite measures as in the previous analyses. Those who were not HSU and had contact with internal medicine pre-assessment had higher odds of acute care services use in the six months post-assessment than those who were HSU and had contact with internal medicine. Home care clients in the sample at lower levels of DIVERT who had contact with internal medicine pre-assessment had higher odds of any unplanned ED visit (DIVERT=1: OR 1.44, 95% CI 1.30-1.59; vs. DIVERT=6: OR 1.14, 95% CI 1.06-1.22) (Table 4.13) and any hospital admission (DIVERT=1: OR 1.59, 95% CI 1.41-1.79; vs. DIVERT=6: OR 1.28 , 95% CI 1.20-1.37) (Table 4.14) than those at the higher levels of DIVERT who had contact with internal medicine pre-assessment. The same trend is seen when stratifying by CHESS or 5M. Again, the results of the association between internal medicine contact and acute care services use at the lowest level of 5M must be interpreted with caution. Contact with internal medicine almost perfectly distinguished clients with and without acute care services use. When stratifying by MAPLe, it appears that the impact of contact with internal medicine is somewhat consistent across levels. Home care clients in the sample with higher MAPLe scores who had contact with internal medicine in the 90 days pre-assessment had higher odds of acute care services use in the six months post-assessment of only a slightly greater magnitude than those with lower MAPLe scores who had contact with internal medicine (Tables 4.13 and 4.14). Those who were not diagnosed with COPD or heart failure and had contact with internal medicine pre-assessment had higher odds of acute care services use in the six months post-assessment than those who were diagnosed with COPD or heart failure and had contact with internal medicine.

Table 4.11 Odds of any ED visit in the 6 months post-assessment by older, long-stay home care clients as predicted by geriatrician visits in the 90 days pre-assessment, stratified by selected scales and composite measures, Ontario, 2012-2015 (n=196,444)

	Unadjusted				Adjusted for LHIN, age, sex			
Variable	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**
Unstratified								
	-0.08 (0.01)	69.3	<.0001	0.85 (0.81-0.88)	-0.06 (0.01)	30.0	<.0001	0.90 (0.86-0.93)
High service user								
No	-0.13 (0.01)	81.2	<.0001	0.78 (0.74-0.82)	-0.10 (0.01)	47.6	<.0001	0.82 (0.78-0.87)
Yes	-0.04 (0.01)	6.9	0.009	0.93 (0.87-0.98)	0.00 (0.01)	0.0	0.84	0.99 (0.94-1.05)
DIVERT								
1	-0.14 (0.03)	21.7	<.0001	0.75 (0.67-0.85)	-0.12 (0.03)	14.4	0.0002	0.79 (0.70-0.89)
2	-0.05 (0.02)	7.4	0.007	0.90 (0.84-0.97)	-0.03 (0.02)	3.2	0.07	0.93 (0.86-1.01)
3	-0.04 (0.02)	2.9	0.09	0.92 (0.84-1.01)	-0.02 (0.02)	0.6	0.46	0.97 (0.88-1.06)
4	-0.01 (0.02)	0.2	0.67	0.98 (0.91-1.07)	0.02 (0.02)	1.0	0.31	1.04 (0.96-1.13)
5	0.00 (0.03)	0.0	0.95	1.00 (0.89-1.12)	0.02 (0.03)	0.3	0.58	1.04 (0.92-1.17)
6	-0.07 (0.04)	3.0	0.08	0.87 (0.74-1.02)	-0.03 (0.04)	0.6	0.46	0.94 (0.80-1.11)
CHESS								
0	-0.14 (0.02)	33.1	<.0001	0.76 (0.70-0.84)	-0.11 (0.02)	22.4	<.0001	0.80 (0.73-0.88)
1	-0.03 (0.02)	3.3	0.07	0.94 (0.87-1.01)	-0.01 (0.02)	0.3	0.59	0.98 (0.91-1.05)
2	-0.08 (0.02)	17.7	<.0001	0.86 (0.80-0.92)	-0.05 (0.02)	7.6	0.006	0.90 (0.84-0.97)
3	-0.08 (0.03)	8.6	0.003	0.86 (0.77-0.95)	-0.05 (0.03)	3.7	0.05	0.90 (0.81-1.00)
4	-0.04 (0.05)	0.8	0.36	0.92 (0.76-1.11)	-0.02 (0.05)	0.2	0.62	0.95 (0.79-1.16)
5	0.10 (0.28)	0.1	0.71	1.23 (0.41-3.71)	0.18 (0.31)	0.3	0.56	1.42 (0.43-4.73)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted χ^2	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted χ^2	Adjusted *p*-value	Adjusted Odds Ratio (95% CI)
MAPLe								
1	-0.14 (0.04)	12.6	0.0004	0.76 (0.66-0.89)	-0.08 (0.04)	4.7	0.03	0.85 (0.73-0.98)
2	-0.01 (0.05)	0.1	0.80	0.98 (0.81-1.17)	0.04 (0.05)	0.6	0.44	1.08 (0.89-1.30)
3	-0.03 (0.02)	2.7	0.10	0.93 (0.86-1.01)	-0.01 (0.02)	0.4	0.53	0.97 (0.90-1.06)
4	-0.14 (0.02)	82.7	<.0001	0.76 (0.71-0.80)	-0.11 (0.02)	50.1	<.0001	0.80 (0.75-0.85)
5	-0.07 (0.02)	12.0	0.0005	0.86 (0.79-0.94)	-0.05 (0.02)	5.6	0.02	0.90 (0.83-0.98)
5M								
*0	-0.01 (0.25)	0.0	0.9626	0.98 (0.37-2.58)	0.07 (0.26)	0.1	0.7863	1.15 (0.42-3.13)
1	-0.21 (0.07)	9.8	0.0018	0.65 (0.50-0.85)	-0.17 (0.07)	6.1	0.0138	0.71 (0.55-0.93)
2	-0.18 (0.03)	44.5	<.0001	0.69 (0.62-0.77)	-0.15 (0.03)	30.5	<.0001	0.73 (0.66-0.82)
3	-0.10 (0.02)	29.7	<.0001	0.82 (0.77-0.88)	-0.07 (0.02)	15.0	0.0001	0.87 (0.81-0.93)
4	-0.07 (0.02)	16.1	<.0001	0.88 (0.82-0.93)	-0.05 (0.02)	7.4	0.0067	0.91 (0.85-0.98)
5	-0.02 (0.03)	0.4	0.5276	0.97 (0.88-1.07)	0.02 (0.03)	0.6	0.4499	1.04 (0.94-1.15)
Diagnosis of COPD or heart failure								
No	-0.07 (0.01)	40.4	<.0001	0.87 (0.83-0.91)	-0.05 (0.01)	16.9	<.0001	0.91 (0.87-0.95)
Yes	-0.05 (0.02)	4.2	0.04	0.91 (0.83-1.00)	-0.02 (0.02)	0.8	0.37	0.96 (0.88-1.05)

*Quasi-complete separation of data points detected, maximum likelihood estimate may not exist. Results based on last maximum likelihood iteration. Validity of the model fit is questionable.

Table 4.12 Odds of any hospital admission in the 6 months post-assessment by older, long-stay home care clients as predicted by geriatrician visits in the 90 days pre-assessment, stratified by selected scales and composite measures, Ontario, 2012-2015 (n=196,444)

	Unadjusted				Adjusted for LHIN, age, sex			
Variable	Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)	Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)
Unstratified								
	-0.12 (0.01)	104.5	<.0001	0.79 (0.76-0.83)	-0.10 (0.01)	74.7	<.0001	0.82 (0.79-0.86)
High service user								
No	-0.20 (0.02)	130.3	<.0001	0.67 (0.63-0.72)	-0.18 (0.02)	106.1	<.0001	0.70 (0.65-0.75)
Yes	-0.05 (0.02)	10.4	0.001	0.91 (0.85-0.96)	-0.02 (0.02)	2.2	0.13	0.95 (0.90-1.02)
DIVERT								
1	-0.20 (0.04)	22.6	<.0001	0.67 (0.57-0.79)	-0.17 (0.04)	16.5	<.0001	0.71 (0.60-0.84)
2	-0.15 (0.02)	40.0	<.0001	0.74 (0.67-0.81)	-0.15 (0.02)	36.2	<.0001	0.75 (0.68-0.82)
3	-0.06 (0.03)	5.0	0.03	0.89 (0.80-0.99)	-0.04 (0.03)	2.7	0.10	0.92 (0.82-1.02)
4	-0.05 (0.02)	4.4	0.04	0.91 (0.83-0.99)	-0.03 (0.02)	1.5	0.22	0.95 (0.87-1.03)
5	0.00 (0.03)	0.0	0.99	1.00 (0.89-1.13)	0.00 (0.03)	0.0	0.97	1.00 (0.89-1.13)
6	0.01 (0.04)	0.0	0.88	1.01 (0.87-1.18)	0.02 (0.04)	0.3	0.58	1.05 (0.89-1.23)
CHESS								
0	-0.17 (0.03)	30.9	<.0001	0.72 (0.64-0.81)	-0.14 (0.03)	22.9	<.0001	0.75 (0.67-0.84)
1	-0.08 (0.02)	12.6	0.0004	0.86 (0.79-0.94)	-0.07 (0.02)	9.4	0.002	0.88 (0.81-0.95)
2	-0.11 (0.02)	29.3	<.0001	0.81 (0.74-0.87)	-0.10 (0.02)	21.8	<.0001	0.83 (0.76-0.90)
3	-0.10 (0.03)	13.9	0.0002	0.82 (0.73-0.91)	-0.09 (0.03)	10.9	0.001	0.83 (0.75-0.93)
4	-0.05 (0.05)	0.9	0.33	0.91 (0.76-1.10)	-0.04 (0.05)	0.6	0.45	0.93 (0.77-1.13)
5	0.20 (0.28)	0.5	0.49	1.48 (0.49-4.47)	0.36 (0.31)	1.4	0.24	2.05 (0.61-6.89)

Variable	Unadjusted: Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)	Adjusted for LHIN, age, sex: Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)
MAPLe								
1	-0.18 (0.05)	15.0	0.0001	0.71 (0.59-0.84)	-0.12 (0.05)	6.3	0.01	0.79 (0.66-0.95)
2	0.01 (0.05)	0.0	0.92	1.01 (0.82-1.24)	0.04 (0.05)	0.5	0.50	1.07 (0.87-1.32)
3	-0.04 (0.02)	3.4	0.06	0.92 (0.84-1.01)	-0.03 (0.02)	1.5	0.21	0.95 (0.87-1.03)
4	-0.18 (0.02)	97.1	<.0001	0.70 (0.66-0.76)	-0.16 (0.02)	82.3	<.0001	0.72 (0.67-0.77)
5	-0.11 (0.02)	19.9	<.0001	0.81 (0.73-0.89)	-0.09 (0.02)	14.5	0.0001	0.83 (0.75-0.91)
5M								
*0	-0.92 (0.52)	3.2	0.0743	0.16 (0.02-1.20)	-0.88 (0.52)	2.8	0.0921	0.17 (0.02-1.33)
1	-0.35 (0.09)	15.6	<.0001	0.50 (0.35-0.71)	-0.29 (0.09)	10.6	0.0011	0.56 (0.40-0.80)
2	-0.29 (0.04)	65.8	<.0001	0.56 (0.49-0.65)	-0.26 (0.04)	53.9	<.0001	0.59 (0.51-0.68)
3	-0.14 (0.02)	45.5	<.0001	0.75 (0.69-0.82)	-0.13 (0.02)	36.4	<.0001	0.77 (0.71-0.84)
4	-0.08 (0.02)	19.9	<.0001	0.85 (0.79-0.91)	-0.07 (0.02)	15.6	<.0001	0.86 (0.80-0.93)
5	-0.03 (0.03)	1.2	0.2753	0.94 (0.85-1.05)	-0.01 (0.03)	0.2	0.666	0.98 (0.88-1.09)
Diagnosis of COPD or heart failure								
No	-0.12 (0.01)	85.5	<.0001	0.79 (0.75-0.83)	-0.10 (0.01)	60.66	<.0001	0.81 (0.77-0.86)
Yes	-0.01 (0.02)	0.4	0.53	0.97 (0.89-1.07)	-0.01 (0.02)	0.3	0.59	0.97 (0.89-1.07)

*Quasi-complete separation of data points detected, maximum likelihood estimate may not exist. Results based on last maximum likelihood iteration. Validity of the model fit is questionable.

Table 4.13 Odds of any ED visit in the 6 months post-assessment by older, long-stay home care clients as predicted by internal medicine visits in the 90 days pre-assessment, stratified by selected scales and composite measures, Ontario, 2012-2015 (n=196,444)

	Unadjusted				Adjusted for LHIN, age, sex			
Variable	Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)	Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)
Unstratified								
	0.17 (0.01)	918.6	<.0001	1.39 (1.36-1.42)	0.17 (0.01)	978.0	<.0001	1.42 (1.39-1.45)
High service user								
No	0.12 (0.01)	137.8	<.0001	1.26 (1.22-1.31)	0.12 (0.01)	153.2	<.0001	1.28 (1.23-1.34)
Yes	0.06 (0.01)	64.6	<.0001	1.12 (1.09-1.15)	0.07 (0.01)	90.0	<.0001	1.15 (1.11-1.18)
DIVERT								
1	0.18 (0.03)	50.5	<.0001	1.43 (1.29-1.57)	0.18 (0.03)	50.7	<.0001	1.44 (1.30-1.59)
2	0.13 (0.01)	100.8	<.0001	1.30 (1.23-1.37)	0.14 (0.01)	107.9	<.0001	1.32 (1.25-1.39)
3	0.08 (0.01)	34.4	<.0001	1.16 (1.11-1.22)	0.09 (0.01)	46.9	<.0001	1.20 (1.14-1.26)
4	0.08 (0.01)	53.2	<.0001	1.16 (1.12-1.21)	0.09 (0.01)	67.3	<.0001	1.19 (1.14-1.24)
5	0.06 (0.01)	22.7	<.0001	1.14 (1.08-1.20)	0.07 (0.01)	27.5	<.0001	1.16 (1.09-1.22)
6	0.05 (0.02)	9.0	0.003	1.11 (1.04-1.19)	0.06 (0.02)	12.3	0.0005	1.14 (1.06-1.22)
CHESS								
0	0.19 (0.01)	167.5	<.0001	1.46 (1.38-1.55)	0.19 (0.01)	169.8	<.0001	1.47 (1.39-1.56)
1	0.14 (0.01)	198.9	<.0001	1.33 (1.28-1.38)	0.15 (0.01)	220.2	<.0001	1.35 (1.30-1.41)
2	0.14 (0.01)	202.9	<.0001	1.32 (1.27-1.38)	0.15 (0.01)	210.9	<.0001	1.34 (1.29-1.39)
3	0.14 (0.01)	122.4	<.0001	1.32 (1.26-1.39)	0.14 (0.01)	119.5	<.0001	1.32 (1.26-1.39)
4	0.13 (0.03)	24.8	<.0001	1.28 (1.16-1.42)	0.12 (0.03)	22.9	<.0001	1.28 (1.16-1.42)
5	-0.11 (0.09)	1.4	0.24	0.81 (0.56-1.16)	-0.09 (0.10)	0.8	0.38	0.84 (0.57-1.24)

Variable	Unadjusted: Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)	Adjusted for LHIN, age, sex: Estimate (Standard Error)	χ^2	*p*-value	Odds Ratio (95% CI)
MAPLe								
1	0.17 (0.01)	162.2	<.0001	1.40 (1.33-1.47)	0.16 (0.01)	142.9	<.0001	1.38 (1.31-1.45)
2	0.14 (0.02)	62.6	<.0001	1.32 (1.23-1.42)	0.14 (0.02)	63.3	<.0001	1.33 (1.24-1.43)
3	0.17 (0.01)	338.2	<.0001	1.41 (1.36-1.46)	0.18 (0.01)	376.7	<.0001	1.44 (1.39-1.50)
4	0.18 (0.01)	323.8	<.0001	1.44 (1.39-1.50)	0.19 (0.01)	340.3	<.0001	1.46 (1.41-1.53)
5	0.15 (0.02)	71.9	<.0001	1.36 (1.27-1.46)	0.16 (0.02)	77.4	<.0001	1.39 (1.29-1.49)
5M								
*0	0.16 (0.06)	6.6	0.0103	1.37 (1.08-1.75)	0.12 (0.07)	3.2	0.0735	1.26 (0.98-1.63)
1	0.22 (0.03)	69.7	<.0001	1.54 (1.39-1.71)	0.22 (0.03)	67.4	<.0001	1.55 (1.40-1.72)
2	0.19 (0.01)	162.5	<.0001	1.45 (1.37-1.54)	0.18 (0.01)	148.3	<.0001	1.44 (1.36-1.53)
3	0.17 (0.01)	294.8	<.0001	1.42 (1.36-1.48)	0.18 (0.01)	304.6	<.0001	1.44 (1.38-1.50)
4	0.14 (0.01)	238.2	<.0001	1.33 (1.28-1.38)	0.15 (0.01)	257.3	<.0001	1.35 (1.31-1.41)
5	0.12 (0.01)	80.9	<.0001	1.27 (1.21-1.34)	0.13 (0.01)	92.5	<.0001	1.30 (1.23-1.37)
Diagnosis of COPD or heart failure								
No	0.15 (0.01)	555.9	<.0001	1.36 (1.32-1.39)	0.16 (0.01)	584.9	<.0001	1.38 (1.34-1.41)
Yes	0.14 (0.01)	176.6	<.0001	1.32 (1.27-1.37)	0.15 (0.01)	198.3	<.0001	1.35 (1.29-1.40)

*Quasi-complete separation of data points detected, maximum likelihood estimate may not exist. Results based on last maximum likelihood iteration. Validity of the model fit is questionable.

Table 4.14 Odds of any hospital admission in the 6 months post-assessment by older, long-stay home care clients as predicted by internal medicine visits in the 90 days pre-assessment, stratified by selected scales and composite measures, Ontario, 2012-2015 (n=196,444)

	Unadjusted				Adjusted for LHIN, age, sex			
Variable	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**
Unstratified								
	0.22 (0.01)	1450.7	<.0001	1.55 (1.51-1.58)	0.22 (0.01)	1395.3	<.0001	1.55 (1.51-1.58)
High service user								
No	0.16 (0.01)	225.2	<.0001	1.39 (1.33-1.45)	0.17 (0.01)	233.1	<.0001	1.40 (1.34-1.46)
Yes	0.11 (0.01)	244.0	<.0001	1.25 (1.22-1.29)	0.11 (0.01)	242.9	<.0001	1.26 (1.22-1.29)
DIVERT								
1	0.24 (0.03)	68.1	<.0001	1.63 (1.45-1.83)	0.23 (0.03)	59.6	<.0001	1.59 (1.41-1.79)
2	0.18 (0.01)	160.7	<.0001	1.44 (1.36-1.53)	0.19 (0.01)	161.2	<.0001	1.45 (1.37-1.54)
3	0.13 (0.01)	83.5	<.0001	1.29 (1.22-1.36)	0.13 (0.01)	87.9	<.0001	1.30 (1.23-1.38)
4	0.12 (0.01)	131.7	<.0001	1.28 (1.23-1.34)	0.12 (0.01)	127.6	<.0001	1.28 (1.23-1.34)
5	0.12 (0.01)	83.5	<.0001	1.28 (1.21-1.35)	0.12 (0.01)	76.6	<.0001	1.27 (1.20-1.34)
6	0.13 (0.02)	60.3	<.0001	1.29 (1.21-1.38)	0.12 (0.02)	54.1	<.0001	1.28 (1.20-1.37)
CHESS								
0	0.22 (0.02)	176.1	<.0001	1.55 (1.46-1.66)	0.22 (0.02)	162.7	<.0001	1.54 (1.44-1.64)
1	0.19 (0.01)	289.1	<.0001	1.45 (1.39-1.52)	0.19 (0.01)	279.8	<.0001	1.45 (1.39-1.52)
2	0.21 (0.01)	425.6	<.0001	1.53 (1.47-1.59)	0.21 (0.01)	398.7	<.0001	1.52 (1.46-1.58)
3	0.17 (0.01)	191.6	<.0001	1.41 (1.34-1.48)	0.16 (0.01)	158.0	<.0001	1.38 (1.31-1.45)
4	0.19 (0.02)	59.5	<.0001	1.45 (1.32-1.60)	0.17 (0.02)	48.4	<.0001	1.41 (1.28-1.56)
5	-0.10 (0.09)	1.2	0.27	0.81 (0.57-1.17)	-0.09 (0.10)	0.8	0.36	0.83 (0.56-1.24)

Variable	Unadjusted				Adjusted for LHIN, age, sex			
	Estimate (Standard Error)	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	**χ^2**	***p*-value**	**Odds Ratio (95% CI)**
MAPLe								
1	0.21 (0.01)	230.1	<.0001	1.54 (1.45-1.62)	0.19 (0.01)	181.4	<.0001	1.48 (1.39-1.56)
2	0.17 (0.02)	78.1	<.0001	1.40 (1.30-1.51)	0.16 (0.02)	70.9	<.0001	1.39 (1.29-1.50)
3	0.21 (0.01)	487.5	<.0001	1.53 (1.47-1.59)	0.22 (0.01)	496.8	<.0001	1.55 (1.49-1.61)
4	0.24 (0.01)	497.1	<.0001	1.60 (1.54-1.67)	0.23 (0.01)	473.9	<.0001	1.60 (1.53-1.67)
5	0.24 (0.02)	156.0	<.0001	1.60 (1.49-1.73)	0.24 (0.02)	156.9	<.0001	1.62 (1.50-1.74)
5M								
*0	0.23 (0.07)	12.2	0.0005	1.59 (1.23-2.05)	0.18 (0.07)	6.4	0.0117	1.42 (1.08-1.87)
1	0.27 (0.03)	94.1	<.0001	1.72 (1.54-1.92)	0.26 (0.03)	82.2	<.0001	1.69 (1.51-1.89)
2	0.28 (0.02)	307.5	<.0001	1.75 (1.64-1.86)	0.26 (0.02)	266.1	<.0001	1.70 (1.59-1.81)
3	0.21 (0.01)	389.2	<.0001	1.54 (1.47-1.60)	0.21 (0.01)	365.9	<.0001	1.53 (1.46-1.60)
4	0.20 (0.01)	418.3	<.0001	1.48 (1.43-1.54)	0.20 (0.01)	405.8	<.0001	1.48 (1.43-1.54)
5	0.17 (0.01)	155.1	<.0001	1.40 (1.33-1.47)	0.17 (0.01)	152.2	<.0001	1.40 (1.33-1.48)
Diagnosis of COPD or heart failure								
No	0.21 (0.01)	937.5	<.0001	1.53 (1.49-1.57)	0.21 (0.01)	877.9	<.0001	1.52 (1.48-1.56)
Yes	0.17 (0.01)	274.0	<.0001	1.41 (1.35-1.46)	0.17 (0.01)	268.8	<.0001	1.41 (1.35-1.47)

*Quasi-complete separation of data points detected, maximum likelihood estimate may not exist. Results based on last maximum likelihood iteration. Validity of the model fit is questionable.

4.4 Discussion

4.4.1 Service Use Patterns

This study represents the first examination of the patterns of outpatient geriatric medicine services use by the overall population of older, home care clients in Ontario. It also describes their frequency of contact with other outpatient physician services and acute care services, and explores subsequent acute care services use as outcomes of prior contact with geriatric medicine. The implications of current practice patterns for health care system resource planning are discussed.

The older, home care client population in Ontario is complex, and becoming increasingly more so with population aging. Almost a third of the sample were already over the age of 85, and the majority were functionally and cognitively impaired, at risk for caregiver distress, institutionalization, and unplanned ED visits. This group is precisely the target population of geriatric medicine, according to experts in both the US and Canada: individuals 85 years and older, with moderate or severe functional impairment, complex biomedical or psychomedical conditions, frailty, and geriatric syndromes (Molnar et al., 2017; Warshaw et al., 2008).

The vast majority of home care clients had multiple contacts with physicians in general on an outpatient basis during the periods of time observed (90 days pre-assessment, 90 days post-assessment, and six months post-assessment). The frequency of contact was generally lower in the 90 days post-assessment than in the 90 days pre-assessment, potentially because clients are often referred to home care services when undergoing a crisis, which could account for their higher use of services during the pre-assessment time period. Once a client was assessed and began receiving home care services, it is possible that their situation improved somewhat and there was less need for physician services. Very few home care clients had any outpatient contact with a geriatrician, despite the fact that geriatric medicine as a specialty is geared towards caring for vulnerable, older adults with complex biopsychosocial needs, such as the older home care client population. As described earlier, it has been suggested that geriatric medicine care should be targeted to the top 25%-30% most vulnerable older adults (Chun, 2011; Fried & Hall, 2008; Warshaw et al., 2008). Home care clients represent some of the most complex and vulnerable of the community-dwelling older adult population in Ontario, yet only 5% had any contact with geriatric medicine. Further, it appears that access differs based on geographic location and is not equitable across the province. There is some evidence that referral to specialists is predicted in part by community type, or size, with family physicians in larger urban centres with medical schools making a greater number of referrals to specialists than physicians in other communities (Chan & Austin, 2003; Iverson, Coleridge, Fulda, & Licciardone, 2005).

The low percentage of older home care clients in contact with geriatric medicine is perhaps due to the lack of services available or a poor understanding of the role of geriatrics and when to appropriately consult or refer (Gordon, 2011). Lack of services available or long wait times may exacerbate issues accessing geriatric medicine. There is evidence that once referred, older adults in Canada are less likely to see a specialist in a timely manner following referral compared to seniors in nine other countries (Osborn et al., 2014). Further, some family physicians may have difficulty determining which older patients with unmet needs would benefit from referral to geriatric medicine (Man-Son-Hing, Power, Byszewski, & Dalziel, 1997). These factors are consistent with barriers to referral identified by experts in the care of older adults in Ontario as described in Chapter 2.

The majority of home care clients had more than one discipline involved in their care post-assessment, indicating that in addition to having multiple contacts with physicians in general, clients had contact with multiple types of physicians. With multiple disciplines involved in the care of complex, older adults, there is the potential for lack of care coordination and its consequences, including conflicting care plans and multiple, interacting medications (Bodenheimer, 2008; Green, Hawley, & Rask, 2007). Geriatric medicine specialists are trained to take a holistic approach, simultaneously managing multiple geriatric syndromes and chronic conditions, balancing the benefits and harms of medications and interventions (Cantor, 2017; Chun, 2011; Fried & Hall, 2008). While few home care clients were actually in contact with geriatric medicine, those with multiple complex conditions, under the care of multiple disciplines, would likely benefit from the holistic approach taken by a geriatric medicine specialist.

Disciplines most commonly seen were family medicine, followed by internal medicine. This finding is consistent with the results of a Canadian study that found that family medicine and internal medicine provided about 75% of all medical services to older adults in eight provinces (Slade, Shrichand, & DiMillo, 2019). In the same study, geriatric medicine accounted for less than 1% of the care provided to older adults because of their limited numbers. Of the home care clients who had contact with geriatric medicine, few clients had no other physician contact during that time period in the current study. As expected, it appears geriatric medicine is not taking on the role of primary community-based medical care provider in Ontario, even for the most vulnerable community-dwelling older adults. In light of the limited supply of geriatricians provincially, it would not be feasible for geriatric medicine to take on this role.

It is expected that family medicine should be the specialty with the highest rate of contact as family physicians are the main primary care providers in Ontario and act as gatekeepers to other parts of the health care system (Canadian Medical Association, 2018a). In light of this gatekeeper role, it was expected that as frequency of contact with family medicine increased pre-assessment, subsequent contact with geriatric medicine would also increase. This was based on the assumption that clients with frequent attendance in primary care have complex needs and family medicine physicians would refer to specialists when appropriate. However, this trend was weaker than expected. Within the same time period (90 days pre-assessment), as frequency of contact with family medicine increased, any contact with geriatric medicine decreased. This finding could suggest that frequent contact with family medicine reflects care that is being managed in that setting and does not require referral to a geriatric specialist. Contact with family medicine may include contact with physicians who have additional Care of the Elderly (COE) training, and are better equipped to manage complex, older patients. However, it is estimated that less than 1% of family physicians in Ontario have COE training (Borrie, Seitz, et al., 2019; Canadian Medical Association, 2018d).

Nevertheless, as frequency of contact with family medicine increased, more home care clients had contact with internal medicine, both within the same time period (90 days pre-assessment), and during the subsequent time period (90 days post-assessment). This finding suggests that frequent contact with family medicine does not necessarily mean that care is being well managed in that setting. Geriatric medicine specialists are better equipped to handle caring for complex, older adults. A study by Phelan and colleagues (2008) found that compared to generalist physicians, fellowship-trained geriatricians performed better in terms of avoiding inappropriate medications and screening for geriatric syndromes (Phelan et al., 2008).

Another possibility is that this finding could reflect a lack of collaboration or understanding between these disciplines. In a 2009 study by Beaulieu et al., there was some evidence found of increasing distance between specialty and general medicine reported within residency training programs in Canada (Beaulieu et al., 2009). It is unclear whether the teaching of collaboration between family physicians and specialists during medical training has improved since that study was published in 2009. Regardless, the relationships between primary care, home care, and outpatient geriatric medicine may be improved. Stronger relationships between these different community-based care providers may help to ensure appropriate referrals to geriatric medicine (Heckman, Hillier, et al., 2013).

4.4.2 Characteristics Associated with Services Use

Home care clients who had contact with geriatric medicine tended to be male, living with others, married, and to have a diagnosis of dementia but not of COPD or heart failure. The descriptive findings suggested that dementia may actually be underdiagnosed among older home care clients, as only about one fifth had a diagnosis but almost two thirds had some degree of cognitive impairment. Home care clients who were in contact with geriatric medicine tended to have high cognitive impairment, more symptoms of depression, higher risk of caregiver distress and risk of institutionalization. However, home care clients who had contact with geriatric medicine also tended to have lower pain scores, less medical complexity and instability, and lower risk of unplanned ED visits.

These results were consistent with the findings of the regression analysis examining the association of various scales and outcomes measures with geriatric medicine. It appears that geriatric medicine plays less of a role in caring for home care clients with acute illness and more of a role in caring for home care clients with cognitive and functional impairment. Those with complex or unstable medical needs or acute illnesses appear to be cared for by internal medicine rather than geriatric medicine. Conversely, clients with functional impairment are cared for by geriatric medicine, but not internal medicine. It is important to note that geriatric medicine specialists are originally internal medicine specialists who have additional training in caring for older adults. They are, therefore, well positioned to care for older adults who are medically complex, unstable, or acutely ill. Experts in the care of older adults in Ontario agreed, suggesting that multicomplexity and acute illness are in fact important characteristics for referral to SGS in addition to cognitive and functional impairment (see Chapter 2). On a similar theme, high service use (HSU) was associated with lower odds of geriatric medicine contact, despite the fact that provincial experts also identified multiple ED visits as important for referral to SGS (see Chapter 2). These findings may again reflect a lack of understanding of the expertise and role of geriatric medicine. It is also possible that outpatient geriatric medicine has moved away from its roots in internal medicine and that geriatricians practicing on an outpatient basis are less comfortable taking on the care of more medically complex patients, but that is impossible to discern within the scope of this study.

4.4.3 Benefits of Geriatric Medicine Services Use

Overall, contact with geriatric medicine appears to prevent acute care services use in the subsequent six months. Preventing unnecessary acute care services is a major health system policy goal of the current provincial government in Ontario (Devlin et al., 2019). The findings of this research indicate that geriatric medicine has a role to play in achieving this goal and ensuring the sustainability of the health care system in the context of an aging population.

The benefit derived from contact with geriatric medicine appears to vary by subgroups of the older home care population. The medically complex and unstable, at risk for unplanned ED visits, or those with cardiorespiratory conditions, who actually had contact with geriatric medicine did not appear to benefit from their care in terms of preventing unplanned ED visits or hospital admissions, compared to their less complex and more stable counterparts. It is possible that, since clients who are medically complex or unstable, at high risk for unplanned ED visits, or those with cardiorespiratory conditions are already more likely to use acute care services, any benefit from contact with geriatric medicine is diluted (Costa et al., 2015; Hirdes et al., 2003). These findings may indicate the need for a more upstream approach to providing geriatric medicine services to older home care clients to manage their medical needs before they progress to a highly complex and unstable situation. Further, these findings also highlight that geriatric medicine makes a difference in caring for older home care clients with functional and cognitive impairment, as indicated by higher MAPLe scores.

Home care clients who had contact with internal medicine were more likely to visit the ED or be admitted to hospital than those who did not have contact with internal medicine. It is possible that those who require the care of an internal medicine specialist are inherently more at risk for acute care services use than those who do not. Stratifying by certain summary measures allowed more insight into this topic. If an individual has a low DIVERT score, indicating low risk of unplanned ED visit, yet they see an internal medicine specialist, it is likely for reasons not captured in the component items of DIVERT, which include previous emergency department use, cardio-respiratory symptoms, and cardio-respiratory conditions. Therefore, whatever is driving contact with internal medicine must be strong enough such that the effect size of that contact is stronger at this level. At the highest level of DIVERT, the odds ratio is smaller. It may be that, since these clients are already at high risk for acute care services use, whatever additional factors are driving contact with internal medicine have less of an impact.

The strength of the odds of acute care services use associated with internal medicine contact increased as MAPLe increased. As older home care clients with higher MAPLe scores have lower odds of contact with internal medicine, it is possible that whatever is driving that contact may also be more strongly driving contact with acute care services. If an individual is more cognitively and functionally impaired, whatever reason is driving contact with internal medicine may result in a higher odds of acute care services use. If an individual is less cognitively or functionally impaired, yet has a reason for contact with internal medicine, they are still at increased risk of acute care services, but not as much as someone who was more impaired to begin with.

4.4.4 Implications

The findings of this study provide evidence to help understand the current state of geriatric medicine in Ontario. The Provincial Geriatrics Leadership Office (PGLO) is currently identifying and mapping the programs, services, and human resources that deliver specialized geriatric care to older people in Ontario (Kay, 2019). The purpose of their project is to obtain an overview of the supply and utilization of SGS in order to inform future capacity planning. The results of this dissertation will complement the PGLO work to gain a deeper understanding of the current landscape of geriatric medicine in Ontario.

A better understanding is needed of referral practices to geriatric medicine, and the barriers and facilitators to accessing specialized geriatric care. It appears that there are home care clients in the province who have care needs that would benefit from the expertise of a specialist in geriatric medicine; however, they are not accessing that expertise and are less likely to access that care than more well clients. From the limited analysis of contact with geriatric medicine by region, it appears that there is differential access to geriatric medicine services across Ontario. The findings highlight a need for an approach to target the limited resources available in a more rational and equitable manner across the province, and identify individuals who would most benefit from geriatric medicine specialist care. One approach to facilitate referrals that was recommended by provincial experts in the care of older adults (see Chapter 2) is for home care coordinators to be allowed to directly refer clients to geriatric medicine, or the broader spectrum of community-based SGS. This practice is allowed within some regions in Ontario but not all (Michael Garron Hospital, 2019; North Simcoe Muskoka Specialized Geriatric Services, 2019; North York General, 2019; Providence Care, n.d.; Seniors Care Network, 2019; St. Joseph's Health Care London, 2019; The Regional Geriatric

Program of Eastern Ontario, 2019). Centralized intake services may also be used to facilitate referrals and triage care.

There is also a need to improve relationships and collaboration between primary care, home care, and community-based geriatric medicine. Non-specialized medical students, residents, primary care physicians, specialists and other health care professionals must also have an improved understanding of health changes in older adults and the role of geriatric medicine to allow for early identification, referral, and intervention.

These results support the need for a provincial health human resources strategy, including approaches to education, training, recruitment, and hiring, so that the health workforce in Ontario is well equipped to care for an aging population. Medical schools and professional associations should place a greater emphasis on training in geriatrics and recruiting trainees into specialized geriatric programs to address the lack of geriatricians in this province. Community-based physicians specialized in geriatric medicine may benefit from additional training in caring for older adults with medical complexity and instability.

4.4.5 Limitations

This study has several limitations to consider in interpreting and applying its findings. It was not possible to discern why individuals were or were not referred to geriatric medicine, whether there were individuals who were referred who did not actually receive care, or the wait times to access care. It was not possible to perform a comprehensive analysis comparing practice patterns by region within the province as geographical data was encrypted by ICES for privacy reasons.

In order to create the dependent variable, contact with geriatric medicine was restricted to outpatient physician billing records by location code. The location code is determined by an algorithm created by ICES that may contain some error. Therefore, some of the contact recorded may have actually been in-patient. Nevertheless, the results indicate that acute care issues were not associated with geriatric medicine contact. If some of the contact recorded was indeed on an in-patient basis, the associations between acute conditions such as cardiorespiratory conditions or medical complexity and instability would have been stronger and positive. It was also not possible to discern or distinguish whether any of the contact with family medicine included contact with physicians who had completed the Care of the Elderly (COE) training program.

Finally, the sample only included older long-stay home care clients with an admission assessment during the study period. All client clinical characteristics were obtained from this admission assessment. The characteristics of new home care clients may differ systematically from established home care clients. Further, the findings may not be generalizable to short-stay older home care clients receiving services for less than 60 days who have different care needs than long-stay home care clients.

4.5 Conclusions

In summary, few older home care clients have contact with geriatric medicine. Those who do tend to be male, living with others, cognitively impaired, dependent on a caregiver, but not medically complex or acutely ill, and have care needs within the scope of geriatric medicine. It does not appear that family physicians refer patients to geriatric medicine when overwhelmed by frequent visits. Clients are actually more likely to be in contact with internal medicine. Nevertheless, older home care clients who do have contact with geriatric medicine are less likely to use acute care services. The results of this study provide insight into the current state of geriatric medicine in Ontario and support the development of a strategy for capacity planning moving forward.

Chapter 5
Determinants of Contact with Geriatric Medicine by Older Home Care Clients

5.1 Introduction

5.1.1 Geriatric Medicine

Geriatric medicine is a sub-specialty of internal medicine dedicated to the care of older adults (Canadian Medical Association, 2018c). Geriatricians have expertise in age-related physiological changes and are trained to manage geriatric syndromes and multiple chronic conditions through a holistic, patient-centred approach (Cantor, 2017; Fried & Hall, 2008). They are able to balance the benefits and harms of several, potentially interacting, medications and interventions. In Ontario, some geriatricians practice within specialized geriatric services (SGS) teams. SGS teams are multidisciplinary teams of health care professionals who provide a spectrum of hospital and community-based health care services to recognize and care for older adults with multiple, complex needs (The Regional Geriatric Programs of Ontario, 2016).

There is currently a shortage in the number of geriatricians practicing in Ontario, with an estimated deficit of over 100 full-time equivalent physicians (Borrie, Kay, et al., 2019; Canadian Medical Association, 2018c). Of the practicing geriatricians, less than one fifth practice in community-based settings (Canadian Medical Association, 2018c; The College of Family Physicians of Canada et al., 2014). Due to the limited availability of these and other community-based SGS, not every vulnerable community-dwelling older adult has access to specialized care, nor is it clear how these resources are allocated and which older adults actually gain access.

5.1.2 Behavioural Model of Health Services Utilization

Access to health services can be understood through the Behavioural Model of Health Services Utilization, the most commonly cited theory or framework of access to health care services (Aday & Andersen, 1974; Andersen & Newman, 1973; Ricketts & Goldsmith, 2005). This multi-level model is meant to both explain and predict the use of health care services (Andersen, 1995). It considers societal and individual determinants of access, and assumes that the interplay among these multiple variables results in the type and amount of services used (Andersen & Newman, 1973; Babitsch et al., 2012). Individual determinants are divided into three categories: predisposing, enabling, and need.

The predisposing determinants are those characteristics belonging to an individual which exist prior to the onset of illness. Although these characteristics are not directly responsible for use of health services, they may predispose an individual to be more or less likely to use services, and include demographic variables (e.g., age, sex), social structure (e.g., education, head of family status), and attitudes or beliefs (e.g., towards medicine, physicians, diseases). Enabling determinants deal with the ability of and means available to an individual to act on their values, satisfy their health needs, and obtain care (Aday & Andersen, 1974; Andersen & Newman, 1973). These include variables such as income, health insurance coverage, and having a regular primary care physician. Need determinants are the most immediate cause for health services use, and reflect the person's individual illness level, whether as perceived or evaluated by the health care system (Aday & Andersen, 1974; Andersen & Newman, 1973).

As predisposing characteristics, both sex and gender have an impact on individual health risk, health and care-seeking behaviours, outcomes, and treatments (Butler-Jones, 2012). While interconnected, the terms "sex" and "gender" are not synonymous (Johnson et al., 2009). Sex refers to biological and physiological characteristics that distinguish males and females, including anatomy, physiology, genetics, and hormones (Butler-Jones, 2012; Clow et al., 2009; Johnson et al., 2009). Gender refers to socio-cultural characteristics ascribed to males and females, such as personality traits, attitudes, behaviours, values, roles, relative power, and influence (Butler-Jones, 2012; Clow et al., 2009; Johnson et al., 2009). Nevertheless, when individuals are asked to identify themselves as one or the other, their response likely reflects components of both biological and social characteristics (Johnson et al., 2007). Sex- and gender-based analysis (SGBA) is a systematic and iterative process of integrating sex and gender considerations in research. In studies using secondary data, it is recommended that results be disaggregated by sex in order to explore similarities and differences (Johnson et al., 2007). In exploring determinants of access to specialized geriatric care using administrative services use data, sex and gender should be considered in this way.

5.1.3 Literature Review of the Determinants of Contact with Outpatient Physician Services

Many articles and reviews have been published on the use of health services by older adults. Some researchers have taken a broad approach, using the Behavioural Model of Health Services Utilization as a guide to examine which characteristics most strongly predict services use. Other researchers have chosen to focus on specific determinants, such as age, sex, chronic conditions, physical activity, mental health, social networks, or loneliness, and their impact on services use. Researchers have not only examined services use, such as primary care visits, specialist visits, emergency department visits, hospital admissions, and institutionalization, but also the individual determinants of the costs associated with health services use. Several reviews have been published on these topics specifically in older adult populations. For example, some reviews have focused on health services use in general (Chappell & Blandford, 1987), multimorbidity (Lehnert et al., 2011), physical activity (Sari, 2011), social relationships (Valtorta, Moore, Barron, Stow, & Hanratty, 2018), Hispanic ethnicity (Burnette & Mui, 1999), and frequent use (Welzel, Stein, Hajek, König, & Riedel-Heller, 2017).

There appear to have been no empirical studies to date on the determinants of access to community-based geriatric medicine or specialized geriatric services (SGS) by the general population of community-dwelling older adults, nor by the more complex subset of older home care clients. A review of the determinants of outpatient based physician services use, including primary care and specialist physicians, by community-dwelling older adults may provide insight into this topic and guide analysis into the determinants of contact with geriatric medicine by home care clients.

5.1.3.1 Description of Studies Reviewed

Searches of PubMed, Scopus, and Google Scholar identified 22 articles describing longitudinal observational studies of the use of physician services by community-dwelling older adults (see Appendix D for a summary of studies included). The majority of studies were conducted in Canada (Fillion et al., 2019; Fisher et al., 2016; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Gruneir, Markle-Reid, et al., 2016; Newall, McArthur, & Menec, 2015), and the United States (US) (Adepoju, Lin, Mileski, Kruse, & Mask, 2018; Bowen & Gonzalez, 2008; Cameron, Song, Manheim, & Dunlop, 2010; Dunlop, Manheim, Song, & Chang, 2003; Gerst-Emerson & Jayawardhana, 2015; Perkins & Clark, 2001; Reckrey, DeCherrie, Kelley, & Ornstein, 2013; Stump, Johnson, & Wolinsky, 1995). A handful of studies were conducted in Europe, specifically Germany (Hajek, Bock, & Konig, 2017; Van den Bussche et al., 2011), Spain (Hernández-Aceituno et al., 2017; León-Muñoz et al., 2005, 2007), and England (Simmonds et al., 2014). Finally, the remaining studies were from Singapore (Feng, Yap, Kua, & Ng, 2009; Lim & Chan, 2017), and Australia (Korten et al., 1998). Sample sizes ranged from 213 (Simmonds et al., 2014) to 178,304 (Fillion et al., 2019). The samples in the majority of studies were obtained from the general population of community-dwelling older adults.

One third of studies included a subset of individuals with particular conditions or circumstances, such as non-hip fracture (Fillion et al., 2019), arthritis (Dunlop et al., 2003), dementia (Griffith et al., 2016), stroke (Gruneir, Griffith, et al., 2016), diabetes (Fisher et al., 2016; Gruneir, Markle-Reid, et al., 2016), homebound elderly (Reckrey et al., 2013), and low socioeconomic status (Perkins & Clark, 2001). In each study, the independent variables were measured at a particular point in time and the dependent variables were measured during a subsequent time period. Some of the studies required primary data collection, through interviews, home visits, self-administered survey, and physical exams. Other studies relied on secondary sources, including insurance claims data, patient chart review, practice registers, and administrative datasets. Certain studies obtained their data through a mix of both primary and secondary data sources.

Researchers considered a variety of predisposing, enabling, and need determinants as independent variables. While some authors were generally interested in which types of variables were most important (Hajek et al., 2017; Korten et al., 1998; Stump et al., 1995), the majority focused specifically on a single or a few main independent variables and adjusted for a variety of others as covariates. The main independent variables of interest considered included sex/gender (Cameron et al., 2010), race/ethnicity (Bowen & Gonzalez, 2008), frailty (Fillion et al., 2019), multimorbidity (Dunlop et al., 2003; Fisher et al., 2016; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Gruneir, Markle-Reid, et al., 2016; Van den Bussche et al., 2011), functional status (León-Muñoz et al., 2007), mental health (Adepoju et al., 2018; Feng et al., 2009), loneliness (Gerst-Emerson & Jayawardhana, 2015; Lim & Chan, 2017; Newall et al., 2015), caregiver burden (Reckrey et al., 2013), weight (León-Muñoz et al., 2005), and health behaviours (Hernández-Aceituno et al., 2017; Perkins & Clark, 2001; Simmonds et al., 2014).

Dependent variables all captured contact with physicians in some way; however, there were differences between studies in how contact was captured. Researchers generally operationalized contact in terms of a count of the number of visits with primary health professionals (Simmonds et al., 2014), primary care practitioners (Fillion et al., 2019; Hernández-Aceituno et al., 2017; León-Muñoz et al., 2005, 2007; Perkins & Clark, 2001), general practitioners (Korten et al., 1998), medical doctors (Cameron et al., 2010; Dunlop et al., 2003; Gerst-Emerson & Jayawardhana, 2015), medical service providers (Reckrey et al., 2013), physicians (Bowen & Gonzalez, 2008; Feng et al., 2009; Newall et al., 2015; Stump et al., 1995), outpatient physician services (Fisher et al., 2016; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Gruneir, Markle-Reid, et al., 2016; Hajek et al., 2017; Lim & Chan, 2017), office-based physician visits (Adepoju et al., 2018), physicians in the ambulatory medical care sector (Van den Bussche et al., 2011), or specialist visits (Hernández-Aceituno et al., 2017). Depending on the study, contact could include home visits, phone calls, office visits, or any type of contact, and the time period during which contact was captured varied, from one month to five years.

5.1.3.2 Findings

5.1.3.2.1 Predisposing and enabling determinants

The results of the studies reviewed provided mixed evidence for the presence of associations between predisposing and enabling characteristics, and use of physician services. In a general study of characteristics predicting services use among community-dwelling older adults in Germany, Hajek et al. (2017) found that predisposing and enabling variables were generally not significantly associated with outpatient physician services (Hajek et al., 2017). These findings supported a similar, earlier study conducted in Australia, which found that the enabling variables did not contribute much to the number of general practitioner visits, whether considered alone or when adjusted for predisposing and need variables (Korten et al., 1998).

Sex and gender. Only one study specifically focused on gender (Cameron et al., 2010). Many studies appear to have conflated sex and gender, using the terms interchangeably, and considered them solely as covariates. In multiple studies, sex and gender differences in physician visits were not found to be significant (Cameron et al., 2010; Fisher et al., 2016; Simmonds et al., 2014; Van den Bussche et al., 2011). Simmonds and colleagues (2014) suggested that the absence of gender differences may be because patterns of disease and disability become more evenly distributed across socio-economic status in older age groups (Simmonds et al., 2014). However, when controlling for health needs and economic access, Cameron et al. (2010) found that women tend to have fewer visits to physicians than men (Cameron et al., 2010).

Age. There was some increase in physician visits associated with age in two studies (Fisher et al., 2016; Van Den Bussche et al., 2011). Their findings were was not consistent with the findings from Simmonds et al. (2004), however, the latter study had the smallest sample size (n=213) of the studies reviewed (Simmonds et al., 2014).

Ethnicity. Bowen and Gonzalez examined the association of ethnicity and physician services use in socioeconomically disadvantaged older adults in urban settings in the US (Bowen & Gonzalez, 2008). Their findings indicate that there may be a significant association, but these results may not be generalizable to the Canadian context.

Marital status. The findings on marital status as a predictor of services use were consistent across studies that reported on this variable. Lim and Chan (2017) found that not being married was associated with lower odds of services use while Gerst-Emerson and Jayawardhana (2015) found that being married was positively associated with number of doctor visits (Gerst-Emerson & Jayawardhana, 2015; Lim & Chan, 2017).

Education. In two of three studies reporting on education as an independent variable, higher education was found to be associated with doctor visits (Adepoju et al., 2018; Gerst-Emerson & Jayawardhana, 2015). The studies suggested that this finding was related to the association between higher socioeconomic status and health services use (Adepoju et al., 2018). A third study did not find an association between these variables (Simmonds et al., 2014).

Employment status and income. The findings were mixed on the association of employment status and income, and physician services use. However, it is difficult to compare the results of the studies reviewed due to the diversity of constructs and measures used, as well as differences in local health insurance financing and coverage. One study found higher income to be associated with higher odds of service use in Singapore (Lim & Chan, 2017) while a second study reported that Index of Multiple Deprivation (IMD) of the patient catchment area was not associated with primary care consultations in England (Simmonds et al., 2014). Hajek et al. (2017) reported that a change in employment status from working to retired or not employed to be associated with service use in Germany (Hajek et al., 2017).

Informal and formal care providers. In terms of informal care, high caregiver burden was not found to be associated with services use after adjusting for other predisposing, enabling, and need variables. The presence of a regular formal care provider was associated with services use (Adepoju et al., 2018).

5.1.3.2.2 Need determinants

In an equitable health care system, needs variables are generally expected to be more strongly associated with services use, according to the Behavioural Model of Health Services Utilization (Aday & Andersen, 1974; Andersen & Newman, 1973). The evidence from the articles reviewed supports this conclusion (Hajek et al., 2017; Lim & Chan, 2017; Stump et al., 1995).

Multimorbidity and frailty. Higher levels of frailty and increased number of chronic conditions were generally found to be associated with higher odds of or increased services use (Feng et al., 2009; Fillion et al., 2019; Fisher et al., 2016; Gerst-Emerson & Jayawardhana, 2015; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Hajek et al., 2017; Lim & Chan, 2017; Van den Bussche et al., 2011). Certain specific conditions were found to be associated with services use, including coronary heart disease, cancer, and arthritis (Adepoju et al., 2018). Only one study had contrary findings to the others, reporting that chronic illnesses were not associated with primary care consultations (Simmonds et al., 2014). As noted earlier in regard to “Age”, the Simmonds et al. study had the smallest sample size (n=213) of the studies reviewed.

Mental health. In all of the studies reporting on mental health difficulties or depression, a positive association with services use was found. Chronic mental health difficulties and depression were found to be associated with higher odds of services use and increased number of physician visits (Adepoju et al., 2018; Feng et al., 2009; Gerst-Emerson & Jayawardhana, 2015; Lim & Chan, 2017).

Self-rated health. Poor self-rated health was found to be associated with an increase in services use, or higher odds of service use in several studies (Feng et al., 2009; Hajek et al., 2017; Lim & Chan, 2017).

Functional impairment. Functional impairment was found to be associated with higher odds of service use and increased amount of service use in several studies (Bowen & Gonzalez, 2008; Gerst-Emerson & Jayawardhana, 2015; León-Muñoz et al., 2007; Lim & Chan, 2017; Stump et al., 1995).

Physical activity and healthy behaviours. Multiple studies examined the impact of physical activity and other health behaviours, such as smoking, diet, sleep duration, and sedentary behaviour, on services use with mixed results. While one study reported that increased physical activity was associated with increased services use (Hajek et al., 2017), another study reported that physical activity and other healthy behaviours were associated with lower odds of services use (Hernández-Aceituno et al., 2017). The remaining studies reporting on these determinants did not find a significant association with services use (Perkins & Clark, 2001; Simmonds et al., 2014).

Weight status. Change in weight, including weight gain (Hajek et al., 2017; León-Muñoz et al., 2005) and weight loss (León-Muñoz et al., 2005), was found to be significantly associated with physician visits. However, body mass index (BMI) or weight status was not found to be associated with physician visits (Hajek et al., 2017; Simmonds et al., 2014).

Pain. No pain was found to be associated with lower odds of service use (Lim & Chan, 2017).

Loneliness. An American study by Gerst-Emerson and Jayawardhana (2015) found that chronic loneliness was associated with a greater services use, after controlling for other predisposing, enabling, and need variables (Gerst-Emerson & Jayawardhana, 2015). The authors suggested that older adults who were lonely visited the physician for social interaction (Gerst-Emerson & Jayawardhana, 2015). However, in a Singaporean study by Lim and Chan (2017), loneliness was significantly associated with lower odds of services use (Lim & Chan, 2017). The authors hypothesized that the difference in findings may be due to cultural differences between Eastern and

Western cultures. Finally, Newall et al. (2015), found that loneliness was not significantly associated with services use after adjusting for need variables (Newall et al., 2015).

5.1.3.2.3 Interactions

Several studies reported on interactions between sex or gender and other determinants, and their association with physician services use. Korten et al. (1998) found differences in multivariable models stratified by sex. The authors found that sociodemographic variables were more important in predicting services use for males than for females (Korten et al., 1998). They also found that while the most parsimonious model for females retained only anxiety, the most parsimonious model for males retained health symptoms, hearing impairment, pain, age, and occupational status. León-Muñoz et al. (2007) reported the possibility of an interaction between sex and functioning in the association with services use. In an earlier article published, León-Muñoz et al. (2005) also reported on sex differences. The authors found that abdominal obesity was associated with physician visits in men but not in women, after adjusting for chronic diseases (León-Muñoz et al., 2005).

5.1.3.3 Summary of Literature Review

It is very difficult to compare the findings reported by the studies reviewed due to the diversity of samples, measures, and outcomes. As previously mentioned, the studies were conducted in a variety of countries with notable differences in their health care systems. While the studies reviewed did not include system or society-level determinants of physician services use, there may still be an interaction between such factors and individual determinants, rendering comparison and generalizability difficult. For example, some health systems require patients to visit a primary care provider who acts as a gatekeeper, making referrals to specialist care. In other settings, patients can choose independently to visit a specialist physician. The majority of studies operationalized physician services use differently, including different types of physicians, over different time periods. Many of the studies reviewed collected data on individuals' characteristics and service use using self-assessment. Self-reported measures may be subject to social desirability bias and recall bias. Finally, as these studies are observational in nature, despite their longitudinal design, it is not possible to establish causality.

The most commonly identified determinants of physician services by older adults in the literature reviewed (i.e., comorbidities, depressive symptomatology, and functional impairment) are considered need characteristics according to the Behavioural Model of Health Services Utilization. Predisposing and enabling variables appear to be less important when need variables are considered, but it appears that age, marital status, and education may be the most promising non-need determinants. Sex and/or gender appear to play a role, interacting with need variables and modifying the association with services use. This review provides insight into which factors should be considered when beginning to explore determinants associated with geriatric medicine services use.

5.1.4 Rationale and Objectives

To the best of my knowledge, the determinants of contact with community-based geriatric medicine services or the broader spectrum of community-based SGS by older home care clients have not been specifically examined in the literature to date. However, it is difficult to study contact with SGS overall at a provincial level due to a lack of clear identifiers for this type of service. However, contact with geriatric medicine may be studied using provincial physician billing data that includes a physician discipline identifier. Therefore, this study aims to answer the following research questions:

- Which characteristics of older home care clients in Ontario are associated with subsequent geriatric medicine contact?

- Are there sex differences in the determinants of contact with geriatric medicine among this population?

5.2 Methods

5.2.1 Study Design

This is a retrospective cohort study using secondary health information linked to administrative service use datasets. This study was reviewed and received ethics clearance through the Office of Research Ethics (ORE) at the University of Waterloo (ORE#31345).

5.2.2 Secondary Data Sources

Home care assessment data were linked to physician billing records data. Data were obtained from three sources through the Institute for Clinical Evaluative Sciences (ICES): Resident Assessment Instrument – Home Care (RAI-HC); Registered Persons Database (RPDB); and Ontario Health Insurance Plan (OHIP) billing records.

5.2.2.1 Resident Assessment Instrument – Home Care (RAI-HC)

Home care assessment data were collected using the RAI-HC, a comprehensive clinical assessment instrument with over 300 items covering multiple domains (Canadian Home Care Association, 2013; Morris, Bernabei, et al., 1999). This instrument is meant to assess needs, strengths, and preferences of individuals with complex medical, functional, and psychosocial needs (Hirdes et al., 2011; Steel, 1999). The RAI-HC contains embedded scales which produce measures of functioning, cognition, health issues, and mental health, and also contains decision support applications (Hirdes et al., 2011; Steel, 1999). It may be used to determine service eligibility, develop care plans, and contract home care services (Canadian Home Care Association, 2013). While not a diagnostic tool, the RAI-HC may be used to identify potential to reverse or prevent decline and adverse outcomes.

Until 2018, the RAI-HC assessment was mandated for use in Ontario with all adult home care clients expected to require services for 60 days or more (considered long-stay clients) (Auditor General of Ontario, 2015; Carpenter & Hirdes, 2013; Hirdes, 2006a). Assessments were conducted at admission and every 6 to 12 months thereafter, or upon a significant change in health status. The interRAI HC is a newer version of the RAI-HC but maintains the same purpose and applications. In 2018, the interRAI HC replaced the RAI-HC as the mandated home care assessment used in Ontario. The reliability and validity of both instruments have been evaluated and reported in multiple articles within the peer-reviewed literature (Foebel et al., 2013; Hirdes, Ljunggren, et al., 2008; Hirdes et al., 2014; Hogeveen et al., 2017; Landi et al., 2000; Morris et al., 1997). These assessments are part of a suite of standardized assessments that use a common language and are designed to be compatible across sectors and services to form an integrated health information system and support continuity of care (Gray et al., 2009; Hirdes et al., 1999; Hirdes, Ljunggren, et al., 2008). This suite of assessments covers sectors such as long-term residential care, acute care, post-acute care, palliative care, assisted living, supportive housing, other community support services, services for persons with intellectual disabilities, community mental health, emergency psychiatry, and inpatient psychiatry. RAI-HC data were supplied to ICES by Health Shared Services Ontario, a provincial agency that supports the Local Health Integration Networks (LHINs), the regional health authorities in Ontario, which coordinate home care services.

5.2.2.2 Registered Persons Database (RPDB)

The RPDB is a provincial database containing demographic information on individuals registered under the Ontario Health Insurance Plan (OHIP) as well as individuals eligible for the Ontario Drug

Program (Ontario Ministry of Government and Consumer Services, 2017). For the purposes of this study, data elements included age (five year range), sex, and local health integration network (LHIN; encrypted to avoid identification).

5.2.2.3 Ontario Health Insurance Plan (OHIP) Billing Records

The OHIP billing records database contains data relating to claims made by Ontario physicians for reimbursement by the provincial health insurance program. For the purposes of this study, data included encrypted physician number, physician specialty, date of service (in reference to date of RAI-HC assessment), and location of service.

5.2.3 Sample

The sample included long-stay home care clients 60 years of age and older. Clients with an admission assessment within the study period (from the first quarter of 2012 to the second quarter of 2015) were included. The sample excluded home care clients living in board and care, assisted living, group home, or residential care facility settings. Clients were also excluded if they were assessed in hospital or were missing a client identifier on their RAI-HC assessment. The final sample retained 196,444 unique home care clients (Figure 4.1).

5.2.4 Measures

5.2.4.1 Individual characteristics

The first RAI-HC assessment conducted within the study period was considered the index assessment. Measures of individual characteristics were obtained from the RPDB and RAI-HC. Age, sex, and LHIN were obtained from the RPDB. Demographic, cognitive, communication, hearing, vision, mood and behaviour, social functioning, informal support services, physical functioning, continence, disease diagnoses, health conditions, nutrition and hydration status, environment, and medication measures were obtained from the RAI-HC. In addition to these items, scales and other composite measures were obtained from the RAI-HC as measures of individual characteristics. These included: Activities of Daily Living Hierarchy (ADLH) scale; Assessment Urgency Algorithm; Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS); Cognitive Performance Scale (CPS); Depression Rating Scale (DRS); Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT); Instrumental Activities of Daily Living Capacity (IADL-C) scale; Method for Assigning Priority Levels (MAPLe); and Pain scale.

5.2.4.1.1 Activities of Daily Living Hierarchy (ADLH) scale

The ADLH scale groups activities of daily living according to the disablement process stage within which they occur. Early loss ADLs (e.g., dressing) are scored lower while late loss ADLs (e.g., eating) are scored higher. The ADLH scale ranges from zero (no impairment) to six (total dependence) (Morris, Fries, et al., 1999).

5.2.4.1.1.1 Assessment Urgency Algorithm (AUA)

The AUA is an algorithm that prioritizes need for comprehensive follow-up assessment by identifying urgency of the need. The algorithm produces scores ranging from one (least urgent) to six (most urgent). Components include items such as self-rated mood, caregivers overwhelmed, self-rated health, and unstable conditions (Costa et al., 2017).

5.2.4.1.2 Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS) scale

CHESS provides a measure of medical complexity and health instability. Components of CHESS include vomiting, dehydration, weight loss, shortness of breath, edema, end-stage disease, decline in cognition and ADLs, and decrease in food or fluid. This scale ranges from zero (not at all unstable) to five (highly unstable, more complex). At its higher levels, CHESS has been demonstrated to be predictive of adverse outcomes such as mortality, hospitalization, pain, caregiver distress, and poor self-rated health (Hirdes et al., 2003, 2014).

5.2.4.1.3 Cognitive Performance Scale (CPS)

CPS is a scale measuring cognitive performance based on daily decision-making skills, ability to make self understood, and short-term memory recall. This scale ranges from zero to six. Higher scores indicate greater degree of cognitive impairment. CPS has been found to be highly correlated with the Mini Mental State Exam (MMSE) (Landi et al., 2000; Morris et al., 1994, 2016).

5.2.4.1.4 Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT)

DIVERT provides a measure of the risk of unplanned emergency department (ED) use among frail, older adults living in the community. Its main components include previous ED use, cardio-respiratory symptoms, and cardio-respiratory conditions. DIVERT ranges from one (lowest risk) to six (highest risk) (Costa et al., 2015).

5.2.4.1.5 Depression Rating Scale (DRS)

The DRS provides a measure of the signs and symptoms of depression. This scale ranges from zero (no symptoms of depression) to 14 (all symptoms exhibited daily or almost daily). A score of three or more indicates the presence of possible depression. The DRS has been validated based on a comparison with the Hamilton Depression Rating Scale and the Cornell Scale for Depression (Burrows et al., 2000; Szczerbińska et al., 2012).

5.2.4.1.6 Instrumental Activities for Daily Living Capacity (IADL-C) scale

IADL-C is the sum of three items measuring capacity to perform the following IADLs: meal preparation, ordinary housework, and phone use. This scale does not measure actual performance of IADLs, but rather potential to perform. It ranges from zero (no difficulty in any) to six (great difficulty in all three).

5.2.4.1.7 Method for Assigning Priority Levels (MAPLe)

MAPLe categorizes clients according to their risk for adverse outcomes, based on component items such as ADL impairment, cognitive impairment, behavioural symptoms, and problems in the home environment. It ranges from one (low risk) to five (high risk). MAPLe has been demonstrated to be predictive of risk of institutionalization and caregiver distress (Hirdes, Poss, et al., 2008; Mitchell et al., 2015).

5.2.4.1.8 Pain Scale

The Pain Scale provides a composite measure of pain based on two component items: frequency and severity of pain. It ranges from zero (no pain) to three (almost daily pain). The Pain Scale has been demonstrated to be predictive of pain through validation against the Visual Analogue Scale (Fries et al., 2001).

5.2.4.2 Contact with geriatric medicine

The measure of contact with geriatric medicine was obtained from OHIP billing records. A count of contact was created based on the number of days from the index assessment (RAI-HC admission assessment) to the date of contact with geriatric medicine. Frequency of contact was measured in the

90 days post-assessment. Where multiple fee codes were billed by the same physician for the same patient on the same day, it was counted as one instance of contact.

Within the published literature, different methods have been used to count number of physician visits using OHIP billing records, depending on the authors' interests and research questions. Authors have restricted by location (Bastedo et al., 2017; Fridman et al., 2018; Glazier et al., 2015; Perlman et al., 2019), specialty (Aiken et al., 2016; Bastedo et al., 2017; Bronskill et al., 2011; Chan & Schultz, 2005; Glazier et al., 2015; Jaakkimainen & Upshur, 2006; Mahar et al., 2018; Nguyen et al., 2019; Perlman et al., 2019), fee codes indicating type of services provided (Chan & Schultz, 2005; Fridman et al., 2018; Jaakkimainen & Upshur, 2006; Ouellette-Kuntz et al., 2018; Perlman et al., 2019), and reason for visit using diagnostic codes (Fridman et al., 2018; Mahar et al., 2018; Nguyen et al., 2019; Ouellette-Kuntz et al., 2018; Perlman et al., 2019). For the purposes of this study, OHIP billing records were restricted to include only contact with physicians specialized in geriatric medicine and only contact that occurred in locations defined as home, office, or phone (using the location code, created by ICES algorithm to identify the most likely location) in order to capture contact that occurred on an outpatient basis. Contact with geriatric medicine was not restricted by diagnostic code as there is no code identifying frail, older adults. Any contact was considered to be notable and there was no restriction by fee code. This is consistent with the methods reported by Bronskill et al., 2011 (Bronskill et al., 2011).

5.2.5 Analytic Strategy

All analyses were performed using SAS 9.4. Logistic regression was used to examine the association between baseline individual home care client characteristics and any contact with geriatric medicine in the 90 days post-assessment, coded as a binary outcome measure. Independent variables were chosen based on those identified in the literature as associated with physician services use by community-dwelling older adults, and those identified by provincial experts in the care of older adults as important for referral to specialized geriatric services (SGS; see Chapter 2). In accordance with the Behavioural Model of Health Services Utilization, independent variables included predisposing (e.g., age, sex, marital status), enabling (LHIN, finances), and need (e.g., functioning, mental health conditions, cognition, comorbidities) variables (Table 5.1). Unadjusted and adjusted (LHIN, sex, age) odds ratios (ORs) and 95% confidence intervals (95% CI) are reported.

Table 5.1 Independent variables included in the logistic regression analysis according to the Behavioural Model of Health Services Utilization

Type of Variable	Variables	
Predisposing		• Sex • Age • Marital status • Living arrangement • Education • Interpreter needed
Enabling		• Local Health Integration Network (LHIN) • Presence of primary and secondary informal caregivers • Caregiver distress • Home environment issues • Locomotion ability inside and outside of the home • Need to make economic trade-offs
Need	Cognition	• Dementia • Cognitive Performance Scale • Memory problems • Skills for decision making • Changes in mental function • Delirium indicators
	Communication, hearing, vision	• Communication decline • Vision decline
	Mood and behaviour patterns, mental health	• Psychiatric diagnoses • Depression rating scale • Mood decline • Behaviour symptoms • Changes in behaviour symptoms • Loneliness • Delusions and hallucinations
	Physical functioning	• Activities of Daily Living (ADL), instrumental activities of daily living (IADL impairment), decline • Potential for improvement, recovery
	Continence	• Worsening of bladder incontinence
	Disease diagnoses	• Number of diagnoses • Stroke • Congestive heart failure

		• Coronary artery disease • Hypertension • Irregularly irregular pulse • Peripheral vascular disease • Head trauma • Hemiplegia/hemiparesis • Multiple Sclerosis (MS) • Parkinsonism • Arthritis • Hip fracture • Other fractures • Osteoporosis • Cataract • Glaucoma • HIV infection • Pneumonia • Tuberculosis • Urinary tract infection (UTI) • Cancer • Diabetes • Emphysema/ Chronic Obstructive Pulmonary Disorder (COPD)/ asthma • Renal failure • Thyroid disease
	Health conditions, medications, service utilization	• Pain • Falls • Unsteady gait • Poor self-reported health • Unstable conditions • Flare-up of recurrent or chronic conditions • Treatments changed in last 90 days • Elder abuse indicators • Nine or more medications • Overall change in care needs
	Other scales	• Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS) • Method for Assigning Priority Levels (MAPLe) • Assessment Urgency Algorithm (AUA) • Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT)
Interaction terms	Sex, and	• Age

	• Education • Procedural memory • Agitated and disoriented • CPS • Coronary artery disease • Hemiplegia/hemiparesis • Any psychiatric diagnosis • Arthritis • Osteoporosis • Multiple sclerosis • Parkinsonism • Cancer • ADL decline • Presence of secondary caregiver • Changes in behaviour symptoms • Caregiver distress • Falls • Good prospects of recovery
Age, and	• Dementia • Caregiver distress • Short-term memory • Cognitive skills for daily decision-making • Worsening of decision-making • Agitated and disoriented • Changes in behaviour symptoms • Any psychiatric diagnosis • Good prospects for recovery • Osteoporosis • Cancer • Falls • Multiple sclerosis • Parkinsonism

All independent variables that were significant at an alpha level of 0.01 in this analysis were retained for inclusion in a larger multivariable logistic regression model. LHIN was also included in the multivariable model to account for regional effects. Predisposing, enabling, and need variables were considered separately to determine which independent variables within each block were most strongly associated with any contact with geriatric medicine in the 90 days post-assessment. Need variables were further divided into smaller blocks to more easily determine which variables were most strongly associated with geriatric medicine contact. Within each block, variables were reviewed to minimize collinearity and models were specified manually to determine which combination of variables were most predictive of contact with geriatric medicine (based on statistical significance and c-statistic). Predisposing, enabling, and need blocks were combined into one model. Variables were reviewed once more to minimize collinearity. Based on the literature, several interaction terms were considered for inclusion in the final model (Table 5.1). Specifically, interactions between sex and age, sex and other independent variables, and age and other independent variables were tested. The final logistic regression model included independent variables that remained statistically significant ($p<.01$).

As a final step, in order to better account for clustering by LHIN, the independent variables included in the final logistic regression model were included in a multi-level generalized estimating equation (GEE). GEE accounts for correlation within a cluster and models the average effect across all clusters when estimating regression coefficients (Ballinger, 2004; Hanley, Negassa, Edwardes, & Forrester, 2003; Liang & Zeger, 1986; Mcgahan, 2017). The GENMOD procedure in SAS 9.4 was used. An exchangeable correlation structure was specified as the correlation of any contact with geriatric medicine among clients within a particular LHIN was assumed to be equal (Mcgahan, 2017). Empirical standard error estimates, which use the actual variation within a cluster to calculate standard error, were reported rather than the model standard error estimates due to the large amounts of data available (Hanley et al., 2003). Odds ratios for each variable in the final model were calculated. Any variables that did not reach statistical significance in the GEE model were removed. To ensure the final GEE model was clinically meaningful, only independent variables with odds ratios lower than 0.90 or greater than 1.10 were retained. Variables retained in the final GEE model were included in a logistic regression model once more to calculate the c-statistic. The c-statistic, which cannot be calculated for the GEE model, provides a measure of the discriminative power of the model to distinguish home care clients with and without geriatric medicine contact (Caetano, Sonpavde, & Pond, 2018). A c-statistic of 0.50 indicates that the model does not perform better than random chance in discriminating between the two groups while a c-statistic of 1.00 indicates that the model discriminates between the two groups perfectly. The c-statistic was calculated for the full model, and for each block of predisposing, enabling, and need variables retained in the final model.

The entire analytic process was repeated with the sample disaggregated by sex in accordance with SGBA recommendations (Johnson et al., 2007). Gender is not explicitly recorded in the RAI-HC, however it is connected to sex and the measure may reflect some components of both biological and social characteristics (Johnson et al., 2007). Based on the results of this analysis, additional interactions terms between sex and other independent variables were tested in the overall sample model.

5.3 Results

5.3.1 Description of the Study Sample

The study sample has been described elsewhere (see Chapter 4). Briefly, the sample consists of 196,444 long-stay home care clients in Ontario, 60 years of age and older, living in private dwellings. It does not include individuals living in board and care, assisted living, group home settings, or residential care facilities. Slightly over half of the sample was female and one third were 85 years of age or older (Table 5.2). While less than half of the sample were married, almost two thirds lived with others. Nearly one quarter of the sample had a cardiorespiratory or a dementia diagnosis. Nearly one tenth of clients had moderate to severe ADL impairment (based on ADLH) and almost one quarter of clients had moderate to very high levels of medical complexity and instability (based on CHESS). Over one fifth had moderate to severe symptoms indicating presence of possible depression (based on DRS) (Table 5.2).

Table 5.2 Characteristics of older, long-stay, home care clients upon admission RAI-HC assessment, Ontario, 2012-2015 (n=196,444)

Characteristic	Overall sample n=196,444 % (n)
Sex	
Female	59.7 (117,192)
Male	40.3 (79,252)
Age Range	
60-64	6.4 (12,491)
65-69	8.7 (17,091)
70-74	11.7 (23,056)
75-79	17.0 (33,442)
80-84	22.9 (44,911)
85-89	20.9 (40,981)
90+	12.5 (24,472)
Married	
No	54.3 (106,622)
Yes	45.7 (89,822)
Lives Alone	
No	64.6 (126,859)
Yes	35.4 (69,585)
Education	
High school or more	35.8 (70,376)
Less than high school	27.6 (54,208)
Unknown	36.6 (71,860)
Diagnosis of COPD or Heart Failure	
No	75.2 (147,752)
Yes	24.8 (48,692)
Diagnosis of Dementia	
No	78.1 (153,335)
Yes	21.9 (43,109)
ADLH ≥3	9.8 (19,358)
CHESS ≥3	22.0 (43,211)
DRS ≥3	20.3 (39,918)

ADLH: Activities of Daily Living Hierarchy scale; *CHESS*: Changes in Health, End-stage Disease, Signs, and Symptoms; *DRS*: Depression Rating Scale

5.3.2 Odds of Contact with Geriatric Medicine: Overall Sample

The unadjusted and adjusted (LHIN, age, and sex) odds ratios are reported for the relationship between the independent variables and any contact with geriatric medicine in the 90 days post-assessment (Appendix E). The findings are summarized according to the nature of associations with geriatric medicine contact (unadjusted and adjusted; Tables 5.3, 5.4, and 5.5).

5.3.2.1 Significantly Higher Odds of Contact with Geriatric Medicine

Among the predisposing variables, older age, being married, higher or unknown education status, and requiring an interpreter (unadjusted) were associated with higher odds of geriatric medicine contact (Table 5.3). Presence of a primary or secondary caregiver, distressed caregiver, and presence of personal safety issues were enabling variables associated with higher odds of contact. In terms of need variables, all of the indicators of cognitive impairment and communication decline were associated with significantly higher odds. Presence of each mood and behaviour symptom and mental health condition was associated with higher odds of contact with geriatric medicine, with the exception of loneliness. Impairment in IADLs, worsening of bladder incontinence, increasing number of disease diagnoses, Parkinsonism, osteoporosis, head trauma (only after adjusting for LHIN, age, and sex), increasing number of falls, unstable conditions, elder abuse CAP (identifying situations of potential abuse or neglect and indicating possible need for action), unusually poor hygiene, overall change in care needs, moderate to high risk for caregiver distress and institutionalization (MAPLe ≥ 3), and urgent need for assessment (AUA ≥ 3) were also associated with significantly higher odds.

Table 5.3 Results of logistic regression analysis: Variables with significantly higher odds of contact with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Type of Variable	Unadjusted	Adjusted for LHIN, age, and sex
Predisposing	• Age • Married • Higher education or unknown status • Interpreter needed	• Married • Higher education or unknown status
Enabling	• Primary, secondary caregiver present • Caregiver unable to continue, not satisfied with support, distressed • Personal safety issues	• Primary, secondary caregiver present • Caregiver unable to continue, not satisfied with support, distressed • Personal safety issues
Need	<u>Cognition</u> • Alzheimer's or dementia other than Alzheimer's diagnosis • CPS ≥3 • Short-term memory problem • Procedural memory problem • Impaired cognitive skills for daily decision-making • Worsening of daily decision-making • Sudden or new onset/change in mental function over last 7 days • Agitated or disoriented in last 90 days <u>Communication/hearing/vision patterns</u> • Communication decline <u>Mood and behaviour symptoms, mental health conditions</u> • Any psychiatric diagnosis • DRS ≥3 • Mood decline • Wandering • Verbally abusive behaviour symptoms • Physically abusive behaviour symptoms • Socially inappropriate/disruptive behaviour symptoms	<u>Cognition</u> • Alzheimer's or dementia other than Alzheimer's diagnosis • CPS ≥3 • Short-term memory problem • Procedural memory problem • Impaired cognitive skills for daily decision-making • Worsening of daily decision-making • Sudden or new onset/change in mental function over last 7 days • Agitated or disoriented in last 90 days <u>Communication/hearing/vision patterns</u> • Communication decline <u>Mood and behaviour symptoms, mental health conditions</u> • Any psychiatric diagnosis • DRS ≥3 • Mood decline • Wandering • Verbally abusive behaviour symptoms • Physically abusive behaviour symptoms • Socially inappropriate/disruptive behaviour symptoms

Type of Variable	Unadjusted	Adjusted for LHIN, age, and sex
	• Resists care	• Resists care
	• Changes in behaviour symptoms	• Changes in behaviour symptoms
	• Delusions	• Delusions
	• Hallucinations	• Hallucinations
	Physical functioning	Physical functioning
	• IADL ≥3	• IADL ≥3
	Incontinence	Incontinence
	• Worsening of bladder incontinence	• Worsening of bladder incontinence
	Disease diagnoses	Disease diagnoses
	• High number of disease diagnoses	• High number of disease diagnoses
	• Parkinsonism	• Head trauma
	• Osteoporosis	• Parkinsonism
		• Osteoporosis
	Health conditions	Health conditions
	• Falls	• Falls
	• Unstable conditions	• Unstable conditions
	Elder abuse indicators	Elder abuse indicators
	• Abuse CAP level 2	• Abuse CAP level 2
	• Unusually poor hygiene	• Unusually poor hygiene
	Service utilization	Service utilization
	• Overall change in care needs	• Overall change in care needs
	Other scales	Other scales
	• MAPLe ≥3	• MAPLe ≥3
	• AUA ≥4	• AUA ≥3

Table 5.4 Results of logistic regression analysis: Variables with significantly lower odds of contact with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Type of Variable	Unadjusted	Adjusted for LHIN, age, and sex
Predisposing	• Female sex • Lives alone	• Lives alone
Enabling	• Impaired locomotion (inside and outside home) • Access to home issue • Access to rooms in home issue • Any home environment issue • Economic trade-offs	• Impaired locomotion (inside and outside home) • Access to home issue • Access to rooms in home issue • Any home environment issue
Need	<u>Communication/hearing/vision patterns</u> • Vision decline	
	<u>Physical functioning</u> • ADL decline • Functional improvement potential Good prospects of recovery	<u>Physical functioning</u> • ADL ≥3 • ADL decline • Functional improvement potential • Good prospects of recovery
	<u>Disease diagnoses</u> • Congestive heart failure • Coronary artery disease • Hypertension • Irregularly irregular pulse • Peripheral vascular disease • Hemiplegia/hemiparesis • Multiple sclerosis • Arthritis • Hip fracture • Other fractures • Pneumonia • Cancer • Diabetes • Emphysema/COPD/asthma • Renal failure	<u>Disease diagnoses</u> • Congestive heart failure • Coronary artery disease • Hypertension • Irregularly irregular pulse • Peripheral vascular disease • Hemiplegia/hemiparesis • Multiple sclerosis • Arthritis • Hip fracture • Other fractures • Pneumonia • Cancer • Diabetes • Emphysema/COPD/asthma • Renal failure

Type of Variable	Unadjusted	Adjusted for LHIN, age, and sex
	Health conditions • Pain (levels 2,3) • Unsteady gait • Poor self-reported health • Flare-up of recurrent or chronic condition • Treatments changed in last 30 days Medications • Nine or more medications Other scales • CHESS ≥3 • DIVERT	Health conditions • Pain (levels 2,3) • Unsteady gait • Poor self-reported health • Flare-up of recurrent or chronic condition • Treatments changed in last 30 days Medications • Nine or more medications Other scales • DIVERT

Table 5.5 Results of logistic regression analysis: Variables with a non-significant association with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Type of Variable	Unadjusted	Adjusted for LHIN, age, and sex
Predisposing		• Interpreter needed
Enabling	• Home environment CAP • Lighting environment issue • Flooring and carpeting environment issue • Bathroom and toilet room environment issue • Kitchen environment issue • Heating and cooling environment issue	• Environment CAP triggered • Lighting environment problem • Flooring and carpeting environment issue • Bathroom and toilet room environment issue • Kitchen environment issue • Heating and cooling environment issue • Economic trade-offs
Need		Communication/hearing/vision patterns • Vision decline
	Mood and behaviour symptoms, mental health conditions • Loneliness	Mood and behaviour symptoms, mental health conditions • Loneliness
	Physical functioning • ADL ≥3	
	Disease diagnoses • Disease diagnoses (1, ≥6) • Cerebrovascular accident (stroke) • Head trauma • Cataract • Glaucoma • HIV infection • Tuberculosis • Urinary tract infection • Thyroid disease	Disease diagnoses • Disease diagnoses (1, 2, ≥6) • Cerebrovascular accident (stroke) • Cataract • Glaucoma • HIV infection • Tuberculosis • Urinary tract infection • Thyroid disease
	Elder abuse indicators • Abuse CAP (level 1) • Fearful of family/caregiver • Unexplained injuries	Elder abuse indicators • Abuse CAP (level 1) • Fearful of family/caregiver • Unexplained injuries

	• Neglected, abused, or mistreated • Physically restrained	• Neglected, abused, or mistreated • Physically restrained
	Other scales • AUA (levels 2,3)	Other scales • CHESS ≥3

5.3.2.2 Significantly Lower Odds of Contact with Geriatric Medicine

Of the predisposing variables, female sex and living alone were associated with lower odds of contact with geriatric medicine (Table 5.4). Impaired locomotion inside and outside of the home, difficulty accessing the home or rooms in the home, any home environment issues, and needing to make economic trade-offs (only when unadjusted) were enabling variables associated with lower odds of contact. There were also several need variables associated with lower odds of contact with geriatric medicine, namely vision decline (only unadjusted), moderate to severe impairment in ADLs (ADLH ≥3; only when adjusted for LHIN, age, and sex), ADL decline, functional improvement potential, good prospects of recovery, many of the disease diagnoses (congestive heart failure, coronary artery disease, hypertension, irregularly irregular pulse, peripheral vascular disease, hemiplegia, multiple sclerosis, arthritis, hip and other fractures, cancer, renal failure, pneumonia, and tuberculosis), presence of pain, unsteady gait, poor self-reported health, flare-up of recurrent or chronic condition, change in treatments in the last 90 days, nine or more medications, medical complexity and instability (CHESS ≥3; only when unadjusted), and risk for unplanned ED visits (DIVERT) (Table 5.4).

5.3.2.3 Nonsignificant

Several variables were not found to be significantly associated with geriatric medicine contact (Table 5.5). Among predisposing and enabling variables, requiring an interpreter (after adjusting for LHIN, age, and sex), home environment CAP (indicating potential for improvement), certain individual home environment issues, and needing to make economic trade-offs (after adjusting for LHIN, age, and sex) were not significantly associated. Vision decline (after adjusting for LHIN, age, and sex), loneliness, ADL decline (unadjusted), certain disease diagnoses (stroke, cataract, glaucoma, HIV, urinary tract infections, and thyroid disease), most indicators of elder abuse (fearful of family/caregiver, unexplained injuries, neglected, abused, or mistreated, physically restrained), level 1 of the elder abuse CAP (identifying situations of potential abuse or neglect and indicating possible need for action), and medical complexity and instability (CHESS ≥3; after adjusting for LHIN, age, and sex) were among the need variables not significantly associated with geriatric medicine contact (Table 5.5).

5.3.3 Multivariable Model: Overall Sample

Independent variables were retained in the multivariable model if they were significant at an alpha level of 0.01. Remaining variables were screened for clinical significance by applying an odds ratio threshold of less than 0.90 or greater than 1.10. The final GEE model, adjusted for clustering by LHIN, included: age, sex, access to home, locomotion outside of the home, worsening of decision-making, dementia, hallucinations, good prospects of recovery, hemiplegia/hemiparesis, Parkinsonism, osteoporosis, cancer, and MAPLe score (Table 5.6). Of the variables included in the final model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 5.7; c-statistic=0.72). The c-statistic for the full model was 0.77, indicating that the model had moderate discriminatory power.

Within the final model, female sex, difficulties accessing the home, impaired locomotion outside of the home, good prospects of recovery, diagnosis of hemiplegia/hemiparesis, and cancer were associated with lower adjusted odds of geriatric medicine contact. Compared to males, females had 0.93 (95% CI 0.90-0.96) times the odds of any contact with geriatric medicine. Those with issues accessing their home or impaired locomotion outside of the home had 0.83 (95% CI 0.80-0.87) and

0.80 (95% CI 0.78-0.83) times the odds, respectively, to have geriatric medicine contact. The odds of contact among those with good prospects of recovery were 0.87 (95% CI 0.84-0.90) compared to those without good prospects of recovery. Hemiplegia/hemiparesis diagnosis and cancer diagnosis had 0.79 (95% CI 0.72-0.87) and 0.82 (0.79-0.85) times the odds of contact, respectively.

Age, worsening of decision making, dementia, hallucinations, Parkinsonism, osteoporosis, and MAPLe score (indicating risk of caregiver distress and institutionalization) were associated with higher odds of geriatric medicine contact. There was a curvilinear trend to the relationship between age and geriatric medicine contact. The odds of contact were highest for the age range of 80 to 84 years. This age group had 1.91 (95% CI 1.65-2.21) times higher odds of any contact with geriatric medicine than the 60-64 year old age group. Past that age range, the odds ratios were lower. Nevertheless, all age groups had higher odds of contact compared to those aged 60-64 years. Those who experienced worsening in their decision-making, had a diagnosis of dementia, or experienced hallucinations had 1.21 (95% CI 1.17-1.24), 1.89 (95% CI 1.73-2.07), and 1.89 (1.73-2.07) times greater odds, respectively, of contact with geriatric medicine. Parkinsonism diagnosis was associated with 1.20 (95% CI 1.13-1.28) higher odds and osteoporosis diagnosis was associated with 1.10 (95% CI 1.07-1.13) higher odds of contact. Finally, MAPLe score, indicating risk of caregiver distress and institutionalization, was associated with higher odds of contact with geriatric medicine. Those in level three had 1.14 (1.10-1.19) times higher odds of contact while those in levels four and five had 1.47 (95% CI 1.39-1.56) times higher odds of geriatric medicine contact.

Interaction terms were first tested in a simple model with only the relevant main effects. Of those tested, only the following were significant: age and sex, age and caregiver distress, age and dementia, dementia and CPS score, age and CPS score, sex and good prospects for recovery, age and cancer, or age and falls. However, none of these interaction terms were statistically significant in the final GEE multivariable model.

Table 5.6 Multivariable generalized estimating equation model: Empirically-based standard error estimates and odds of contact with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015, overall sample (n=196,444), stratified by sex (male, n=79,252; female, n=117,192)

	Overall sample (n=196,444)			**Males (n=79,252)**			**Females (n=117,192)**		
Parameters	**Estimate (Standard Error)**	**Z**	**Odds ratio (95% CI)**	**Estimate (Standard Error)**	**Z**	**Odds ratio (95% CI)**	**Estimate (Standard Error)**	**Z**	**Odds ratio (95% CI)**
Female sex (Ref = Male)	-0.07 (0.02)	-4.21	0.93 (0.90-0.96)						
Age (Ref = 60-64)									
65-69	0.36 (0.04)	9.78	1.43 (1.33-1.53)	0.83 (0.10)	8.10	2.30 (1.88-2.81)	0.39 (0.06)	6.84	1.48 (1.32-1.66)
70-74	0.54 (0.06)	9.43	1.71 (1.53-1.91)	1.09 (0.12)	8.90	2.96 (2.33-3.77)	0.65 (0.07)	8.65	1.91 (1.65-2.21)
75-79	0.64 (0.07)	9.72	1.89 (1.66-2.15)	1.23 (0.12)	10.02	3.41 (2.68-4.34)	0.76 (0.08)	9.76	2.15 (1.84-2.50)
80-84	0.65 (0.07)	8.66	1.91 (1.65-2.21)	1.25 (0.13)	9.26	3.48 (2.67-4.53)	0.78 (0.09)	8.36	2.17 (1.81-2.61)
85-89	0.58 (0.07)	8.76	1.79 (1.57-2.04)	1.16 (0.13)	9.05	3.19 (2.48-4.10)	0.70 (0.08)	8.31	2.02 (1.71-2.39)
90+	0.41 (0.07)	5.76	1.51 (1.31-1.74)	0.94 (0.15)	6.26	2.56 (1.91-3.44)	0.50 (0.10)	5.24	1.65 (1.37-1.99)
Education (Ref = less than high school)									
High school or more				0.13 (0.03)	4.31	1.14 (1.07-1.20)			
Unknown				0.14 (0.04)	3.38	1.16 (1.06-1.26)			
Caregiver distress (Ref = No)							0.13 (0.02)	6.59	1.13 (1.09-1.18)
Access to home issues (Ref = No)	-0.18 (0.02)	-7.70	0.83 (0.80-0.87)	-0.25 (0.04)	-6.35	0.78 (0.72-0.84)			
Impaired locomotion outside home (Ref = No)	-0.22 (0.02)	-11.74	0.80 (0.78-0.83)	-0.30 (0.06)	-4.87	0.74 (0.66-0.84)	-0.25 (0.02)	-10.84	0.78 (0.75-0.82)
Worsening of decision-making (Ref = No)	0.19 (0.01)	12.70	1.21 (1.17-1.24)	0.39 (0.03)	13.02	1.48 (1.39-1.57)	0.21 (0.02)	10.47	1.23 (1.18-1.28)
Dementia (Ref = No)	0.64 (0.05)	13.96	1.89 (1.73-2.07)	0.99 (0.07)	13.95	2.70 (2.35-3.10)	0.68 (0.04)	18.32	1.97 (1.83-2.12)
Hallucinations (Ref = No)	0.19 (0.03)	5.88	1.21 (1.14-1.29)				0.18 (0.04)	4.36	1.20 (1.11-1.31)
ADL Decline (Ref = No)							-0.12 (0.02)	-4.86	0.89 (0.85-0.93)
Good prospects of recovery (Ref = No)	-0.14 (0.02)	-8.46	0.87 (0.84-0.90)				-0.20 (0.02)	-8.68	0.81 (0.78-0.85)
Hemiplegia/ hemiparesis (Ref = No)	-0.23 (0.05)	-5.04	0.79 (0.72-0.87)				-0.39 (0.08)	-4.65	0.67 (0.57-0.80)

Parameters	Overall sample (n=196,444) Estimate (Standard Error)	Z	Odds ratio (95% CI)	Males (n=79,252) Estimate (Standard Error)	Z	Odds ratio (95% CI)	Females (n=117,192) Estimate (Standard Error)	Z	Odds ratio (95% CI)
Parkinsonism (Ref = No)	0.19 (0.03)	5.70	1.20 (1.13-1.28)	0.33 (0.06)	5.87	1.39 (1.25-1.56)			
Osteoporosis (Ref = No)	0.10 (0.01)	7.50	1.10 (1.07-1.13)	0.21 (0.05)	4.38	1.23 (1.12-1.35)	0.11 (0.02)	6.33	1.11 (1.08-1.15)
Cancer (Ref = No)	-0.20 (0.02)	-11.38	0.82 (0.79-0.85)	-0.32 (0.02)	-13.81	0.72 (0.69-0.76)	-0.24 (0.04)	-6.04	0.78 (0.72-0.85)
Emphysema/ COPD/ Asthma (Ref = No)				-0.18 (0.03)	-7.02	0.84 (0.80-0.88)			
MAPLe - collapsed (Ref = 1,2)									
3	0.13 (0.02)	6.65	1.14 (1.10-1.19)				0.13 (0.03)	5.01	1.14 (1.08-1.20)
4,5	0.39 (0.03)	13.36	1.47 (1.39-1.56)				0.46 (0.03)	17.03	1.58 (1.50-1.67)

Note: All estimates are significant at p<.0001

Table 5.7 Discriminative power (c-statistic) of the final multivariable models and predisposing, enabling, and need blocks for all samples of older, long-stay home care clients, Ontario, 2012-2015, overall sample (n=196,444), stratified by sex (male, n=79,252; female, n=117,192)

c-statistic	Overall (n=196,444)	Male (n=79,252)	Female (n=117,192)
Predisposing	0.59	0.60	0.58
Enabling	0.53	0.53	0.57
Need	0.72	0.72	0.72
Full model	0.77	0.77	0.76

5.3.4 Odds of Contact with Geriatric Medicine: Stratified by Sex

All analyses were repeated with the sample disaggregated by sex (Appendices F and G) to determine whether there were different significant factors for males and females. The findings of these analyses were generally similar to the findings in the overall sample, with some differences. Tables 5.8, 5.9, and 5.10 provide a summary of the nature of the adjusted (LHIN and age) odds ratios results compared between the overall sample, male subsample, and female subsample.

5.3.4.1 Predisposing and Enabling

The 'unknown' level of the education variable was not significant when adjusted for LHIN, age, and sex among males or females (Tables 5.8), although it was significant in the overall sample. While having a primary caregiver that lives separately from the client had higher odds of geriatric contact in the overall sample and female subsample, it was not significant among males (Table 5.9).

Table 5.8 Results of logistic regression analysis: Nature of relationship between predisposing variables with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015, stratified by sex (male, n=79,252; female, n=117,192)

Variable	Overall sample (n=196,444)	Males (n=79,252)	Females (n=117,192)
Married	Higher	Higher	Higher
Lives alone	Lower	Lower	Lower
Higher education	Higher	Higher	Higher
Unknown education status	Higher	NS	NS
Interpreter needed	NS	NS	NS

Higher signifies higher odds of contact with geriatric medicine; *Lower* signifies lower odds of contact with geriatric medicine; *NS* signifies nonsignificant relationship.

Table 5.9 Results of logistic regression analysis: Nature of relationship between enabling variables with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444), stratified by sex (male, n=79,252; female, n=117,192)

Variable	Overall sample (n=196,444)	Males (n=79,252)	Females (n=117,192)
Primary caregiver lives with client	Higher	Higher	Higher
Primary caregiver present but does not live with client	Higher	NS	Higher
Secondary caregiver lives with client	Higher	NS	Higher
Secondary caregiver present but does not live with client	Higher	Higher	Higher
Caregiver unable to continue	Higher	Higher	Higher
Caregiver not satisfied with support	Higher	Higher	Higher
Caregiver distressed	Higher	Higher	Higher
Environment CAP triggered	NS	NS	NS
Impaired locomotion inside home	Lower	Lower	Lower
Impaired locomotion outside home	Lower	Lower	Lower
Lighting environment issue	NS	NS	NS
Flooring and carpeting environment issue	NS	NS	NS
Bathroom and toilet room environment issue	NS	NS	NS
Kitchen environment issue	NS	NS	NS
Heating and cooling environment issue	NS	NS	NS
Personal safety issue	Higher	Higher	Higher
Access to home issue	Lower	Lower	Lower
Access to rooms in home issue	Lower	Lower	Lower
No home environment issues	Lower	Lower	Lower
Required to make economic trade-offs	NS	NS	NS

Higher signifies higher odds of contact with geriatric medicine; *Lower* signifies lower odds of contact with geriatric medicine; *NS* signifies nonsignificant relationship.

Table 5.10 Results of logistic regression analysis: Nature of relationship between need variables with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444), stratified by sex (male, n=79,252; female, n=117,192)

Variable	Overall sample (n=196,444)	Males (n=79,252)	Females (n=117,192)
Cognition			
Alzheimer’s	Higher	Higher	Higher
Dementia other than Alzheimer's disease	Higher	Higher	Higher
CPS ≥3	Higher	Higher	Higher
Short-term memory problem	Higher	Higher	Higher
Procedural memory problem	Higher	Higher	Higher
Impaired cognitive skills for daily decision-making	Higher	Higher	Higher
Worsening of decision-making	Higher	Higher	Higher
Sudden or new onset/change in mental function over last 7 days	Higher	Higher	Higher
Agitated or disoriented in last 90 days	Higher	Higher	Higher
Communication/Hearing/Vision Patterns			
Communication decline	Higher	Higher	Higher
Vision decline	Lower	NS	NS
Mood and Behaviour Patterns, Mental Health Conditions			
Any psychiatric diagnosis	Higher	Higher	Higher
DRS ≥3	Higher	Higher	Higher
Mood decline	Higher	Higher	Higher
Wandering	Higher	Higher	Higher
Verbally abusive behavioural symptoms	Higher	Higher	Higher
Physically abusive behavioural symptoms	Higher	Higher	Higher
Socially inappropriate/disruptive	Higher	Higher	Higher
Resists care	Higher	Higher	Higher
Changes in behaviour symptoms	Higher	Higher	Higher
Lonely	NS	NS	Higher
Delusions	Higher	Higher	Higher
Hallucinations	Higher	Higher	Higher
Physical Functioning			

Variable	Overall sample (n=196,444)	Males (n=79,252)	Females (n=117,192)
ADLH ≥3	NS	NS	Lower
IADL-C ≥3	Higher	Higher	Higher
ADL decline	Lower	Lower	Lower
Functional improvement potential – client perspective	Lower	Lower	Lower
Functional improvement potential – caregiver perspective	Lower	Lower	Lower
Good prospects of recovery	Lower	Lower	Lower
Continence			
Worsening of bladder incontinence		Higher	NS
Disease Diagnoses			
Increasing number of diagnoses	Higher	NS at levels 1,6 Higher at levels 2-5	NS
Cerebrovascular accident (stroke)	NS	NS	NS
Congestive heart failure	Lower	Lower	Lower
Coronary artery disease	Lower	Lower	Lower
Hypertension	Lower	Lower	Lower
Irregularly irregular pulse	Lower	Lower	Lower
Peripheral vascular disease	Lower	Lower	Lower
Head trauma	Higher	Higher	NS
Hemiplegia/hemiparesis	Lower	Lower	Lower
Multiple sclerosis	Lower	NS	NS
Parkinsonism	Higher	Higher	Higher
Arthritis	Lower	Lower	Lower
Hip fracture	Lower	Lower	Lower
Other fractures	Lower	NS	Lower
Osteoporosis	Higher	Higher	NS
Cataract	NS	NS	NS
Glaucoma	NS	NS	NS
HIV infection	NS	NS	NS
Pneumonia	Lower	Lower	Lower

Variable	Overall sample (n=196,444)	Males (n=79,252)	Females (n=117,192)
Tuberculosis	NS	NS	NS
Urinary tract infection	NS	NS	NS
Cancer	Lower	Lower	Lower
Diabetes	Lower	Lower	Lower
Emphysema/COPD/asthma	Lower	Lower	Lower
Renal failure	Lower	Lower	Lower
Thyroid disease (hyper or hypo)	NS	NS	NS
Health Conditions			
Increasing pain scale score	Lower	NS at level 1 Lower at levels 2,3	NS at level 1 Lower at levels 2,3
Multiple falls	Higher	NS at level 1 Higher at level 2,3	NS at levels 1,2 Higher at level 3
Unsteady gait	Lower	Lower	Lower
Poor self-reported health	Lower	Lower	Lower
Unstable conditions	Higher	Higher	Higher
Flare-up of recurrent or chronic condition	Lower	Lower	Lower
Treatments changed in last 30 days	Lower	Lower	Lower
Elder Abuse Indicators			
Abuse CAP triggered	Higher	NS at level 1 Higher at level 2	NS at level 1 Higher at level 2
Fearful of family/caregiver	NS	NS	NS
Unusually poor hygiene	Higher	NS	Higher
Unexplained injuries	NS	NS	NS
Neglected, abused, or mistreated	NS	NS	NS
Physically restrained	NS	NS	NS
Service Utilization			
No change or deterioration in care needs	Higher	Higher	Higher
Medications			
Nine or more medications	Lower	Lower	Lower

Variable	Overall sample (n=196,444)	Males (n=79,252)	Females (n=117,192)
Other Scales			
CHESS ≥3	Lower	NS	NS
MAPLe ≥3	Higher	Higher	Higher
AUA ≥3	Higher	NS at level 2 Higher at levels 3-6	NS at levels 2,3 Higher at levels 4-6
DIVERT ≥3	Lower	Lower	Lower

Higher signifies higher odds of contact with geriatric medicine; *Lower* signifies lower odds of contact with geriatric medicine; *NS* signifies nonsignificant relationship.

5.3.4.2 Need

Loneliness was significantly associated with higher odds of geriatric contact among females but not among males or the overall sample (Table 5.10). Also among females, impairment in ADLs (ADLH ≥3) was significantly associated with lower odds of geriatric medicine contact after adjusting for LHIN, age, and sex. This relationship was not significant among males. Conversely, worsening of bladder incontinence was significantly associated with higher odds of contact among males and in the overall sample, but not among females (Table 5.10).

There were several differences relating to disease diagnoses (Table 5.10). The number of diagnoses was not significantly associated with geriatric medicine contact among females while there was a general trend towards higher odds among males and the overall sample. Head trauma was not significantly associated with geriatric medicine contact among females, although it was associated with higher odds after adjusting for LHIN and age among males and in the overall sample. Individuals with multiple sclerosis in the overall sample had significantly lower odds of geriatric medicine contact; however, this relationship became non-significant after adjusting for LHIN and age in the stratified samples of males and females. Fractures other than hip fractures were associated with significantly lower odds of contact among females and the overall sample, but were not significant among males. Finally, osteoporosis was associated with significantly higher odds of geriatric medicine contact among males and the overall sample, but not among females, after adjusting for LHIN and age.

In the overall sample and among males, lower frequencies of falls were not associated with geriatric medicine contact compared to zero falls (Table 5.10), while higher levels were associated with higher odds. However, among females, the second level of frequency of falls was also not significantly associated. Poor hygiene was associated with higher odds of contact among females and the overall sample, but was not statistically significant among males. Finally, while medical complexity and instability (CHESS) had lower odds of geriatric medicine contact when unadjusted among males and the overall sample, it was not significant among females (Table 5.10).

5.3.5 Multivariable Analysis: Stratified by Sex

There were some differences in the final multivariable models stratified by sex compared to each other and to the overall sample model (Table 5.6). The same decision rules were applied to ensure a clinically meaningful model. Where there were differences observed, an independent variable was significant in one group but not in another. The associations never changed direction, only magnitude.

5.3.5.1 Male Subsample

Similar to the overall sample model, the final multivariable GEE model for the male subsample, clustered by LHIN, retained age, access to home, locomotion outside of home, worsening of decision-making, dementia, Parkinsonism, osteoporosis, and cancer (Table 5.6). In addition to the model for the overall sample, the male subsample model included education and emphysema/COPD/asthma. Unlike the overall sample model, it did not include hallucinations, good prospects of recovery, hemiplegia/hemiparesis, or MAPLe score. Of the variables included in the final model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 5.7; c-statistic=0.72). The c-statistic for the full model was 0.77, indicating that the model had moderate discriminatory power.

The same curvilinear trend for the association between age and geriatric medicine contact observed in the overall sample was observed in the male subsample: the highest odds of contact were among those aged 80-84 (OR 3.48, 95% CI 2.67-4.53). High school education or more and unknown education status were associated with higher odds of geriatric medicine contact (OR 1.14, 95% CI 1.07-1.20; OR 1.16, 95% CI 1.06-1.26, respectively). Access to home issues and impaired locomotion outside the home were associated with lower odds of contact (OR 0.78, 95% CI 0.72-0.84; OR 0.74, 95% CI 0.66-0.84, respectively). Worsening of decision-making and dementia were associated with higher odds of contact (OR 1.48, 95% CI 1.39-1.57; OR 2.70, 95% CI 2.35-3.10, respectively). Those with a diagnosis of Parkinsonism or osteoporosis also had higher odds of contact with geriatric medicine (OR 1.39, 95% CI 1.25-1.56; OR 1.23, 95% CI 1.12-1.35, respectively). Those with a diagnosis of cancer had 0.72 (95% CI 0.69-0.76) times the odds of any contact. A diagnosis of emphysema, COPD, or asthma was associated with lower odds of contact (OR 0.84, 95% CI 0.80-0.88).

5.3.5.2 Female Subsample

The final female subsample multivariable GEE model, clustered by LHIN, retained the following variables in common with the overall sample model: age, locomotion outside of home, worsening of decision-making, dementia, hallucinations, good prospects of recovery, hemiplegia/hemiparesis, osteoporosis, cancer, and MAPLe score (Table 5.6). In addition, it also included caregiver distress and ADL decline. Unlike the overall sample model, the female subsample model did not include access to home or Parkinsonism. Of the variables included in the final model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 5.7; c-statistic=0.72). The c-statistic for the full model was 0.76, indicating that the model had moderate discriminatory power.

The same curvilinear trend for the association between age and geriatric medicine contact observed in the overall sample and in the male subsample was observed in the female subsample: the highest odds of contact were among those aged 80-84 (OR 2.17, 95% CI 1.81-2.61). Caregiver distress was associated with higher odds of geriatric medicine contact (OR 1.13, 95% CI 1.09-1.18). Impaired locomotion outside the home were associated with lower odds of contact (OR 0.78, 95% CI 0.75-0.82). Worsening of decision-making, dementia, and hallucinations were associated with higher odds of contact (OR 1.23, 95% CI 1.18-1.28; OR 1.97, 95% CI 1.83-2.12; OR 1.20, 95% CI 1.11-1.31), respectively). Decline in ADL and good prospects of recovery were associated with lower odds of contact (OR 0.89, 95% CI 0.85-0.93; OR 0.81, 95% CI 0.78-0.85, respectively). Those with a diagnosis of hemiplegia or hemiparesis also had lower odds of contact with geriatric medicine (OR 0.67, 95% CI 0.57-0.80). Those with a diagnosis of osteoporosis had 1.11 (95% CI 1.08-1.15) times higher odds of any contact. A diagnosis of cancer was associated with lower odds of contact (OR 0.78, 95% CI 0.72-0.85). Finally, MAPLe score was associated with higher odds of contact with geriatric medicine. Those in level three had 1.14 (1.08-1.20) times greater odds of contact while those in levels four and five had 1.58 (95% CI 1.50-1.67) times greater odds of geriatric medicine contact then those in levels one or two.

5.3.5.3 Comparison of Male and Female Subsample Models

Both the male and female subsample models retained age, locomotion outside of the home, worsening of decision-making, dementia, osteoporosis, and cancer. Education, access to home, Parkinsonism, and emphysema/COPD/asthma were all significant in the male subsample model but not in the female subsample model. Caregiver distress, hallucinations, ADL decline, hemiplegia/hemiparesis, and MAPLe score were significant in the female subsample model but not in the male subsample model.

5.4 Discussion

Based on this study of the determinants of contact with geriatric medicine, it appears that geriatricians mainly care for cognitively impaired older adults with mood symptoms and conditions typically associated with older age, who are at risk for institutionalization, rather than the medically complex and unstable. Many of the client characteristics tested in simple logistic regression analyses of the overall sample were significantly associated with geriatric medicine, including predisposing, enabling, and need variables. All three types of variables were retained in each of the multivariable models. Some of the relationships observed were consistent with determinants of physician services use by community-dwelling older adults as described in the literature, but there were also conflicting results. The direction of the associations found was of particular interest, as many of the factors were associated with lower odds of contact.

Sex and age were the only predisposing variables retained in the final multivariable models for the overall sample and both subsamples of males and females. The finding that female gender was associated with lower odds of geriatric medicine contact is consistent with the results reported by Cameron et al., 2010, who observed that older women tended to have fewer physician visits than men in an American context (Cameron et al., 2010). The authors suggested that women had less economic resources to access services based on their needs, despite having greater needs. However, in a Canadian context with publicly-funded physician care, the same explanation does not hold. In 2016, Health Quality Ontario reported similar rates of having a regular care provider by the poorest and the richest people in the province. Further, there were no significant differences in wait times to access a specialist based on income level (Health Quality Ontario, 2016). Results from the 2009 Canadian Community Health Survey support the findings of this study and suggest that there may be a higher percentage of men than women over the age of 65 who had contact with a doctor in the previous year, although the gender gap is minimal (Turcotte, 2011). In younger age groups, a greater percentage of women had contact with a doctor than men, which is consistent with the generally accepted notion in the literature that women use more health care services than men (Bertakis, Azari, Callahan, & Robbins, 2000).

The relationship between age and geriatric medicine was of interest. Among older adults, it appears that those aged 80-84 years older, or the middle-old, had the highest odds of contact. It is possible that the youngest-old were healthier and did not require specialized care at the same rate as the middle-old. There may be survival bias in that home care clients who survived to become part of the oldest-old were also healthier overall, and thus had less need for contact with geriatric medicine. However, the final multivariable models accounted for need variables, such as cognitive impairment and certain disease diagnoses, and still the curvilinear association of age with higher odds of geriatric contact persisted. Canadian data show that public health care spending per capita, which covers contact with geriatric medicine, increased in an exponential manner from ages 60-64 to 90 or more in 2014 (Canadian Institute for Health Information, 2016). It appears that trends in the association between age and contact with geriatric medicine in Ontario are not consistent with the trends in overall public health care spending in Canada. It may be that care providers are not referring the oldest-old to more specialized care at the same rate because they have a low expectation of benefit (Wyman, Shiovitz-Ezra, & Bengel, 2018). There is evidence of age discrimination in clinical decision-making in health care systems around the world (Huber et al., 2008). Physicians may believe that the oldest old have low potential for reversibility and improvement. In light of the limited availability of geriatric medicine and the broader spectrum of community-based SGS, referring physicians are likely already engaging in some form of prioritization when deciding which patients to refer and may be considering age as a factor.

Education was only significant in the final male subsample model, in which having a higher education was found to be associated with higher odds of geriatric medicine contact. This finding is consistent with the literature on physician contact (Adepoju et al., 2018; Gerst-Emerson & Jayawardhana, 2015; Lim & Chan, 2017). The discrepancies found between the male and female subsamples are also consistent with the findings reported by Korten et al. (1998), wherein sociodemographic variables were found to be more important in predicting services use for males than for females (Korten et al., 1998).

There were interesting findings observed related to the enabling variables. It appears that older home care clients with difficulty moving around, whether within or outside of their home, have lower odds of geriatric medicine contact. This suggests that there may be older adults who would benefit from the care of geriatric medicine, but may be hindered by issues of accessibility or transportation. Issues of transportation were highlighted by experts in the care of older adults as a barrier to accessing SGS in Ontario (see Chapter 2). However, it was not possible to discern whether there were individuals who were referred, but were not able to attend their appointment, or if these individuals were not referred in the first place. Nevertheless, the finding that these enabling variables remained statistically significant in the multivariable models, even after the inclusion of need variables, further supports the possibility that use of geriatric medicine services may be hindered by issues of accessibility and transportation.

Older home care clients with primary and secondary caregivers were found to have higher odds of geriatric medicine contact in the simple logistic regression analyses, but these variables were not retained in the multivariable analyses. It could be that informal caregivers act as advocates for the older adults, coordinating care and pushing for referral to specialized services to overcome barriers faced by older adults without informal caregivers (Committee on Family Caregiving for Older Adults, 2016; Reinhard, 2017). However, it is also likely that older adults who do not have informal caregivers do not have complex needs requiring that extra support. Therefore, they may also have less need for geriatric medicine care. When presence of primary or secondary caregiver was included in a multivariable model alongside need variables, it was no longer significant, supporting this line of thinking.

The findings of this study suggest that limited funds are not a barrier to accessing geriatric medicine. The relationship between having to make basic purchase trade-offs due to limited funds and contact with geriatric medicine was not statistically significant in the simple or final multivariable logistic regression models. Therefore, cost of care is not a factor determining access to these services, which is consistent with Canadian data which do not show an income effect (Health Quality Ontario, 2016). This finding is in accordance with the principles of the Canada Health Act, which stipulate that the publicly funded health care system should be universally accessible and not impeded by cost (Romanow, 2002).

Overall, need variables were generally more important for predicting geriatric medicine contact, particularly cognitive impairment, hallucinations, certain disease diagnoses and risk of caregiver distress and institutionalization. It is possible that other disciplines do not feel equipped to handle cognitive impairment and hallucinations and thus refer to more specialized care. It may also be that individuals with these characteristics have higher odds of physician services use in general. The literature suggests that mental health difficulties are associated with higher odds of physician services use among community-dwelling older adults (Adepoju et al., 2018; Gerst-Emerson & Jayawardhana, 2015; Lim & Chan, 2017).

The relationship between functional impairment and contact with geriatric medicine was mixed in the simple logistic regression analyses and largely insignificant in the final multivariable GEE models after adjusting for other need variables. The only significant association was found within the final female subsample multivariable model, where ADL decline was associated with lower odds of contact with geriatric medicine. It may be that the clients with declining function are considered beyond help and would not benefit from specialized care. However, the findings also demonstrated that good prospects for recovery are not driving geriatric medicine contact, but are rather associated with lower odds of contact in both the female subsample and the overall sample. Therefore, it does not appear that specialized geriatric care is being targeted to older adults with potential for improvement and recovery.

The published literature report consistent positive associations between number of chronic conditions and higher odds of health services use (Feng et al., 2009; Fillion et al., 2019; Fisher et al., 2016; Gerst-Emerson & Jayawardhana, 2015; Griffith et al., 2016; Gruneir, Griffith, et al., 2016; Hajek et al., 2017; Lim & Chan, 2017; Van den Bussche et al., 2011). However, no strong dose response relationship was observed between the number of disease diagnoses and odds of contact with geriatric medicine in simple logistic regression analyses in this study. Further, the relationship was not significant in any of the final multivariable GEE models. It appears that the number of conditions (i.e., multimorbidity) does not play a role in driving geriatric medicine contact for older adults in home care, despite the fact that geriatricians are ostensibly trained to care for older adults with multiple conditions using a holistic approach, balancing the benefits and harms of various treatments (Cantor, 2017; Chun, 2011; Fried & Hall, 2008).

Among individual diagnoses, only osteoporosis was consistently associated with higher odds of geriatric medicine contact across the overall sample, male subsample, and female subsample in the final multivariable GEE models. Parkinsonism was also associated with higher odds of contact, but retained only in the overall sample and male subsample multivariable GEE models. No other diagnoses (with the exception of dementia and head trauma) were associated in simple logistic regression analysis or multivariable GEE analysis with higher odds of geriatric medicine contact. This may be because osteoporosis and Parkinsonism are typically considered diseases affecting older adults and therefore within the purview of geriatric medicine (Demontiero, Vidal, & Duque, 2012; Reeve, Simcox, & Turnbull, 2014). Other conditions retained in the final multivariable GEE models, such as hemiplegia/hemiparesis (overall sample and female subsample), cancer (overall sample, male subsample, and female subsample), and emphysema, COPD, and asthma (male subsample) were associated with lower odds of contact with geriatric medicine. Geriatricians do not appear to play a role in caring for older home care clients with these conditions, although they are internists by training and should be equipped to address some of these issues and well-positioned to provide insight into their care from a holistic point of view (Canadian Medical Association, 2018c).

The findings also suggest that geriatric medicine specialists do not have a role in managing multiple medications in complex, older home care clients, despite their training in optimizing care plans, accounting for the benefits and harms of various treatments (Cantor, 2017; Chun, 2011; Fried & Hall, 2008). As multimorbidity and acute illness are not drivers of geriatric medicine contact, it is not surprising that polypharmacy is not a determinant either. It is possible that family physicians do not consider medically complex and unstable patients for referral to geriatric medicine, but rather consult with other specialist disciplines and pharmacists when they require additional expertise in managing their medications. However, involvement of geriatric medicine in collaborations between primary care and pharmacy care may further optimize care plans for the most vulnerable and complex older home care clients.

Finally, risk of caregiver distress and institutionalization (indicated by higher MAPLe scores), was associated with higher odds of geriatric medicine contact in the final overall sample and female subsample multivariable GEE models, but not in the male subsample model. MAPLe includes measures of cognitive impairment, behaviour symptoms, impairment in ADLs and IADLs, falls, poor nutrition status, and home environment issues. While some of these factors were not included as individual items in the final multivariable GEE models, they appear to drive contact with geriatric medicine by older home care clients indirectly. For example, behavioural disturbances were associated with higher odds of contact with geriatric medicine in simple logistic regression models that were only adjusted for LHIN, age, and sex. Behavioural symptoms are an important component in the calculation of the MAPLe score, and their presence results in a higher score. However, the individual behaviour items were not retained as separate variables in the final model that included MAPLe. Collinearity between MAPLe and other individual component items included in the final model (i.e., worsening of decision-making, access to home issues, and impaired locomotion) does not appear to be a concern as the associations between these characteristics and geriatric medicine contact remained in the same direction in the final multivariable GEE models as in the simple logistic regression models.

Other composite measures, indicating risk of unplanned ED visits (DIVERT) and medical complexity and instability (CHESS) were not retained in the final multivariable GEE models. These findings lend support to the conclusion that acute care needs and medical complexity are not driving contact with geriatric medicine. Rather, measures indicating cognitive impairment, such as dementia diagnosis and MAPLe, are more important drivers of geriatric medicine services use.

It is interesting that there were no significant interaction effects observed between sex and other determinants, despite evidence of this in the literature (Korten et al., 1998; León-Muñoz et al., 2007). The stratified multivariable GEE models had some discrepancies but all the relationships were either in the same direction or not significant. Of note, the female subsample model retained variables related to caregiver distress and functional impairment while the male subsample model did not. This may be some kind of gendered effect. Women may have to reach a point of crisis before referral occurs whereas the referral may occur sooner for men with otherwise similar medical needs. Gender disparities have been observed in referral and access to medical care among older adults. For example, men have been found to receive more thorough medical examinations, follow-up, preventive care, referrals for surgery, and life-saving interventions than women (Cameron et al., 2010; Chapman, Kaatz, & Carnes, 2013; Chrisler, Barney, & Palatino, 2016; Crilly, Bundred, Hu, Leckey, & Johnstone, 2007; Travis, 2005).

5.4.1 Comparison of Findings with Expert Insight

Cognitive impairment, mental health issues, risk of institutionalization, and caregiver distress were all identified by expert informants as important for referral to SGS, which is consistent with results of this study investigating contact with geriatric medicine. Expert informants also suggested that older adults with mobility impairment should be considered for referral to SGS. However, as described above, impairment in locomotion may be a barrier to accessing geriatric medicine care.

Multimorbidity, recent and significant decline, or potential for reversibility, and acute illness/event triggering major change were also factors identified by experts in the care of older adults as important for referral to SGS, but many of these characteristics were associated with lower odds of contact with geriatric medicine in this study. For example, cardiorespiratory conditions, risk of unplanned ED visits (DIVERT), decline in function, and flare-up of recurrent or chronic problems were associated with lower odds of contact with geriatric medicine and medical complexity and instability (CHESS) was not significantly associated.

Health care professionals also indicated that falls, complications from medications, and prescription of appropriate medications were important for referral to SGS. Falls were found to be associated with higher odds of contact with geriatric medicine in simple logistic regression models. However, some of the risk factors for falls, such as unsteady gait and polypharmacy (which may cause unsteady gait) (Stinchcombe, Kuran, & Powell, 2014), had lower odds of contact with geriatric medicine. The findings suggest that geriatric medicine, and possibly the broader spectrum of community-based SGS, are not being used proactively within the health care system. Specialized geriatric care provided upstream could potentially prevent unplanned ED visits, falls, and other adverse outcomes, and may thus also optimize function, independence, and quality of life. It also appears that the current role of geriatric medicine does not include proactive care that addresses home care clients' potential for improvement, despite being identified as potentially important for referral by expert informants. Functional improvement potential and good prospects for recovery were associated with lower odds of contact with geriatric medicine in this study.

5.4.2 Implications

The findings of this study provide evidence to help understand factors driving contact with geriatric medicine in Ontario. It appears that there are home care clients with acute conditions, cardiorespiratory conditions, polypharmacy, or medical complexity and instability, who have care needs which fall within the scope of practice and expertise of geriatric medicine but may not be accessing services. Non-specialized medical students, residents, primary care physicians, specialists, and other health care professionals may benefit from additional education and training on the role of geriatric medicine and appropriate referrals. Geriatric medicine specialists may benefit from additional training to return to their internal medicine roots in caring for older adults with acute and unstable conditions. Stronger relationships and collaboration between community-based care providers, including primary care, home care, SGS, and other community-based care providers such as pharmacists, may help to ensure appropriate referrals to geriatric medicine and to optimize care for the most vulnerable and complex older home care clients.

Further, clients with difficulty moving around may experience barriers preventing access to specialized care. A better understanding is needed of referral practices, and the barriers that may be preventing access to care, as well as potential solutions to these barriers. One possible solution is to provide in-home consultations for housebound older home care clients. House Calls, launched by Mount Sinai Hospital in Toronto, is a program whereby physicians provide in-home care for marginalized, housebound seniors unable to attend physician care services (Sinha, 2012). The findings also suggest that individuals who have contact with geriatric medicine may be seen reactively rather than proactively, when there is less potential for improvement and recovery. A more upstream approach to geriatric care may reduce strain on the health care system downstream.

Finally, these results should prompt an examination of how limited SGS resources in general, and geriatric medicine resources in particular, should be allocated in Ontario. There is a need for decision-making mechanism that helps identify home care clients who have the most need and would benefit from referral to SGS in a rational, and equitable way. Such a tool is not meant to replace clinical judgment but to act as a support for care providers and remove some of the guesswork in deciding when and whether to refer.

5.4.3 Limitations

This study has several limitations. First, it was not possible to discern which home care clients were referred to geriatric medicine but did not actually access the services, which may affect the interpretation of the results. Second, while contact with geriatric medicine was limited to contact on an outpatient basis using the location code, there may be some error in defining the dependent variable. The location code is based on an algorithm that makes a best guess as to the location of the service. Some instances of in-patient geriatric medicine contact may be included. However, acute care issues were not generally associated with higher odds of contact with geriatric medicine, which would have been expected if the dependent variable included in-patient care. Therefore, the impact of this issue is likely negligible. Finally, the sample only includes older long-stay home care clients with an admission assessment and may not represent the entire population of home care clients, which also includes individuals who have been receiving care on an on-going basis and short-stay clients. Further, home care clients under the age of 60 were not included in the sample. There may be clients who are younger in chronological age but who are complex and present similarly to older home care clients. These younger clients would thus likely also benefit from the care of geriatric specialist.

5.5 Conclusions

In summary, geriatric medicine contact in Ontario is being driven by predisposing, enabling, and need variables, such as locomotion, cognitive impairment, certain disease diagnoses, and risk of caregiver distress and institutionalization. Geriatric medicine does not appear to be involved in the care of acute, unstable conditions, or individuals with potential for improvement, despite provincial expertise suggesting geriatric medicine has a role to play. The results of this study highlight the need for a deeper examination of the barriers to accessing geriatric medicine and the broader spectrum of community-based SGS, and support the need for a decision-making mechanism to allocate limited geriatric medicine resources in an equitable manner.

Chapter 6
Determinants of Frequent Contact with Physicians on an Outpatient Basis by Older Home Care Clients

6.1 Introduction

Geriatric medicine is a subspecialty of internal medicine that focuses on managing the care of older adults (Canadian Medical Association, 2018c). Geriatricians have expertise in age-related physiological changes, managing multiple geriatric syndromes and chronic conditions, and in balancing the benefits and harms of medications and interventions using a holistic, patient-centred approach (Cantor, 2017; Fried & Hall, 2008). In Ontario, there is currently a shortage of geriatricians to meet the needs of the older adult population. While it is generally accepted that geriatric medicine should be targeted to a more vulnerable subset of the general population of older adults, many vulnerable community-dwelling older adults who would benefit do not have access due to the limited resources available (Lacas & Rockwood, 2012). Instead, they may be frequently consulting other physician disciplines for concerns that may be better addressed by geriatric medicine's holistic and specialized approach to care (Phelan et al., 2008).

Access to health care services may be understood by reference to the Behavioural Model of Health Services Utilization – the most popular theory or framework of access to health care services (Ricketts & Goldsmith, 2005). It is a multilevel model, which considers the impact of societal and individual determinants, and the interplay between them, to explain and predict the type and amount of health services used (Andersen, 1995; Andersen & Newman, 1973; Babitsch et al., 2012). Individual determinants include predisposing, enabling, and need characteristics. Predisposing characteristics exist prior to the onset of illness and result in a person being more or less likely to use health care services but are not directly responsible for use (e.g., demographic characteristics, social structure, and attitudes or beliefs) (Aday & Andersen, 1974; Andersen & Newman, 1973). Enabling characteristics are the ability of the person, and the means available to them, to act on their values and satisfy their health needs by obtaining health care services (e.g., income, health insurance coverage, having regular primary care physician) (Aday & Andersen, 1974; Andersen & Newman, 1973). Need characteristics consider the person's individual illness level, whether perceived or evaluated by the health care system (Aday & Andersen, 1974; Andersen & Newman, 1973). Need characteristics are the most immediate cause for health care services use.

There has been little empirical evidence describing determinants of access to geriatric medicine. The findings of earlier analyses in this dissertation suggest that the factors driving access to geriatric services use in Ontario are not fully aligned with expert opinion on factors that should be driving the use of those services, or the broader spectrum of community-based specialized geriatric services (SGS) among older adults. The Regional Geriatric Programs of Ontario (RGPO) and Ontario Ministry of Health and Long-term Care (MOHLTC) have recognized that home care clients are a vulnerable subset of the community-dwelling, older adult population who may benefit from SGS. As such, they want to develop an evidence-based decision support mechanism to identify home care clients for referral. In the Ontario home care sector, standardized assessments allow for embedded output tools that support the kind of mechanism proposed by the RGPO and MOHLTC.

Based on the findings of earlier analyses in this dissertation, historical determinants of contact with geriatric medicine cannot solely be used to capture the target population for specialized geriatric care, as identified by experts in Ontario. Older home care clients having the most frequent contact with physicians on an outpatient basis may represent a subset that would benefit from the specialized, holistic care provided by geriatric medicine. Frequent attenders of physicians services are sometimes described as problematic, difficult patients, with a lowered threshold for care-seeking and in need of an intervention to reduce contact (Haroun et al., 2016; Kivelä, Elo, & Kääriäinen, 2018). However, they often have real needs requiring more frequent contact than others (Gill & Sharpe, 1999; Kivelä et al., 2018; Luciano et al., 2010). Therefore, examining the determinants of frequent contact with physicians may provide insight into which characteristics should best identify home care clients for referral to geriatric medicine, and the broader spectrum of community-based SGS. To inform this analysis, a literature review of frequent attenders of physician services by community-dwelling older adults was conducted.

6.1.1 Literature Review of the Determinants of Frequent Use of Outpatient Physician Services

6.1.1.1 Defining Frequent Attendance

Many articles have been published on the topic of frequent use of physician services, particularly in general or primary care practice. Several literature reviews have also been published, mainly seeking to define frequent attendance and describe the characteristics of frequent attenders (Gill & Sharpe, 1999; Haroun et al., 2016; Howe, Parry, Pickvance, & Hockley, 2002; Kivelä et al., 2018; Vedsted & Christensen, 2005; Welzel et al., 2017). To date, there has been no consensus on the theoretical or operational definition of frequent attendance. Multiple articles have been published on this topic alone (Kivelä et al., 2018; Luciano et al., 2010; Smits, Mohrs, Beem, Bindels, & Van Weert, 2008; Vedsted & Christensen, 2005). Individuals are generally identified as frequent attenders based on their number of consultations with physicians, but definitions differ depending on local system contexts and research purposes (Haroun et al., 2016; Kivelä et al., 2018; Vedsted & Christensen, 2005). Frequent attendance is often defined in three ways: 1) specified number of contacts during a fixed time period; 2) cut-off based on upper percentile, or; 3) above average number of visits for age and sex. Because of these differences, authors have reported difficulty in comparing study results (Kivelä et al., 2018; Welzel et al., 2017).

Many of the studies published have examined this topic within the general population of adults. Characteristics found to be associated with frequent attendance have included female gender, older age, single, lower education level, social (e.g., loneliness, isolation, lack of support) and economic (e.g., low income) difficulties, physical illness, mental illness, poor self-reported health, and multiple, complex problems (Gill & Sharpe, 1999; Kivelä et al., 2018; Vedsted & Christensen, 2005). The literature on frequent attendance by older adults is more limited. One review article on this topic was identified but it did not restrict to studies with only older adults and it only included European studies (Welzel et al., 2017).

6.1.1.2 Description of Studies Reviewed

Searches of PubMed, Scopus, and Google Scholar identified ten articles describing characteristics of frequent contact with physicians on an outpatient basis by older adults (see Appendix H for a summary of studies included). Several articles from the review by Welzel and colleagues were retained (Gilleard, Francis, & Brown, 1998; Menchetti, Cevenini, De Ronchi, Quartesan, & Berardi, 2006; Rennemark, Holst, Fagerstrom, & Halling, 2009; Scherer et al., 2008; Sheehan, Bass, Briggs, & Jacoby, 2003; Van den Bussche et al., 2016). The remainder were excluded because the samples included the general population of adults. The studies included in this current review were mainly from Europe (n=7), including Germany (Hajek & König, 2018; Scherer et al., 2008; Van den Bussche et al., 2016), Ireland (Sheehan et al., 2003), Italy (Menchetti et al., 2006), the United Kingdom (UK) (Gilleard et al., 1998), and Sweden (Rennemark et al., 2009). The remaining studies were from Canada (Hand et al., 2014), Israel (Press, Tandeter, Romem, Hazzan, & Farkash, 2012), and the United States (US) (Freeborn, Pope, Mullooly, & McFarland, 1990). The majority of the studies were cross-sectional, while two studies were longitudinal cohort studies (Hajek & König, 2018; Scherer et al., 2008). Data sources included medical records, insurance claims records, interviews, surveys, and questionnaires. Study sample sizes ranged from n=40 (Hand et al., 2014) to n=123,224 (Van den Bussche et al., 2016), but were generally between the range of n=100 to n=1,000. Most samples included adults at least 60 years of age or older, with the exception of one study, that included adults 40 years of age and older. While not generally considered older adulthood, this study was included because of its longitudinal design and measurement of contact with specialists in addition to general practitioners (GPs) (Hajek & König, 2018). It was also one of two studies that explicitly restricted their sample to community-dwelling, or noninstitutionalized, individuals (Hajek & König, 2018; Press et al., 2012). None of the studies focused specifically on determinants of frequent attendance among older home care clients, although some of the study samples may have included older adults receiving home care services. Most study samples consisted of older adults in general who were registered with primary care practices or health insurance plans.

Several studies focused on the association between frequent attendance and specific independent variables of interest, namely: social isolation (Hand et al., 2014); depression (Menchetti et al., 2006; Press et al., 2012); psychosocial characteristics (Rennemark et al., 2009; Scherer et al., 2008); and somatization (i.e., psychological distress expressed as physical symptoms) (Sheehan et al., 2003). Authors were otherwise interested in a mix of predisposing, enabling, and need variables, such as sex, marital status, living situation, socioeconomic status and social factors, comorbidities, mental health, somatic symptoms, cognition, functional impairment, self-reported health, and medications. Frequent attendance was operationalized either as a cut-off based on an upper percentile of frequent contact (i.e., top 33% (Freeborn et al., 1990; Sheehan et al., 2003); top 30% (Rennemark et al., 2009), or; top 10% (Gilleard et al., 1998)) or based on a number of contacts during a fixed time period (Hajek &

König, 2018; Hand et al., 2014; Menchetti et al., 2006; Press et al., 2012; Scherer et al., 2008; Van den Bussche et al., 2016). Contact was mainly with GPs, family physicians (FPs), or primary care, but a few studies included outpatient contact in general (Freeborn et al., 1990; Hajek & König, 2018; Van den Bussche et al., 2016).

6.1.1.3 Findings

6.1.1.3.1 Predisposing and enabling determinants

Most studies adjusted for some predisposing and enabling determinants, but did not always report on the findings specifically related to these variables. Where reported, the findings are summarized below. Variables included age, sex, marital status, living situation, social factors, and socioeconomic status.

Age. In one cross-sectional study, older age was associated with frequent attendance (Freeborn et al., 1990). However, in a longitudinal study, the onset of frequent attendance was negatively associated with age after adjusting for several need factors (Hajek & König, 2018). The authors suggested individuals may become more pessimistic about the potential benefit of treatment for their conditions as they age. This was the only study with a longitudinal design that examined the association of change in individual characteristics with onset of frequent attendance (Hajek & König, 2018). Its unique design may explain the discrepancy between its results and the results of the other studies reviewed. Several studies reported no significant association (Hand et al., 2014; Press et al., 2012; Rennemark et al., 2009; Sheehan et al., 2003). However, one of those studies had a very small sample size (n=40) and examined factors associated with more frequent physician contact among those who were already considered frequent attenders (Hand et al., 2014). Press and colleagues did not report the effect of age in a multivariable logistic regression model, but only reported that there were no significant differences in age between high services users and low service users (Press et al., 2012). Sheehan and colleagues only examined the association of age with frequent attendance at the bivariate level, and did not adjust for other covariates (Sheehan et al., 2003). Rennemark and colleagues reported no significant association between age and frequent attendance in bivariate analyses or in a multivariable logistic regression model that was adjusted for other covariates, including gender, comorbidity, and functional ability (Rennemark et al., 2009).

Sex. Findings related to sex were mixed. One study reported that female sex was associated with frequent attendance in bivariate analysis but did not report its relationship when included in a multivariable model (Scherer et al., 2008). Several studies reported no differences in bivariate analysis (Freeborn et al., 1990; Hand et al., 2014; Press et al., 2012; Sheehan et al., 2003) or multivariable analysis (Rennemark et al., 2009). However, the findings of the study by Hand and colleagues must be interpreted with caution due to its small sample size (n=40) (Hand et al., 2014).

Marital status and living situation. Several studies reported no association of frequent attendance with marital status (Freeborn et al., 1990; Hajek & König, 2018; Hand et al., 2014; Press et al., 2012) or living situation (Hand et al., 2014; Press et al., 2012). Only one study of older adults with heart failure found that living alone was associated with frequent attendance in a multivariable logistic regression model that included gender, severity of heart failure, anxiety, depression, and physical problems (Scherer et al., 2008).

Social factors. Social support was generally found to have no significant association with frequent attendance (Hand et al., 2014; Press et al., 2012; Rennemark et al., 2009; Scherer et al., 2008), nor did loneliness (Hajek & König, 2018). There was one exception: Sheehan and colleagues reported that low social support was associated with frequent attendance in a multivariable regression model (Sheehan et al., 2003).

Socioeconomic status. No association between education, income, or occupational status and frequent attendance was found in studies from various countries, including the US (Freeborn et al., 1990), Germany (Hajek & König, 2018), Israel (Press et al., 2012), Ireland (Sheehan et al., 2003), and Sweden (Rennemark et al., 2009).

6.1.1.3.2 Need determinants

Need determinants included comorbidities, mental health, somatic symptoms, cognition, functional impairment, self-reported health, and medications. Frequent attendance was generally more often found to be significantly associated with need variables than predisposing or enabling variables.

Comorbidities. A high number of physical conditions was found to be significantly associated with frequent attendance in almost all of the studies reviewed (Freeborn et al., 1990; Hajek & König, 2018; Menchetti et al., 2006; Press et al., 2012; Rennemark et al., 2009; Scherer et al., 2008; Sheehan et al., 2003; Van den Bussche et al., 2016). Cardiovascular conditions and arthritis were specifically found to be associated with frequent attendance in two studies (Freeborn et al., 1990; Van den Bussche et al., 2016). Of the remaining studies that did not report an association, one study did not include physical health in their analyses (Gilleard et al., 1998) and the second had a very small sample size and did not report any significant findings (n=40) (Hand et al., 2014).

Mental health. Mental health conditions were generally found to be associated with frequent attendance, including depression, anxiety, and other psychological disorders (Freeborn et al., 1990; Menchetti et al., 2006; Press et al., 2012; Sheehan et al., 2003; Van den Bussche et al., 2016). However, two studies reported no association between anxiety, depression, or psychiatric morbidity and frequent attendance (Gilleard et al., 1998; Scherer et al., 2008). In the first study, the analytical approach was not well explained and only simple bivariate analyses were performed (Gilleard et al., 1998). The second study had a sample that was limited to older adults with heart failure. While anxiety and depression were significantly associated with frequent attendance in bivariate analyses, the association was no longer significant when tested in a multivariable model containing gender, living situation, severity of heart failure, and physical problems (Scherer et al., 2008).

Somatic symptoms. Two studies reported that the presence of somatic symptoms (i.e., psychological distress expressed as physical symptoms) was associated with frequent attendance (Menchetti et al., 2006; Sheehan et al., 2003).

Cognition. In one study, impaired cognition was found to be associated with frequent attendance in a bivariate model and in a multivariable model that also retained measures of comorbidities and depression (Press et al., 2012). A second study that included cognition in the analyses found no significant association in a bivariate model and thus did not test for this variable in a multivariable model (Hajek & König, 2018).

Function. Two of the studies reviewed with samples containing a subset of patients receiving home nursing care services found that impaired functioning was associated with frequent attendance (Hajek & König, 2018; Van den Bussche et al., 2016). However, other studies of community-dwelling older adults reported no significant association (Hand et al., 2014; Press et al., 2012; Rennemark et al., 2009). It was not apparent whether these samples included any older adults requiring home care services.

Self-reported health. Poor self-reported health was found to be associated with frequent attendance in two studies (Freeborn et al., 1990; Hajek & König, 2018).

Medications. No consistent or significant relationships were observed between frequency of attendance and use of antidepressants, hypnotics, antipsychotic medication, or prescriptions in general (Gilleard et al., 1998; Sheehan et al., 2003).

6.1.1.3.3 Interactions

Few of the studies reported testing interaction effects in multivariable models. One study reported no significant interactions found with sex, education, depression, and other variables (Hajek & König, 2018; Menchetti et al., 2006). However, a second study found a significant interaction between age and gender, whereby females aged 65-74 had higher odds of frequent attendance compared to males aged 65-74, but females aged 75 years and older did not have significantly higher odds of frequent attendance than males aged 65-74. Nevertheless, males aged 75 years and older did have significantly higher odds of frequent attendance than males 65-74 (Van den Bussche et al., 2016).

6.1.1.4 Summary of Literature Review

The studies reviewed explored the association between various characteristics and frequent attendance among older adults in general. Need variables appeared to be more strongly associated with frequent attendance than predisposing or enabling variables. The associations between frequent attendance and age or sex were inconsistent. Other predisposing and enabling variables were generally reported to have no association with frequent attendance, with some exceptions. It may still be worthwhile considering marital status, living situation, socioeconomic status, and social factors in addition to age and sex as determinants for frequent attendance in a longitudinal study with a larger sample size than the studies reviewed. Reviews of frequent primary care attendance in the general population reported that low education, income, and unemployment were consistently associated with frequent attendance, and may all be interrelated with poor health resulting in higher care needs (Gill & Sharpe, 1999; Kivelä et al., 2018; Vedsted & Christensen, 2005).

Physical and mental health conditions, and somatic symptoms, were generally found to be associated with frequent attendance. Other need variables, such as cognition, function, self-reported health, and medications may be associated but the evidence to date is either limited and/or inconsistent. While the studies reviewed did not find evidence of any interactions between individual determinants, there may still be an interplay between age, sex, education, mental health and other need factors and it would worthwhile to consider these variables for inclusion in a larger, longitudinal study.

It was somewhat difficult to compare findings due to differences in the operationalization of frequent attendance, independent variables chosen, and local health systems. The only Canadian study included in the review had a very small sample size and investigated frequency of contact among older adults who were already considered frequent attenders. The studies reviewed largely did not consider or discuss system or society-level determinants and their potential interplay with individual-level determinants. As the studies were observational and mostly cross-sectional in nature, it was not possible to establish causality. In many cases, the analyses were quite simple and limited to bivariate analysis. Often variables were not tested in multivariable models and covariates and interactions were not considered.

There are important differences between older home care clients – the population of interest for this study – and the overall population of older adults in the community. Older home care clients as a whole are complex and have higher needs. They are thus a more homogeneous group than the general population of older adults. As a result, the determinants of frequent attendance among home care clients may differ from those identified in the studies reviewed. Nevertheless, this review provides insight into which variables to consider as determinants for frequent contact with outpatient physician services by older home care clients in Ontario.

6.1.2 Rationale and Objectives

Identifying determinants of frequent attendance among older home care clients may provide insight into which of these should be referred to geriatric medicine. Historical home care assessment data may be linked to administrative services use data to answer this question. The Resident Assessment Instrument - Home Care (RAI-HC) was a mandated assessment instrument in Ontario until it was replaced by the newer interRAI HC in 2018. However, interRAI HC data have not yet been linked to physician services use data. Nevertheless, this new version of the home care assessment contains a measure of past physician services use. Using data collected with the newly mandated interRAI HC, associations found to be significant in the RAI-HC may be tested within the current home care context. This study aims to answer the following research questions:

- What are the determinants of frequent contact with physicians on an outpatient basis among older home care clients in Ontario?
- Are the associations observed in the home care sector prior to 2018 (as measured by the RAI-HC) consistent since 2018 (as measured by the interRAI HC)?

6.2 Methods

6.2.1 Study Design

This is a retrospective cohort study conducted using linked secondary health information and administrative datasets. This study was reviewed and received ethics clearance through the Office of Research Ethics (ORE) at the University of Waterloo (ORE#31345 and ORE#30173).

6.2.2 Secondary Data Sources

Data for this study were obtained from three sources through the Institute for Clinical Evaluative Sciences (ICES): 1) Resident Assessment Instrument – Home Care (RAI-HC); 2) Registered Persons Database (RPDB); and 3) Ontario Health Insurance Plan (OHIP) physician billing records. interRAI Home Care (HC) data were obtained from Health Shared Services Ontario (HSSO) based on a license agreement with interRAI.

6.2.2.1 Resident Assessment Instrument – Home Care (RAI-HC) and interRAI Home Care (HC)

Prior to 2018, home care assessment data were collected using the RAI-HC, a comprehensive clinical assessment instrument containing over 300 items covering multiple domains, such as cognition, mood and behaviour, physical functioning, disease diagnoses, medications, and other health conditions (Canadian Home Care Association, 2013; Morris, Bernabei, et al., 1999). Scales and algorithms embedded in the assessment act as decision support applications and provide measures of functioning, cognitive performance, mental health, and health issues (Hirdes et al., 2011; Steel, 1999). The RAI-HC assesses needs, strengths, and preferences of individuals with complex medical, functional, and psychosocial needs. While it is not a diagnostic tool, it may be used to identify the potential to reverse or prevent decline and adverse outcomes. In 2018, the interRAI HC replaced the RAI-HC as the mandated assessment tool for use in Ontario with all adult home care clients expected to require services for 60 days or more. Assessments are conducted on admission and every 6 to 12 months thereafter, or upon significant change in health status (Auditor General of Ontario, 2015; Carpenter & Hirdes, 2013; Hirdes, 2006a). The interRAI HC has the same purpose and applications as the RAI-HC. Both assessments belong to a suite of standardized assessments that use a common language and are designed to be compatible across sectors and services (e.g., long-term residential care, acute care, post-acute care, palliative care, community support services, etc.) to form an integrated health information system and support continuity of care (Gray et al., 2009; Hirdes et al., 1999; Hirdes, Ljunggren, et al., 2008). The reliability and validity of both the RAI-HC and interRAI HC have been evaluated and reported in several articles within the peer-reviewed literature (Foebel et al., 2013; Hirdes, Ljunggren, et al., 2008; Hirdes et al., 2014; Hogeveen et al., 2017; Landi et al., 2000; Morris et al., 1997). RAI-HC data were supplied to ICES by Health Shared Services Ontario (HSSO). interRAI HC data were supplied to interRAI by HSSO.

6.2.2.2 Registered Persons Database (RPDB)

The RPDB contains demographic information on each person registered with the Ontario Health Insurance Plan (OHIP) in addition to persons who are eligible for the Ontario Drug Program (Ontario Ministry of Government and Consumer Services, 2017). Relevant data elements for this study include age (five year range), sex, and encrypted Local Health Integration Region (LHIN).

6.2.2.3 Ontario Health Insurance Plan (OHIP) Physician Billing Records

OHIP billing records contain data on every claim made by physicians in Ontario for reimbursement by the provincial insurance plan. For the purpose of this study, relevant data elements include encrypted physician number, physician specialty, location of service, and date of service (in reference to index RAI-HC assessment within the study period).

6.2.3 Sample

Separate samples were created using the RAI-HC dataset and the interRAI HC dataset. In both cases, the samples were limited to include only long-stay home care clients in Ontario, 60 years of age or older, living in a private home, apartment, or rented room. Individuals living in board and care, assisted living, group home or residential care facilities, or those missing a client identifier, were excluded. The RAI-HC sample included only clients with an admission assessment within the study period (first quarter of 2012 to the second quarter of 2015). Regardless of whether clients continued to remain on service with the home care agency, or ended service for any reason, they were retained in the sample for the remainder of the study period and their assessment was linked to service use data subsequent to their admission assessment. The final RAI-HC sample included 196,444 unique home care clients see (Figure 6.1).

The interRAI HC sample only included clients with two assessments during the study period (2018). They must therefore have remained on service with the home care agency for the duration of time between both assessments. Clients who were discharged for any reason (e.g., death, institutionalization, etc.) were not included in the sample. The final interRAI HC sample included 18,127 unique home care clients (Figure 6.2). It is possible that there are individuals belonging to both samples, but as the data may not be linked, the actual amount of overlap cannot be determined at this time.

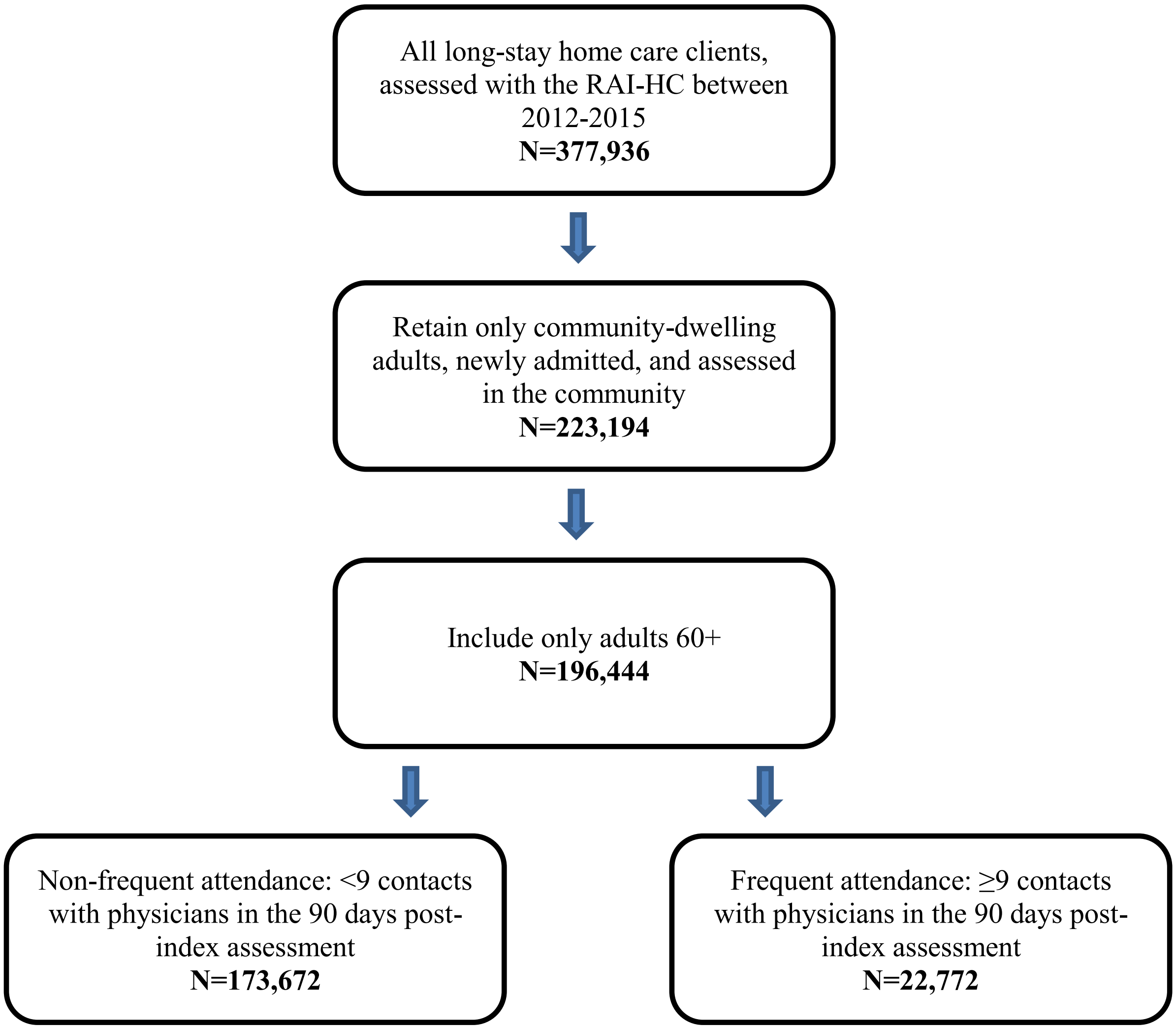

Figure 6.1 Flow diagram of RAI-HC sample

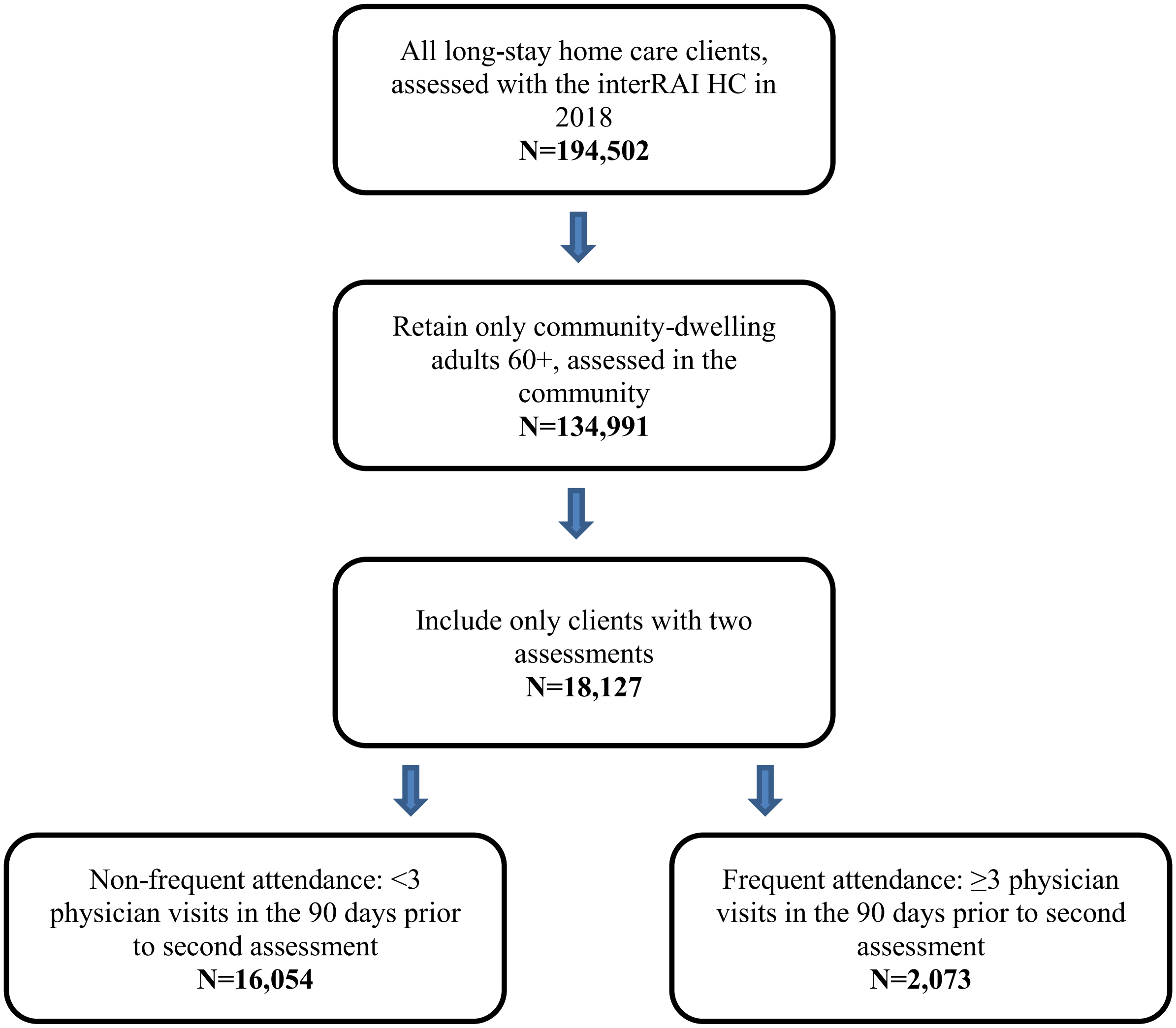

Figure 6.2 Flow diagram of interRAI HC sample

6.2.4 Measures

6.2.4.1 Individual characteristics

Individual characteristics were obtained from the RPDB, RAI-HC, and interRAI HC. For the RAI-HC sample, age (five year range), sex, and region (encrypted LHIN) were obtained from the RPDB. Individual characteristics were obtained from the first admission RAI-HC assessment for each client that occurred within the study period (considered the index assessment). For the interRAI HC sample, individual characteristics were obtained from the first assessment within 2018, and included age and sex. The kinds of measures obtained from the RAI-HC and the interRAI HC were similar and included items from the following domains: demographics (e.g., marital status, living arrangement), cognition, communication, hearing and vision, mood and behaviour, social functioning, informal support services, physical functioning, continence, disease diagnoses, health conditions, nutrition and hydration status, environment, and medications. Scales and other composite measures obtained from the RAI-HC and interRAI HC were additional individual characteristics considered. These included: Activities of Daily Living Hierarchy (ADLH) scale; Assessment Urgency Algorithm; Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS); Cognitive Performance Scale (CPS); Depression Rating Scale (DRS); Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT); Instrumental Activities of Daily Living Capacity (IADL-C) scale; Method for Assigning Priority Levels (MAPLe); and Pain scale.

6.2.4.1.1 Activities of Daily Living Hierarchy Scale (ADLH)

The ADLH clusters activities of daily living (ADLs) according to the stage of the disablement process in which they occur. Activities such as dressing are considered early loss and receive a lower score while activities such as eating are considered late loss and receive a higher score. The scale ranges from zero (no impairment) to six (total dependence) (Morris, Fries, et al., 1999).

6.2.4.1.2 Assessment Urgency Algorithm (AUA)

The AUA provides a measure identifying the urgency of need for comprehensive follow-up assessment. It produces a score ranging from one (least urgent) to six (most urgent) based on component items such as self-rated health and mood, caregiver status, and unstable conditions (Costa et al., 2017).

6.2.4.1.3 Changes in Health, End-stage Disease, Signs, and Symptoms (CHESS)

CHESS is a measure of medical complexity and health instability, based on items such as vomiting, dehydration, weight loss, shortness of breath, edema, and decline in cognition and ADLs. This scale ranges from zero (not at all unstable) to five (highly unstable, more complex), where higher levels are predictive of adverse outcomes, including mortality, hospitalization, pain, caregiver distress, and poor self-rated health (Hirdes et al., 2003, 2014).

6.2.4.1.4 Cognitive Performance Scale (CPS)

The CPS scale provides a measure of cognitive impairment. Its component items include daily decision-making, making self understood, and short-term memory recall. CPS ranges from zero to six. Higher scores indicate greater degree of cognitive impairment. It is highly correlated with the Mini Mental State Exam (MMSE) (Landi et al., 2000; Morris et al., 1994, 2016).

6.2.4.1.5 Depression Rating Scale (DRS)

DRS is a measure of the signs and symptoms of depression. It ranges from zero (no symptoms of depression) to 14 (all symptoms exhibited daily or almost daily). A score of three or more indicates the presence of possible depression. The DRS was validated based on a comparison with the Hamilton Depression Rating Scale and Cornell Scale for Depression (Burrows et al., 2000; Szczerbińska et al., 2012)).

6.2.4.1.6 Detection of Indicators and Vulnerabilities for Emergency Room Trips (DIVERT)

DIVERT identifies risk of unplanned emergency department (ED) use among frail, community-dwelling older adults based on items such as previous ED use, and cardio-respiratory symptoms and conditions. It ranges from one (lowest risk) to six (higher risk) (Costa et al., 2015).

6.2.4.1.7 Instrumental Activities for Daily Living Capacity Scale (IADL-C)

The IADL-C Scale is the sum of three items measuring capacity to perform the following IADLs: meal preparation, ordinary housework, and phone use. It ranges from zero (no difficulty in any) to six (great difficulty in all three).

6.2.4.1.8 Method for Assigning Priority Levels (MAPLe)

MAPLe is an algorithm that categorizes home care clients according to their risk for adverse outcomes. Its component items include ADL impairment, cognitive impairment, wandering and other behaviour problems, and issues in the home environment. MAPLe ranges from one (low risk) to five (high risk). It is predictive of risk of institutionalization and caregiver distress (Hirdes, Poss, et al., 2008; Mitchell et al., 2015).

6.2.4.1.9 Pain Scale

The pain scale is created from two items measuring frequency and severity of pain. It ranges from zero (no pain) to three (daily severe pain). The pain scale was validated against the Visual Analogue Scale and shown to be predictive of pain (Fries et al., 2001).

6.2.4.2 Physician Services Use

Physician services use measures were obtained differently for the RAI-HC sample and the interRAI HC sample. For the RAI-HC sample, data on physician services use was obtained from OHIP billing records. A count variable was created of the number of contacts with physicians within 90 days post-admission RAI-HC assessment. Different methods have been described in the published literature to count physician contact using OHIP billing data, depending on research interests and questions. Some authors restricted by location of physician contact (Bastedo et al., 2017; Fridman et al., 2018; Glazier et al., 2015; Perlman et al., 2019), many authors restricted by discipline (Aiken et al., 2016; Bastedo et al., 2017; Bronskill et al., 2011; Chan & Schultz, 2005; Glazier et al., 2015; Jaakkimainen & Upshur, 2006; Mahar et al., 2018; Nguyen et al., 2019; Perlman et al., 2019), some by fee code of services provided (Chan & Schultz, 2005; Fridman et al., 2018; Jaakkimainen & Upshur, 2006; Ouellette-Kuntz et al., 2018; Perlman et al., 2019), and others by reason for contact with a physician using the diagnostic code (Fridman et al., 2018; Mahar et al., 2018; Nguyen et al., 2019; Ouellette-Kuntz et al., 2018; Perlman et al., 2019).

For the purposes of this study, contact with physicians was limited to locations defined as home, office, or phone (using the location code, created by an ICES algorithm to identify the most likely location) in order to capture physician contact in an outpatient setting. Certain specialties were excluded as they were not considered relevant contact for the purposes of the research questions. The excluded specialties, a modified selection of those excluded by Jaakkimainen et al. (2006), were as follows: paediatrics, non-physician lab director, pathology, microbiology, clinical biochemistry, diagnostic radiology, nuclear medicine, alternate health professionals, and non-medical professionals for independent health facilities (Jaakkimainen & Upshur, 2006). Contact with physicians was not restricted by diagnostic code or by fee code. Any contact was considered to be notable, consistent with the methods reported by Bronskill et al. (2011) (Bronskill et al., 2011). In cases where multiple fee codes were billed by the same physician on the same day for the same patient, it was counted as one instance of contact. Using the count of physician contact on an outpatient basis in the 90 days post-assessment, home care clients were categorized as frequent attenders or not (binary variable). As described earlier, many methods to identify frequent attenders have been described in the published literature. A popular and recommended approach is to consider the top 10% of those with the most frequent physician contact to be "frequent attenders" (Kivelä et al., 2018; Luciano et al., 2010). When applied to the RAI-HC sample, the top 10% of older home care clients in Ontario had contact with a physician nine or more times in the 90 days post-assessment. This number corresponded to three or more instances of contact per month, or almost weekly contact, and was reasonable compared to the physician contact by similar populations in Ontario, also measured using OHIP billing records and reported by Bronskill and colleagues (Bronskill et al., 2011).

At this time, interRAI HC data have not yet been linked to physician services use data but this version of the home care assessment contains a measure of past physician services use. This measure is a count of the number of physician visits (or authorized assistant or practitioner) in the 90 days prior to the assessment. The assessor records the information based on a review of past services use with the client and a review of clinical or transmittal records, if available. For the purposes of this study, the measure of physician services use was obtained from their second assessment within 2018, subsequent to the first assessment from where the measures of individual characteristics were obtained. As clients are re-assessed every six to twelve months, or upon significant change in health status, the measure of physician contact generally reflects contact six to twelve months after the first assessment, minus 90 days. In other words, it generally captures contact three to nine months post-assessment. The same approach was used to categorize frequent attenders in the interRAI HC sample in order to account for the differences in how physician contact was measured. The top 10% most frequent attenders in the interRAI HC sample corresponded to three or more visits in 90 days.

6.2.5 Analytic Strategy

All analyses were performed using SAS 9.4. Descriptive statistics (i.e., frequencies) were used to describe the baseline individual characteristics of the RAI-HC and interRAI HC samples. Inferential statistics were used to examine the associations between baseline characteristics and frequent contact with physicians in both the RAI-HC sample and the interRAI HC sample.

6.2.5.1 RAI-HC Sample

Simple logistic regression analysis was used to examine the association between home care client characteristics and frequent attendance in the 90 days post-assessment. Variables tested in Chapter 5 for their association with geriatric medicine contact were considered in this study for comparison purposes. Independent variables were also considered based on those identified in the literature as associated with frequent attendance by community-dwelling older adults. There were no new variables identified in the literature review in addition to those already considered in Chapter 5. Therefore, the list of independent variables considered remains the same. In accordance with the Behavioural Model of Health Services Utilization (described in Chapter 5), independent variables included predisposing (e.g., age, sex, marital status), enabling (finances), and need (e.g., functioning, mental health conditions, cognition, comorbidities) (Table 6.1). Unadjusted and adjusted (LHIN, sex, age) odds ratios (ORs) and 95% confidence intervals (95% CI) are reported.

Table 6.1 Independent variables included in the simple logistic regression analysis according to the Behavioural Model of Health Services Utilization

Type of Variable		Variables
Predisposing		• Sex • Age • Marital status • Living arrangement • Education • Interpreter needed
Enabling		• Local Health Integration Network (LHIN) • Presence of primary and secondary informal caregivers • Caregiver distress • Home environment issues • Locomotion ability inside and outside of the home • Need to make economic trade-offs
Need	Cognition	• Dementia • Cognitive Performance Scale • Memory problems • Skills for decision making • Changes in mental function • Delirium indicators
	Communication, hearing, vision	• Communication decline • Vision decline
	Mood and behaviour patterns, mental health	• Psychiatric diagnoses • Depression rating scale • Mood decline • Behaviour symptoms • Changes in behaviour symptoms • Loneliness • Delusions and hallucinations
	Physical functioning	• ADL, IADL impairment, decline • Potential for improvement, recovery
	Continence	• Worsening of bladder incontinence
	Disease diagnoses	• Number of diagnoses • Stroke • Congestive heart failure • Coronary artery disease • Hypertension • Irregularly irregular pulse • Peripheral vascular disease • Head trauma

Type of Variable		Variables
		• Hemiplegia/hemiparesis • Multiple Sclerosis (MS) • Parkinsonism • Arthritis • Hip fracture • Other fractures • Osteoporosis • Cataract • Glaucoma • HIV infection • Pneumonia • Tuberculosis • Urinary tract infection (UTI) • Cancer • Diabetes • Emphysema/COPD/asthma • Renal failure • Thyroid disease
	Health conditions, medications, service utilization	• Pain • Falls • Unsteady gait • Poor self-reported health • Unstable conditions • Flare-up of recurrent or chronic conditions • Treatments changed in last 90 days • Elder abuse indicators • Nine or more medications • Overall change in care needs
	Other scales	• CHESS • MAPLe • AUA • DIVERT
Interaction terms	Sex, and	• Age • Marital status • Presence of secondary caregiver • CPS • Dementia diagnosis • Loneliness • Number of diagnoses • Pain • Number of medications • CHESS • MAPLe

Type of Variable		Variables
		• DIVERT
	Age, and	• Sex • Marital status • Presence of secondary caregiver • CPS • Dementia diagnosis • Loneliness • Number of diagnoses • Pain • Number of medications • CHESS • MAPLe • DIVERT
	DRS, and	• Age • Sex • Marital status • Education • CPS • Loneliness • Number of diagnoses • Pain • CHESS • MAPLe • DIVERT
	Education, and	• Age • Sex • Marital status • Presence of secondary caregiver • CPS • Dementia diagnosis • Loneliness • Number of diagnoses • Pain • Number of medications • CHESS • MAPLe • DIVERT
	Loneliness, and	• Age • Sex • Marital status • Presence of secondary caregiver • CPS • Dementia • Any psychiatric diagnosis

Type of Variable	Variables
	• ADL impairment • Pain • Number of medications • Number of diagnoses • CHESS • MAPLe • DIVERT

Independent variables that were significant at an alpha level of 0.01 in the simple logistic regression analysis were considered for inclusion in a multivariable logistic regression model. The multivariable model was adjusted for LHIN to account for regional effects. Predisposing, enabling, and need variables were initially considered in separate models to determine which independent variables within each block were most strongly associated with frequent attendance. Need variables were sub-divided by domain to more easily determine which variables were most strongly associated with frequent attendance. Each model was specified manually to identify which variables were most predictive of frequent attendance (based on statistical significance and c-statistic) and to minimize collinearity. Sub-blocks of need variables were combined into one block. Next, predisposing, enabling, and need blocks were combined into one multivariable model. All remaining variables were again reviewed to minimize collinearity. Based on a literature review, some interaction terms were considered for inclusion in the final model, namely: sex and other variables, age and other variables, DRS and other variables, education and other variables, and loneliness and other variables (Table 6.1). The final logistic regression model included independent variables that remained statistically significant ($p<.01$).

Next, in order to account for clustering by LHIN, a multi-level generalized estimating equation (GEE) was applied using the variables included in the final logistic regression model. GEE accounts for correlation within a cluster (i.e., LHIN) and estimates regression coefficients by modeling the average effect across all clusters (Ballinger, 2004; Hanley et al., 2003; Liang & Zeger, 1986; Mcgahan, 2017). The GENMOD procedure in SAS 9.4 was used. An exchangeable correlation structure was specified as the correlation of frequent attendance among clients within a particular LHIN was assumed to be equal (Mcgahan, 2017). Due to the large amounts of data available, this study reports the empirical standard error estimates, which use the actual within-cluster variation to calculate the standard error (Hanley et al., 2003). Odds ratios for each variable in the final model were calculated. Variables that did not reach statistical significance in the GEE model were dropped. Variables with odds ratios lower than 0.90 or greater than 1.10 were retained in the final model to ensure clinical significance. Variables retained in the final GEE model were included in a logistic regression model once more to calculate the c-statistic. The c-statistic, which cannot be calculated for the GEE model, provides a measure of the discriminative power of the model to distinguish frequent attenders from non-frequent attenders (Caetano et al., 2018). A c-statistic of 0.50 indicates that the model does not perform better than random chance in discriminating between the two groups while a c-statistic of 1.00 indicates that the model discriminates between the two groups perfectly. The c-statistic was calculated for the full model, and for each block of predisposing, enabling, and need variables retained in the final model.

Beyond the testing of interactions between sex and other independent variables, to confirm the absence of clinical meaningful sex differences in frequent attendance, the final logistic regression model was applied in separate subsamples of males and females. For each subsample, independent variables that remained statistically significant were retained ($p<.01$). In order to account for clustering by LHIN, GEE models were then applied using the variables included in the final logistic regression models. Odds ratios for each variable in the final model were calculated. Variables that did not reach statistical significance in the GEE model were dropped. Variables with odds ratios lower than 0.90 or greater than 1.10 were retained in the final male and female subsample models to ensure clinical significance. Male and female subsample GEE models were compared. Variables retained in the final GEE models were included in logistic regression models once more to calculate the c-statistic. The c-statistic was calculated for the full models, and for each block of predisposing, enabling, and need variables retained in the final male and female subsample models.

6.2.5.2 interRAI HC Sample

To ensure that the associations observed in the RAI-HC (used prior to 2018) were consistent in the interRAI HC (used since 2018), the final GEE model from the overall RAI-HC sample was applied in the interRAI HC sample. The same approach was used to select variables for inclusion. Variables that did not reach statistical significance in the GEE model were dropped. Variables with odds ratios lower than 0.90 or greater than 1.10 were retained in the final model to ensure clinical significance. The final GEE model from the interRAI HC sample was compared to the final GEE model from the RAI-HC sample. Once more, variables retained in the final interRAI HC sample GEE model were included in a logistic regression model to calculate the c-statistic.

6.3 Results

6.3.1 Description of the Study Samples

The RAI-HC (n=196,444) and interRAI HC (n=18,127) samples both consisted of long-stay home care clients in Ontario, 60 years of age and older, living in private dwellings. They did not include individuals living in board and care, assisted living, group home settings, or residential care facilities. In both cases, slightly over half of the sample was female (Table 6.2). While one third of the RAI-HC sample were 85 years of age or older, almost half of the interRAI HC sample were 85 years of age or older. In both samples, just under half of home care clients were married and about a third lived alone. Nearly one quarter of the sample had a cardiorespiratory diagnosis in both samples, but the percentage of home care clients in the interRAI HC sample with a dementia diagnosis was double the percentage in the RAI-HC sample (42.4% vs. 21.9%). The percentage of clients with moderate to severe impairment in ADLs (ADLH ≥3) in the interRAI HC sample was more than four times the percentage in the RAI-HC sample (39.4% vs. 9.8%). In both samples, there were approximately a quarter of clients with moderate to very high levels of medical complexity and instability (CHESS ≥3). In the interRAI HC sample, the percentage of clients with moderate to severe cognitive impairment was three times greater than the percentage in the RAI-HC (31.4% vs. 9.6%). The percentage with possible depression (DRS ≥3) was closer in both samples (20.3% in the RAI-HC sample vs. 26.7% in the interRAI HC sample). About three quarters of home care clients in the RAI-HC sample were at moderate to high risk for caregiver distress and institutionalization (MAPLe ≥3) while more than 90% of clients in the interRAI HC sample had the same score (Table 6.2).

Table 6.2 Characteristics of older, long-stay, home care clients upon admission RAI-HC assessment (2012-2015, n=196,444) and first interRAI HC assessment (2018, n= 18,127), Ontario

Characteristic	RAI-HC Sample % (n)	interRAI HC Sample % (n)
Sex		
Female	59.7 (117,192)	59.7 (10,827)
Male	40.3 (79,252)	40.3 (7,300)
Age Range		
60-64	6.4 (12,491)	4.2 (765)
65-69	8.7 (17,091)	6.2 (1,123)
70-74	11.7 (23,056)	9.7 (1,758)
75-79	17.0 (33,442)	14.0 (2,531)
80-84	22.9 (44,911)	20.5 (3,718)
85-89	20.9 (40,981)	23.4 (4,238)
90+	12.5 (24,472)	22.0 (3,994)
Married	45.7 (89,822)	45.2 (8,200)
Lives Alone	35.4 (69,585)	30.7 (5,570)
Education		
High school or more	35.8 (70,376)	-
Less than high school	27.6 (54,208)	-
Unknown	36.6 (71,860)	-
Diagnosis of COPD or Heart Failure	24.8 (48,692)	23.9 (4,336)
Diagnosis of Dementia	21.9 (43,109)	42.4 (7,687)
ADLH ≥3	9.8 (19,358)	39.4 (7,144)
CHESS ≥3	22.0 (43,211)	26.5 (4,800)
CPS ≥3	9.6 (18,821)	31.4 (5,685)
DRS ≥3	20.3 (39,918)	26.7 (4,847)
MAPLe ≥3	75.1 (147,465)	92.9 (16,847)

Note: Education level is not measured in the interRAI HC.

6.3.2 Odds of Frequent Attendance: RAI-HC Sample

The unadjusted and adjusted (LHIN, age, and sex) odds ratios are reported for the relationship between the independent variables and frequent attendance in the 90 days post-assessment (Appendix I). The findings are summarized according to the nature of their association (Tables 6.3, 6.4, and 6.5).

6.3.2.1 Significantly Higher Odds of Frequent Attendance

Several predisposing, enabling, and need variables were found to be associated with significantly higher odds of frequent attendance (Table 6.3). Among the predisposing and enabling variables, being married, high school or more, or unknown education status, and primary caregiver lives with client (only when adjusted for LHIN, age, and sex) were associated with higher odds of frequent attendance. Vision decline, presence of possible depression (DRS ≥3), mood decline, ADL decline, functional improvement potential, and good prospects of recovery were also associated with significantly higher odds of frequent attendance (unadjusted and adjusted for LHIN, age, and sex). Overall, having a high number of disease diagnoses was associated with higher odds of frequent attendance, as were several individual diagnoses, namely: congestive heart failure, coronary artery disease, irregularly irregular pulse, peripheral vascular disease, cataract (only when adjusted for LHIN, age, and sex), glaucoma (only when adjusted for LHIN, age, and sex), HIV infection, pneumonia, urinary tract infection, cancer, diabetes, emphysema/COPD/asthma, renal failure, and thyroid disease (only when adjusted for LHIN, age, and sex). High levels of pain, poor self-reported health, a change in treatments in the last 30 days, deterioration in care needs, and nine or more medications were also associated with higher odds of frequent attendance. Of the composite measures, medical complexity and instability (CHESS ≥3), moderate urgency of need for assessment (AUA levels 2, 3), and risk of unplanned ED visits (DIVERT) were associated with significantly higher odds.

6.3.2.2 Significantly Lower Odds of Frequent Attendance

A greater number of the independent characteristics investigated were associated with significantly lower odds of frequent attendance (Table 6.4). Of the predisposing variables, female sex, age, living alone, and requiring an interpreter were associated with significantly lower odds of frequent attendance. Among the enabling variables, presence of a primary caregiver that does not live with the client (unadjusted only), presence of a secondary caregiver that lives with the client, presence of a secondary caregiver that does not live with the client (unadjusted only), indicators of caregiver distress, impaired locomotion inside and outside of the home, home environment Clinical Assessment Protocol (CAP) triggered (indicating potential for improvement in this area), several individual home environment issues (lighting (only when adjusted for LHIN, age, and sex), flooring and carpeting, bathroom and toilet room, kitchen, personal safety, access to home, access to rooms in home (only when adjusted for LHIN, age, and sex), and any home environment issue), and having to make economic trade-offs (only when adjusted for LHIN, age, and sex) were associated with significantly lower odds of frequent attendance.

Within the cognition domain, dementia diagnosis, cognitive impairment (CPS $\geq$3), short-term and procedural memory problems, impaired and worsening decision-making skills, and agitated or disoriented in the last 90 days were associated with significantly lower odds of frequent attendance. Communication decline was also associated with lower odds. Many of the mood and behavioural symptoms, and mental health conditions were associated with significantly lower odds, including: any psychiatric diagnosis (only after adjusting for LHIN, age, sex), wandering, verbally abusive behavioural symptoms, physically abusive behavioural symptoms (exhibited less than daily), socially inappropriate/disruptive symptoms, resists care, changes in behaviour symptoms, loneliness, delusions, and hallucinations. Impairment in ADLs (ADLH $\geq$3) and IADLs (IADL-C $\geq$3) was associated with significantly lower odds of frequent attendance. Worsening of bladder incontinence was only significantly associated with lower odds when unadjusted. Of the disease diagnoses, several were associated with significantly lower odds of frequent attendance, including: cerebrovascular accident (stroke), hypertension (unadjusted only), head trauma, hemiplegia/hemiparesis, multiple sclerosis, Parkinsonism, arthritis, hip fracture, only fracture (unadjusted only), and osteoporosis (unadjusted only). Falls, unsteady gait, and unstable conditions were also associated with significantly lower odds of frequent attendance. The abuse CAP (indicating potential for improvement in preventing elder abuse), and the individual indicator of unusually poor hygiene were both associated with lower odds. No change in care needs and risk of caregiver distress and institutionalization were significantly associated with lower odds of frequent attendance.

6.3.2.3 Nonsignificant Odds of Frequent Attendance

Several enabling and need variables were not found to be significantly associated with odds of frequent attendance (Table 6.5). Of the enabling variables, primary caregiver lives with client (only unadjusted), primary caregiver present but does not live with client (after adjusting for LHIN, age, and sex), lighting environment issues (unadjusted), issues accessing rooms in home (unadjusted), and having to make economic trade-offs (unadjusted) were not significantly associated with frequent attendance.

Sudden or new onset/change in mental function (unadjusted), any psychiatric diagnosis (unadjusted), physically abusive behavioural symptoms (exhibited daily), worsening of bladder incontinence (adjusted for LHIN, age, and sex) were not significantly associated with frequent attendance. Among the disease diagnoses, hypertension (adjusted for LHIN, age, and sex), fractures other than hip (adjusted for LHIN, age, and sex), osteoporosis (adjusted for LHIN, age, and sex), cataract (unadjusted), glaucoma (unadjusted), tuberculosis, and thyroid disease (unadjusted) were not significantly associated. Pain (level 1), unsteady gait, and several of the indicators of elder abuse (unexplained injuries, neglected, abused, mistreated, physically restrained) were also not significantly associated with frequent attendance.

Table 6.3 Results of logistic regression analysis: Variables with significantly higher odds of frequent attendance in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Type of Variable	Unadjusted	Adjusted (LHIN, age, sex)
Predisposing	• Married • High school or more, or unknown education level	• Married • High school or more, or unknown education level
Enabling		• Primary caregiver lives with client
Need	<u>Communication/hearing/vision patterns</u> • Vision decline	<u>Communication/hearing/vision patterns</u> • Vision decline
	<u>Mood and behaviour symptoms, mental health conditions</u> • DRS ≥3 • Mood decline	<u>Mood and behaviour symptoms, mental health conditions</u> • DRS ≥3 • Mood decline
	<u>Physical functioning</u> • ADL decline • Functional improvement potential • Good prospects of recovery	<u>Physical functioning</u> • ADL decline • Functional improvement potential • Good prospects of recovery
	<u>Disease diagnoses</u> • High number of diagnoses • Congestive heart failure • Coronary artery disease • Irregularly irregular pulse • Peripheral vascular disease • HIV infection • Pneumonia • Urinary tract infection • Cancer • Diabetes • Emphysema/COPD/asthma • Renal failure	<u>Disease diagnoses</u> • High number of diagnoses • Congestive heart failure • Coronary artery disease • Irregularly irregular pulse • Peripheral vascular disease • Cataract • Glaucoma • HIV infection • Pneumonia • Urinary tract infection • Cancer • Diabetes • Emphysema/COPD/asthma • Renal failure • Thyroid disease
	<u>Health conditions</u> • Pain (levels 2,3) • Poor self-reported health • Treatments changed in last 30 days <u>Service utilization</u> • Deterioration in care needs	<u>Health conditions</u> • Pain (levels 2,3) • Poor self-reported health • Treatments changed in last 30 days <u>Service utilization</u> • Deterioration in care needs
	<u>Medications</u>	<u>Medications</u>

Type of Variable	Unadjusted	Adjusted (LHIN, age, sex)
	• ≥9 medications <u>Other scales</u> • CHESS ≥3 • AUA (levels 2,3) • DIVERT	• ≥9 medications <u>Other scales</u> • CHESS ≥3 • AUA (levels 2,3) • DIVERT

Table 6.4 Results of logistic regression analysis: Variables with significantly lower odds of frequent attendance in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Type of Variable	Unadjusted	Adjusted (LHIN, age, sex)
Predisposing	• Female sex • Age • Lives alone • Interpreter needed	• Lives alone • Interpreter needed
Enabling	• Primary caregiver present but does not live with client • Secondary caregiver present • Caregiver unable to continue • Caregiver not satisfied with support • Caregiver distressed • Impaired locomotion inside the home • Impaired locomotion outside the home • Home environment CAP triggered • Flooring and carpeting environment issue • Bathroom and toilet room environment issue • Kitchen environment issue • Personal safety issue • Access to home issue • Any home environment issue	• Secondary caregiver lives with client • Caregiver unable to continue • Caregiver not satisfied with support • Caregiver distressed • Impaired locomotion inside the home • Impaired locomotion outside the home • Home environment CAP triggered • Lighting environment issue • Flooring and carpeting environment issue • Bathroom and toilet room environment issue • Kitchen environment issue • Personal safety issue • Access to home issue • Access to rooms in home issue • Any home environment issue • Economic trade-offs
Need	<u>Cognition</u> • Dementia diagnosis • CPS ≥3 • Short-term memory problem • Procedural memory problem • Impaired cognitive skills for daily decision-making • Worsening of decision-making • Agitated or disoriented in last 90 days <u>Communication/hearing/vision patterns</u> • Communication decline <u>Mood and behaviour symptoms, mental health conditions</u> • Wandering • Verbally abusive behavioural symptoms	<u>Cognition</u> • Dementia diagnosis • CPS ≥3 • Short-term memory problem • Procedural memory problem • Impaired cognitive skills for daily decision-making • Worsening of decision-making • Agitated or disoriented in last 90 days <u>Communication/hearing/vision patterns</u> • Communication decline <u>Mood and behaviour symptoms, mental health conditions</u> • Any psychiatric diagnosis • Wandering • Verbally abusive behavioural symptoms

Type of Variable	Unadjusted	Adjusted (LHIN, age, sex)
	• Physically abusive behavioural symptoms (level 1) • Socially inappropriate/disruptive symptoms • Resists care • Changes in behaviour symptoms • Lonely • Delusions • Hallucinations	• Physically abusive behavioural symptoms (exhibited less than daily) • Socially inappropriate/disruptive symptoms • Resists care • Changes in behaviour symptoms • Lonely • Delusions • Hallucinations
	Physical functioning • ADLH ≥3 • IADL-C ≥3	Physical functioning • ADLH ≥3 • IADL-C ≥3
	Incontinence • Worsening of bladder incontinence	
	Disease diagnoses • Cerebrovascular accident (stroke) • Hypertension • Head trauma • Hemiplegia/hemiparesis • Multiple sclerosis • Parkinsonism • Arthritis • Hip fracture • Other fractures • Osteoporosis	Disease diagnoses • Cerebrovascular accident (stroke) • Head trauma • Hemiplegia/hemiparesis • Multiple sclerosis • Parkinsonism • Arthritis • Hip fracture
	Health conditions • Falls • Unsteady gait • Unstable conditions	Health conditions • Falls • Unsteady gait • Unstable conditions
	Elder abuse indicators • Abuse CAP (level 1) • Unusually poor hygiene	Elder abuse indicators • Abuse CAP (level 1,2) • Unusually poor hygiene
	Service utilization • No change in care needs	Service utilization • No change in care needs
	Other scales • MAPLe ≥3 • AUA ≥4	Other scales • MAPLe ≥3 • AUA ≥4

Table 6.5 Results of logistic regression analysis: Variables with a non-significant association with frequent attendance in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

Type of Variable	Unadjusted	Adjusted (LHIN, age, sex)
Predisposing		
Enabling	• Primary caregiver lives with client • Lighting environment issues • Issues accessing rooms in home • Economic trade-offs required	• Primary caregiver present but does not live with client
Need	Cognition • Sudden or new onset/change in mental function over last 7 days	
	Mood and behaviour symptoms, mental health conditions • Any psychiatric diagnosis • Physically abusive behavioural symptoms (level 2)	Mood and behaviour symptoms, mental health conditions • Physically abusive behavioural symptoms (level 2)
		Incontinence • Worsening of bladder incontinence
	Disease diagnoses • Cataract • Glaucoma • Tuberculosis • Thyroid disease	Disease diagnoses • Hypertension • Other fractures • Osteoporosis • Tuberculosis
	Health conditions • Pain (level 1)	Health conditions • Pain (level 1) • Unsteady gait
	Elder abuse indicators • Abuse CAP (level 1) • Fearful of family/caregiver • Unexplained injuries • Neglected, abused, mistreated • Physically restrained	Elder abuse indicators • Fearful of family/caregiver • Unexplained injuries • Neglected, abused, mistreated • Physically restrained

6.3.3 Multivariable Results: RAI-HC Sample

The final multivariable GEE model, adjusted for clustering by LHIN, retained predisposing, enabling, and need variables that were significant at an alpha level of 0.01 and had odds ratios of less than 0.90

or greater than 1.10. It contained age, sex, marital status, locomotion outside of the home, dementia, cognitive impairment (CPS), functional improvement potential (client perspective), cerebrovascular accident (stroke), congestive heart failure, irregularly irregular pulse, multiple sclerosis, Parkinsonism, hip fracture, cancer, change in treatments in last 30 days, unusually poor hygiene, nine or more medications, medical complexity and instability (CHESS ≥3), urgent need for assessment (AUA ≥4), and risk of unplanned ED visit (DIVERT) (Table 6.6). Of the variables included in the final model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 6.7; c-statistic=0.70). The c-statistic for the full model was 0.74, indicating that the model had moderate discriminatory power.

Within this model, being married, functional improvement potential (from client perspective), congestive heart failure diagnosis, irregularly irregular pulse, cancer, treatments changed in last 30 days, nine or more medications, medical instability and complexity (CHESS ≥3), and risk of unplanned ED visit (DIVERT) were associated with higher odds of frequent attendance (Table 6.6). Married home care clients had 1.25 (95% CI 1.21-1.30) times greater odds than unmarried home care clients of being frequent attenders. Those who considered themselves to have potential for functional improvement had 1.14 (95% CI 1.10-1.18) times greater odds of being frequent attenders. In terms of disease diagnoses, older home care clients with congestive heart failure, irregularly irregular pulse, and cancer had 1.17 (95% CI 1.10-1.25), 1.28 (95% CI 1.22-1.35), and 2.36 (95% CI 2.17-2.57) times greater odds of being frequent attenders, respectively. The odds of frequent attendance among those whose treatments had changed in the 30 days prior to assessment were 1.24 (1.19-1.29) compared to those whose treatments had not changed. The odds among those prescribed nine or more medications were 1.36 (1.29-1.43) compared to those prescribed less than nine medications. Older home care clients with moderate to very high medical complexity and instability (CHESS ≥3) had

1.18 (95% CI 1.14-1.21) times greater odds of being frequent attenders than those with no or low medical complexity and instability. Finally, risk of unplanned ED visits was associated with greater odds of frequent attendance. Older home care clients with a DIVERT score of two had 1.36 (95% CI 1.29-1.44) times greater odds of being frequent attenders, while those with a score of three or four had 1.71 (95% CI 1.60-1.84) times greater odds and those with a score of five or six had 2.22 (95% CI 1.99-2.49) times greater odds than those with a score of one.

Female sex, older age, locomotion outside of the home, dementia diagnosis, cognitive impairment (CPS), cerebrovascular accident (stroke), multiple sclerosis, Parkinsonism, hip fracture, unusually poor hygiene, and urgent need for assessment (AUA ≥4) were associated with lower odds of frequent attendance (Table 6.6). Females had 0.86 (95% CI 0.82-0.89) times the odds of being frequent attenders as males. Those between the ages of 65 to 69 had 0.90 (95% CI 0.85-0.95) times the odds of frequent attendance while those over the age of 90 had 0.45 (95% CI 0.42-0.48) times the odds of frequent attendance compared to those between the ages of 60 to 64. Older home care clients with impairment moving around outside of the home had 0.81 (95% CI 0.77-0.85) times the odds of being frequent attenders. The odds of frequent attendance among those with a dementia diagnosis were 0.63 (0.60-0.67). Those with a CPS score of one or two had 0.84 (95% CI 0.81-0.87) times the odds while those with a score of three or more had 0.67 (95% CI 0.63-0.71) times the odds of being frequent attenders. The following diagnoses were associated with lower odds of frequent attendance: cerebrovascular accident (stroke; OR 0.89, 95% CI 0.87-0.91); multiple sclerosis (OR 0.57, 95% CI 0.46-0.72); Parkinsonism (OR 0.77, 95% CI 0.72-0.83); and hip fracture (OR 0.81, 95% CI 0.74-0.88). Unusually poor hygiene was the only indicator of elder abuse remaining in the final model and it was associated with 0.69 (95% CI 0.62-0.77) times the odds of frequent attendance. Finally, those with an AUA score of four or more, indicating mid-level to highest urgency in terms of need for comprehensive assessment, had 0.87 (95% CI 0.82-0.91) times the odds of being frequent attenders than those with a lower level of urgent need.

Interaction terms were first tested in simple models containing only the main effects. The results of those analyses indicated that the following were significant: age and dementia, age and CPS, age and marital status, DRS and CHESS, DRS and number of diagnoses. However, none of these interactions terms were statistically significant in the final multivariable GEE model.

Table 6.6 Multivariable generalized estimating equation model: Empirically-based standard error estimates and odds of frequent attendance in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015, overall sample (n=196,444), stratified by sex (male, n=79,252; female, n=117,192)

	Overall sample (n=196,444)			Males (n=79,252)			Females (n=117,192)		
Variable	**Estimate (Standard Error)**	**Z**	**Odds ratio (95% CI)**	**Estimate (Standard Error)**	**Z**	**Odds ratio (95% CI)**	**Estimate (Standard Error)**	**Z**	**Odds ratio (95% CI)**
Female sex (Ref = Male)	-0.16 (0.02)	-7.8	0.86 (0.82-0.89)						
Age (Ref = 60-64)									
65-69	-0.11 (0.03)	-3.8*	0.90 (0.85-0.95)	-0.09 (0.04)	-2.2‡	0.92 (0.85-0.99)	-0.14 (0.05)	-3.1†	0.87 (0.80-0.95)
70-74	-0.22 (0.03)	-7.6	0.81 (0.76-0.85)	-0.13 (0.04)	-3.2†	0.88 (0.82-0.95)	-0.33 (0.05)	-6.5	0.72 (0.66-0.80)
75-79	-0.32 (0.03)	-10.6	0.73 (0.69-0.77)	-0.22 (0.04)	-6.0	0.80 (0.75-0.86)	-0.44 (0.05)	-9.5	0.64 (0.59-0.70)
80-84	-0.43 (0.02)	-24.4	0.65 (0.63-0.68)	-0.31 (0.03)	-11.9	0.73 (0.69-0.77)	-0.58 (0.04)	-16.3	0.56 (0.52-0.60)
85-89	-0.58 (0.03)	-22.1	0.56 (0.53-0.59)	-0.49 (0.04)	-11.3	0.62 (0.57-0.67)	-0.77 (0.05)	-15.6	0.47 (0.42-0.51)
90+	-0.80 (0.04)	-21.1	0.45 (0.42-0.48)	-0.72 (0.05)	-13.5	0.49 (0.44-0.54)	-1.03 (0.06)	-16.5	0.36 (0.32-0.40)
Married (Ref = No)	0.22 (0.02)	11.9	1.25 (1.21-1.30)	0.22 (0.02)	12.4	1.25 (1.20-1.29)	0.22 (0.03)	8.3	1.24 (1.18-1.31)
Enabling									
Secondary caregiver lives with client (Ref = No such helper)									
Yes				-0.16 (0.02)	-7.1	0.85 (0.82-0.89)			
No				-0.06 (0.02)	-3.0†	0.94 (0.90-0.98)			
Impaired locomotion outside home (Ref = No)	-0.21 (0.03)	-8.3	0.81 (0.77-0.85)	-0.25 (0.03)	-9.8	0.78 (0.74-0.82)	-0.22 (0.03)	-6.3	0.80 (0.75-0.86)
Need									
Cognition									
Dementia (Ref = No)	-0.46 (0.03)	-15.1	0.63 (0.60-0.67)	-0.49 (0.05)	-10.8	0.61 (0.56-0.67)	-0.64 (0.04)	-14.5	0.53 (0.49-0.58)
CPS (condensed) (Ref = 0)									
1 or 2	-0.17 (0.02)	-9.7	0.84 (0.81-0.87)	-0.27 (0.03)	-10.3	0.76 (0.72-0.80)	-0.17 (0.02)	-7.1	0.84 (0.81-0.88)

Variable	Overall sample (n=196,444) Estimate (Standard Error)	Z	Odds ratio (95% CI)	Males (n=79,252) Estimate (Standard Error)	Z	Odds ratio (95% CI)	Females (n=117,192) Estimate (Standard Error)	Z	Odds ratio (95% CI)
3 or more	-0.41 (0.03)	-13.2	0.67 (0.63-0.71)	-0.48 (0.04)	-11.3	0.62 (0.57-0.67)	-0.49 (0.07)	-7.4	0.61 (0.54-0.70)
Physical Functioning									
Functional improvement potential - client perspective (Ref = No)	0.13 (0.02)	7.9	1.14 (1.10-1.18)	0.19 (0.02)	10.5	1.21 (1.17-1.25)			
Disease Diagnoses									
Cerebrovascular accident (stroke) (Ref = No)	-0.12 (0.01)	-9.9	0.89 (0.87-0.91)	-0.20 (0.02)	-8.5	0.82 (0.79-0.86)			
Congestive heart failure (Ref = No)	0.16 (0.03)	5.1	1.17 (1.10-1.25)	0.16 (0.04)	4.3	1.17 (1.09-1.25)	0.32 (0.04)	8.0	1.38 (1.28-1.50)
Irregularly irregular pulse (Ref = No)	0.25 (0.03)	9.7	1.28 (1.22-1.35)	0.22 (0.03)	7.1	1.25 (1.17-1.32)	0.40 (0.04)	10.7	1.49 (1.39-1.61)
Multiple sclerosis (Ref = No)	-0.56 (0.12)	-4.8	0.57 (0.46-0.72)	-0.82 (0.20)	-4.0	0.44 (0.30-0.66)	-0.60 (0.15)	-4.1	0.55 (0.41-0.73)
Parkinsonism (Ref = No)	-0.26 (0.04)	-6.6	0.77 (0.72-0.83)	-0.33 (0.06)	-5.7	0.72 (0.64-0.80)			
Arthritis (Ref = No)							-0.13 (0.02)	-7.5	0.88 (0.85-0.91)
Hip fracture (Ref = No)	-0.21 (0.04)	-5.0	0.81 (0.74-0.88)	-0.31 (0.04)	-7.7	0.74 (0.68-0.80)			
Cancer (Ref = No)	0.86 (0.04)	20.0	2.36 (2.17-2.57)	0.80 (0.04)	19.8	2.23 (2.06-2.42)	1.02 (0.07)	15.5	2.78 (2.44-3.16)
Health Conditions									
Treatments changed in last 30 days (Ref = No)	0.21 (0.02)	11.4	1.24 (1.19-1.29)	0.23 (0.03)	6.8	1.25 (1.18-1.34)	0.30 (0.02)	16.0	1.35 (1.30-1.40)
Elder Abuse									
Unusually poor hygiene (Ref = No)	-0.37 (0.06)	-6.7	0.69 (0.62-0.77)	-0.55 (0.14)	-3.8†	0.58 (0.44-0.76)			
Medications									
9 or more medications (Ref = No)	0.30 (0.03)	11.3	1.36 (1.29-1.43)	0.32 (0.03)	12.5	1.37 (1.30-1.44)	0.38 (0.03)	11.3	1.46 (1.36-1.56)

Variable	Overall sample (n=196,444) Estimate (Standard Error)	Z	Odds ratio (95% CI)	Males (n=79,252) Estimate (Standard Error)	Z	Odds ratio (95% CI)	Females (n=117,192) Estimate (Standard Error)	Z	Odds ratio (95% CI)
Other Scales									
CHESS three or more (Ref = 1,2)	0.16 (0.01)	11.7	1.18 (1.14-1.21)	0.16 (0.02)	7.6	1.18 (1.13-1.23)	0.25 (0.02)	10.0	1.28 (1.22-1.35)
AUA four or more (Ref = 1,2,3)	-0.14 (0.03)	-5.2	0.87 (0.82-0.91)						
DIVERT (Ref = 1)									
2	0.31 (0.03)	11.2	1.36 (1.29-1.44)	0.34 (0.04)	8.2	1.41 (1.30-1.53)			
3 or 4	0.54 (0.04)	15.2	1.71 (1.60-1.84)	0.55 (0.05)	11.6	1.74 (1.58-1.91)			
5 or 6	0.80 (0.06)	13.9	2.22 (1.99-2.49)	0.85 (0.07)	12.3	2.33 (2.04-2.66)			

Note: All estimates significant at p<.001, with the exception of:
*Estimates are significant at p<.001
†Estimates are significant at p<.01
‡Estimates are significant at p<.05

Table 6.7 Discriminative power (c-statistic) of the final multivariable models and predisposing, enabling, and need blocks for all samples of older, long-stay home care clients, Ontario, 2012-2015, overall sample (n=196,444), stratified by sex (male, n=79,252; female, n=117,192) and the interRAI HC sample, Ontario, 2018 (n=18,127)

c-statistic	RAI-HC Sample Overall (n=196,444)	RAI-HC Sample Male (n=79,252)	RAI-HC Sample Female (n=117,192)	interRAI HC Sample Overall (n=18,127)
Predisposing	0.62	0.59	0.62	0.55
Enabling	0.51	0.53	0.51	n/a
Need	0.70	0.70	0.69	0.62
Full model	0.74	0.73	0.73	0.63

Table 6.8 Multivariable generalized estimating equation model: Empirically-based standard error estimates and odds of frequent attendance in the 90 days post-assessment by older, long-stay home care clients, Ontario, (RAI-HC sample: 2012-2015, n=196,444; interRAI HC sample: 2018, n=18,127)

	RAI-HC Sample (n=196,444)				interRAI H,C Sample (n=18,127)			
Variable	**Estimate (Standard Error)**	**Z**	**Pr>|Z|**	**Odds ratio (95% CI)**	**Estimate (Standard Error)**	**Z**	**Pr>|Z|**	**Odds ratio (95% CI)**
Female sex (Ref = Male)	-0.16 (0.02)	-7.8	<.0001	0.86 (0.82-0.89)	-0.04 (0.05)	-0.8	0.42	0.96 (0.87-1.06)
Age (Ref = 60-64)								
65-69	-0.11 (0.03)	-3.8	0.0002	0.90 (0.85-0.95)	0.04 (0.10)	0.4	0.68	1.04 (0.85-1.28)
70-74	-0.22 (0.03)	-7.6	<.0001	0.81 (0.76-0.85)	-0.23 (0.05)	-4.4	<.0001	0.79 (0.71-0.88)
75-79	-0.32 (0.03)	-10.6	<.0001	0.73 (0.69-0.77)	-0.13 (0.09)	-1.4	0.17	0.88 (0.74-1.06)
80-84	-0.43 (0.02)	-24.4	<.0001	0.65 (0.63-0.68)	-0.28 (0.11)	-2.6	0.01	0.75 (0.61-0.93)
85-89	-0.58 (0.03)	-22.1	<.0001	0.56 (0.53-0.59)	-0.29 (0.09)	-3.3	0.001	0.75 (0.63-0.89)
90+	-0.80 (0.04)	-21.1	<.0001	0.45 (0.42-0.48)	-0.43 (0.08)	-5.7	<.0001	0.65 (0.56-0.76)
Married (Ref = No)	0.22 (0.02)	11.9	<.0001	1.25 (1.21-1.30)				
Enabling								
Secondary caregiver lives with client (Ref = No such helper)								
Yes								
No								
Impaired locomotion outside home (Ref = No)	-0.21 (0.03)	-8.3	<.0001	0.81 (0.77-0.85)				
Need								
Cognition								
Dementia (Ref = No)	-0.46 (0.03)	-15.1	<.0001	0.63 (0.60-0.67)	-0.44 (0.04)	-9.9	<.0001	0.64 (0.59-0.70)
CPS (condensed) (Ref = 0)								

	RAI-HC Sample (n=196,444)				interRAI H,C Sample (n=18,127)			
Variable	Estimate (Standard Error)	Z	Pr>|Z|	Odds ratio (95% CI)	Estimate (Standard Error)	Z	Pr>|Z|	Odds ratio (95% CI)
1 or 2	-0.17 (0.02)	-9.7	<.0001	0.84 (0.81-0.87)				
3 or more	-0.41 (0.03)	-13.2	<.0001	0.67 (0.63-0.71)				
Physical Functioning								
Functional improvement potential - client perspective (Ref = No)	0.13 (0.02)	7.9	<.0001	1.14 (1.10-1.18)	0.22 (0.06)	3.9	<.0001	1.24 (1.11-1.39)
Disease Diagnoses								
Cerebrovascular accident (stroke) (Ref = No)	-0.12 (0.01)	-9.9	<.0001	0.89 (0.87-0.91)				
Congestive heart failure (Ref = No)	0.16 (0.03)	5.1	<.0001	1.17 (1.10-1.25)				
Irregularly irregular pulse (Ref = No)	0.25 (0.03)	9.7	<.0001	1.28 (1.22-1.35)	Not available in interRAI HC			
Multiple sclerosis (Ref = No)	-0.56 (0.12)	-4.8	<.0001	0.57 (0.46-0.72)				
Parkinsonism (Ref = No)	-0.26 (0.04)	-6.6	<.0001	0.77 (0.72-0.83)				
Arthritis (Ref = No)								
Hip fracture (Ref = No)	-0.21 (0.04)	-5.0	<.0001	0.81 (0.74-0.88)				
Cancer (Ref = No)	0.86 (0.04)	20.0	<.0001	2.36 (2.17-2.57)	0.63 (0.07)	9.7	<.0001	1.89 (1.66-2.14)
Health Conditions								
Treatments changed in last 30 days (Ref = No)	0.21 (0.02)	11.4	<.0001	1.24 (1.19-1.29)	Not available in interRAI HC			
Elder Abuse								
Unusually poor hygiene (Ref = No)	-0.37 (0.06)	-6.7	<.0001	0.69 (0.62-0.77)	Not available in interRAI HC			
Medications								
9 or more medications (Ref = No)	0.30 (0.03)	11.3	<.0001	1.36 (1.29-1.43)	0.33 (0.04)	9.1	<.0001	1.39 (1.29-1.49)
Other Scales								
CHESS three or more (Ref = 1,2)	0.16 (0.01)	11.7	<.0001	1.18 (1.14-1.21)				

	RAI-HC Sample (n=196,444)				interRAI H,C Sample (n=18,127)			
Variable	**Estimate (Standard Error)**	**Z**	**Pr>|Z|**	**Odds ratio (95% CI)**	**Estimate (Standard Error)**	**Z**	**Pr>|Z|**	**Odds ratio (95% CI)**
AUA four or more (Ref = 1,2,3)	-0.14 (0.03)	-5.2	<.0001	0.87 (0.82-0.91)				
DIVERT (Ref = 1)								
2	0.31 (0.03)	11.2	<.0001	1.36 (1.29-1.44)				
3 or 4	0.54 (0.04)	15.2	<.0001	1.71 (1.60-1.84)				
5 or 6	0.80 (0.06)	13.9	<.0001	2.22 (1.99-2.49)				

6.3.4 Multivariable Analysis: Stratified by Sex

The male and female subsample multivariable GEE models were similar to the overall sample multivariable GEE model, but there were some differences between the three (Table 6.6). The same decision rules were applied as previously stated: variables were retained if they were significant at $p<.01$ and had an odds ratio <0.90 or >1.10. Where differences were observed between the models, variables were retained in one model but not significant in another. Associations did not change direction, only magnitude.

6.3.4.1 Male Subsample

The male subsample model had the following variables in common with the overall sample model: age, locomotion outside of home, dementia, cognitive impairment (CPS), functional improvement potential, cerebrovascular accident (stroke), congestive heart failure, irregularly irregular pulse, multiple sclerosis, Parkinsonism, hip fracture, cancer, treatments changed in last 30 days, unusually poor hygiene, medical complexity and instability (CHESS ≥3), and risk of unplanned emergency department visits (DIVERT) (Table 6.6). In addition to these, the male subsample model also retained presence of a secondary caregiver. It did not include urgent need for comprehensive assessment (AUA ≥4). Of the variables included in the final male subsample model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 7; c-statistic=0.70). The c-statistic for the full model was 0.73, indicating that the model had moderate discriminatory power.

In the male subsample model, a similar trend was observed in the association between age and frequent attendance as seen in the overall sample. Older, male home care clients between the ages of 65 to 69 had 0.92 (95% CI 0.85-0.99) times the odds of frequent attendance while those over the age of 90 had 0.49 (95% CI 0.44-0.54) times the odds of frequent attendance compared to those between the ages of 60 to 64. Married male home care clients had 1.25 (95% CI 1.20-1.29) times greater odds of being frequent attenders than unmarried male home care clients. Those with secondary caregiver living with them had 0.85 (95% CI 0.82-0.89) times the odds of being frequent attenders while those with a secondary caregiver present, but not living with them had 0.94 (0.90-0.98) times the odds of being frequent attenders compared to those with no secondary caregiver. Older male home care clients with impairment moving around outside of the home had 0.78 (95% CI 0.74-0.82) times the odds of frequent attendance.

As in the overall sample model, the odds of frequent attendance among those with a dementia diagnosis were 0.61 (0.56-0.67). Those with a CPS score of one or two had 0.76 (95% CI 0.72-0.80) times the odds of frequent attendance while those with a score of three or more had 0.62 (95% CI 0.57-0.67) times the odds of frequent attendance compared to those with a score of zero. Those who considered themselves to have potential for functional improvement had 1.21 (95% CI 1.17-1.25) times greater odds of being frequent attenders. All of the disease diagnoses significantly associated with frequent attendance in the overall sample multivariable GEE model were also retained in the male subsample model, including: stroke (OR 0.82, 95% CI 0.79-0.86); congestive heart failure (OR 1.17, 95% CI 1.09-1.25); irregularly irregular pulse (OR 1.25, 95% CI 1.17-1.32); multiple sclerosis (OR 0.44, 95% CI 0.30-0.66); Parkinsonism (OR 0.72, 95% CI 0.64-0.80); hip fracture (OR 0.74, 95% CI 0.68-0.80); and cancer (OR 2.23, 95% CI 2.06-2.42).

Older male home care clients whose treatment had changed in the last 30 days prior to assessment had 1.25 (95% CI 1.18-1.34) times greater odds of frequent attendance than those without a treatment change. Unusually poor hygiene was associated with 0.58 (95% CI 0.44-0.76) times the odds of frequent attendance while nine or more medications was associated with 1.37 (95% CI 1.30-1.44) times the odds of frequent attendance. Older male home care clients with medical complexity and instability (CHESS ≥ 3) had 1.18 (95% CI 1.13-1.23) times greater odds of being frequent attenders.

Risk of unplanned ED visits (DIVERT) was associated with greater odds of frequent attendance. Those with DIVERT score of two had 1.41 (95% CI 1.30-1.53) times greater odds while those with a DIVERT score of five or six (high risk) had 2.33 (95% CI 2.04-2.66) times greater odds of frequent attendance than those with a score of one (low risk).

6.3.4.2 Female Subsample

The female subsample model included the following items in common with overall sample model: age, marital status, locomotion outside of home, dementia, cognitive impairment (CPS), congestive heart failure, irregularly irregular pulse, multiple sclerosis, cancer, treatments changed in last 30 days, nine or more medications, and medical complexity and instability (CHESS ≥3) (Table 6.6). In addition to these, arthritis was retained. The female subsample model did not include functional improvement potential, cerebrovascular accident (stroke), Parkinsonism, hip fracture, unusually poor hygiene, urgent need for comprehensive assessment (AUA ≥4), or risk of unplanned ED visits (DIVERT). Of the variables included in the final female subsample model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 6.7; c-statistic=0.79). The c-statistic for the full model was 0.73, indicating that the model had moderate discriminatory power.

As in the male subsample model and overall sample model, a similar trend in the association between age and frequent attendance was observed in the female subsample model. Older female home care clients between the ages of 65 to 69 had 0.87 (95% CI 0.80-0.95) times the odds of being frequent attenders while those over the age of 90 had 0.36 (95% CI 0.32-0.40) times the odds of being frequent attenders compared to those between the ages of 60 to 64. Married female home care clients had 1.24 (95% CI 1.18-1.31) times greater odds of frequent attendance than unmarried female home care clients. Those with impairment moving around outside of the home had 0.80 (95% CI 0.75-0.86) times the odds of being frequent attenders.

Similar to the overall sample and male subsample models, odds of frequent attendance were lower with cognitive impairment. The odds of frequent attendance among those with a dementia diagnosis were 0.53 (0.49-0.58). Those with a CPS score of one or two had 0.84 (95% CI 0.81-0.88) times the odds while those with a score of three or more had 0.61 (95% CI 0.54-0.70) times the odds of frequent attendance than those with a CPS score of zero (no cognitive impairment). Several disease diagnoses were associated with frequent attendance in the female subsample model, namely: congestive heart failure (OR 1.38, 95% CI 1.28-1.50); irregularly irregular pulse (OR 1.49, 95% CI 1.39-1.61); multiple sclerosis (OR 0.55, 95% CI 0.41-0.73); arthritis (OR 0.88, 95% CI 0.85-0.91); and cancer (OR 2.78, 95% CI 2.44-3.16).

Older female home care clients who had a change in their treatments in the 30 days prior to assessment had 1.35 (95% CI 1.30-1.40) times greater odds of being frequent attenders. Those with nine or more medications and medical complexity and instability (CHESS ≥3) also had higher odds of frequent attendance (OR 1.46, 95% CI 1.36-1.56; OR 1.28 (95% CI 1.22-1.35, respectively).

6.3.4.3 Comparison of Male and Female Subsample Models

Both the male and female subsample multivariable GEE models retained age, marital status, impaired locomotion outside of the home, dementia, cognitive impairment (CPS), congestive heart failure, irregularly irregular pulse, multiple sclerosis, cancer, treatments changed in last 30 days, nine or more medications, and medical complexity and instability (CHESS ≥3) (Table 6.6). Secondary caregiver present, functional improvement potential, cerebrovascular accident (stroke), Parkinsonism, hip fracture, unusually poor hygiene, and risk of unplanned ED visits (DIVERT) were retained in male subsample model, but not in female subsample model. The female subsample was more parsimonious than the male subsample model overall, but included arthritis which was not significant in the latter.

6.3.5 Multivariable Results: interRAI HC Sample

Variables that were retained in the final multivariable GEE model in the overall RAI-HC sample were tested for inclusion in a multivariable GEE model in the interRAI HC sample (i.e., age, sex, marital status, locomotion outside of the home, dementia, cognitive impairment (CPS), functional improvement potential (client perspective), cerebrovascular accident (stroke), congestive heart failure, irregularly irregular pulse, multiple sclerosis, Parkinsonism, hip fracture, cancer, change in treatments in last 30 days, usually poor hygiene, nine or more medications, medical complexity and instability (CHESS $\geq$3), urgent need for assessment (AUA $\geq$4), and risk of unplanned ED visit (DIVERT). Variables that were significant at an alpha level of 0.01 and had odds ratios of less than 0.90 or greater than 1.10 were retained. The final multivariable GEE model in the interRAI HC sample, adjusted for clustering by LHIN, retained dementia diagnosis, functional improvement potential (client perspective), cancer diagnosis, and nine or more medications (Table 6.8). Age and sex were not statistically significant but were retained as covariates. Of the variables included in the final interRAI HC sample model, variables considered need characteristics had the highest discriminatory power, as indicated by the c-statistic (Table 6.7; c-statistic=0.62). The c-statistic for the full model was 0.63, indicating that the model had weak discriminatory power.

Older home care clients with a dementia diagnosis had 0.64 (95% CI 0.59-0.70) times the odds of frequent attendance compared to those with no dementia diagnosis. Older home care clients who considered themselves to have potential for functional improvement had 1.32 (95% CI 1.19-1.46) times greater odds of being frequent attenders. Those with a cancer diagnosis had 1.94 (95% CI 1.70-

2.20) times greater odds and those prescribed nine or more medications had 1.48 (95% CI 1.38-1.58) times greater odds of frequent attendance.

Items included in the final model from the RAI-HC sample and the interRAI HC sample are compared in Table 6.8. A handful of the variables were not available for testing in the interRAI HC data (i.e., irregularly irregular pulse, change in treatments in last 30 days, and usually poor hygiene). Many of the variables that were significant in the RAI-HC sample were not significant in the interRAI HC sample (i.e., age, sex, marital status, locomotion outside of the home, cognitive impairment (CPS), cerebrovascular accident (stroke), congestive heart failure, irregularly irregular pulse, multiple sclerosis, Parkinsonism, hip fracture, change in treatments in last 30 days, unusually poor hygiene, medical complexity and instability (CHESS ≥3), mid-level to highest urgency in terms of need for comprehensive assessment (AUA ≥4) and risk of unplanned ED visit (DIVERT). Where associations were significant in both samples, they were in the same direction.

6.4 Discussion

The variables associated with frequent attendance in the RAI-HC overall sample, male subsample, and female subsample were quite similar and included a handful of predisposing and enabling characteristics, in addition to several need characteristics. Need characteristics had more discriminatory power compared to predisposing and enabling characteristics. In terms of need, it appears that older home care clients who have frequent contact with physicians on an outpatient basis have medical complexity and instability, are at risk for unplanned ED visits, are prescribed multiple medications, and have comorbid conditions such as cardiovascular diseases and cancer. Older home care clients with cognitive impairment and comorbid conditions such as Parkinsonism and hip fracture do not appear to have the same frequency of contact. Findings appear to be consistent within the home care client population over time despite an update in assessment from the RAI-HC to the interRAI HC in 2018.

6.4.1 Comparing Samples

The size of the RAI-HC sample was substantially larger than the size of the interRAI HC sample. Despite this difference in size, the samples were similar in terms of demographic characteristics such as sex, age, marital status, living arrangement, cardiorespiratory diagnosis, and medical complexity and instability (CHESS ≥3). However, there appeared to be substantial differences in terms of cognition and function. The interRAI HC sample was much more cognitively and functionally impaired than the RAI-HC sample, which was also reflected in their level of risk for caregiver distress and institutionalization (MAPLe score). Similar levels of medical complexity and instability, and diagnosis of COPD or heart failure, suggest that medical needs are similar between the two samples, but the interRAI HC sample is much more dependent than the RAI-HC sample. It has been observed that the home care population in Ontario is becoming increasingly complex and resource intensive over time (Hogeveen et al., 2017). However, the two sample are only separated by a few years in time (3 to 6 years), therefore it is unlikely that the home care population has become so much more impaired from 2012 to 2018. It is more probable that the manner in which the samples were constructed resulted in such a difference. The RAI-HC sample consisted of newly admitted and assessed home care clients. Clients were retained in the sample regardless of whether they were discharged from home care for any reason before the end of the study period. Therefore, clients who improved and no longer required services, moved out of Ontario, were institutionalized, or died, were all represented in the RAI-HC sample. Therefore, this sample may be more heterogeneous in their care needs than the interRAI HC sample, with a more dispersed distribution of cognitive and functional impairment. The interRAI HC sample consisted only of home care clients who remained on home care service and had two assessments over one year (the duration of the study period). As a result, it is possible that the interRAI HC sample is a more homogeneous and generally higher needs subset of older, long stay home care clients than the RAI-HC sample. Reassessments are recommended every six to twelve months but are not required. The RAI-HC sample also included home care clients who were reassessed less often. Therefore, it may be that home care clients who had multiple assessments within the span of one year had significantly higher needs resulting in reassessment whereas less high needs clients were not reassessed as quickly.

6.4.2 Final RAI-HC Sample Models

Of the predisposing variables, sex, age and marital status were retained in the final RAI-HC sample models. Counter to the general understanding that females are more often frequent attenders of physician care (Gill & Sharpe, 1999; Kivelä et al., 2018; Vedsted & Christensen, 2005), female sex was found to be associated with lower odds of frequent attendance. As many studies considered the general population of adults, there may be nuances later in life that were not uncovered. In the review of frequent attendance among older adults (see section 6.1.1), the findings related to sex largely indicated no significant association with frequent attendance. According to Canadian data, after the age of 65 years, men have higher physician expenditures per capita than women (Canadian Institute for Health Information, 2012c). Further, men had a higher average number of general practitioner (GP) or family physician (FP) visits per person/year than women starting at age 80 in Ontario in 2001-2002 (Chan & Schultz, 2005). Therefore, it appears that the findings of this study are consistent with what has been observed in the Canadian data.

The relationship between age and frequent attendance was of interest. Age was associated with lower odds of frequent attendance in the overall RAI-HC sample, and the male and female subsamples. It is generally suggested in the literature that frequent attendance is associated with older age (Freeborn et al., 1990; Rennemark et al., 2009; Van den Bussche et al., 2016). However, one of the few longitudinal studies reviewed reported that the onset of frequent attendance status was negatively associated with age (Hajek & König, 2018). Canadian data indicate that physician expenditures per capita begin to drop off at the oldest age groups (i.e., between the ages of 85-89) (Canadian Institute for Health Information, 2012c). Stratified by sex, Canadian data indicate that the average number of GP/FP visits per person/year (2001-2002) peaked for women at ages 80-84, and for men at ages 85-89, and then decreased (Chan & Schultz, 2005). The reason for the lower odds of frequent attendance with increasing age may be that older adults themselves, their caregivers, or care providers become more pessimistic about the potential for improvement with care, or the cost-benefit of treatment (Hajek & König, 2018). However, it is important to note that the findings of the studies reviewed and the Canadian data mainly pertain to the general population of older adults. This study included only older home care clients. Older home care clients are a more complex and dependent subset of older adults. Increased health services use is mainly driven by chronic conditions, rather than age itself, although the prevalence of chronic conditions increases with age (Canadian Institute for Health Information, 2011). The reference age group for this analysis was 60-64 years old. Younger home care clients represent only a small proportion of the RAI-HC sample (6.4%), and may be more complex and have higher needs by virtue of being younger yet meeting eligibility requirements for care. Therefore, rather than representing a more healthy and independent group, the reference group may represent a group with higher need for frequent physician services than older age groups, which may explain the findings that older age groups have lower odds of frequent attendance than those aged 60-64 years.

The association between marital status and higher odds of frequent attendance is somewhat inconsistent with the literature reviewed. Several studies reported that marital status was not significantly associated with frequent attendance among older adults (Freeborn et al., 1990; Hajek & König, 2018; Hand et al., 2014; Press et al., 2012). In fact, in the general population of adults, singleness has been found to be associated with frequent attendance (Gill & Sharpe, 1999; Kivelä et al., 2018; Vedsted & Christensen, 2005). It may be that previous studies within the older adult population did not have sufficient power to detect the effect of marital status as their sample sizes were generally much smaller than that of the current study. It may also be that older home care clients who are married have another person looking out for them and prompting them to seek care. The effect of marital status was more important than the presence of an informal caregiver. None of the informal caregiver variables were included in the final models with the exception of the presence of a secondary care in the male subsample model. However, presence of a secondary caregiver was associated with lower odds of frequent attendance. It is possible that older male home care clients who had a secondary caregiver in addition to a primary caregiver were more functionally impaired and dependent on others. The results of this study suggested that functional impairment was associated with lower odds of frequent attendance as well.

Impaired locomotion outside of the home, an individual measure of functional impairment, was significantly associated with lower odds of frequent attendance in all three RAI-HC samples. There was little discussion of this characteristic or issues of access to care in the literature reviewed. However, in two German studies reviewed, functional impairment in general was associated with frequent attendance (Hajek & König, 2018; Van den Bussche et al., 2016). The discrepancy in findings may reflect differences in facilitators and barriers to accessing health services in Germany and Ontario. The findings of this study suggest that older home care clients in Ontario with medical needs may experience barriers to frequent contact with physicians due to an impaired ability to move around outside of their homes.

Another finding of interest was the association of dementia and cognitive impairment with lower odds of frequent attendance. Only two of the studies reviewed reported on this association. One study found that cognitive impairment was associated with frequent attendance (Press et al., 2012) while the second found the relationship to be non-significant (Hajek & König, 2018). There has been some literature published on the use of health services by individuals with dementia or cognitive impairment. One study reported no significant difference in physician visits between impaired and unimpaired groups of community-dwelling older adults (Ganguli, Seaberg, Belle, Fischer, & Kuller, 1993). Caspi and colleagues found that lower cognitive function level was associated with decreased levels of outpatient physician contact, but increased levels of hospitalization among community-dwelling older adults in the US (Caspi, Silverstein, Porell, & Kwan, 2009). They suggested that older adults with lower cognitive impairment were perhaps underserved by primary care. Another study reported that Alzheimer's disease (AD) was associated with less specialist visits and outpatient visits overall, but higher odds of general health care visits and inpatient admissions among community-dwelling older adults in Finland (Tolppanen et al., 2015). Tolppanen and colleagues hypothesized that older adults with AD and/or their families chose not to treat comorbidities or that outpatient physician services were being underutilized, leading to more inpatient services use. It is possible that physicians generally do not feel equipped to care for older adults with dementia or cognitive impairment (Chang, Patel, & Schulz, 2015). As with increasing age, it is also possible that older adults with dementia or cognitive impairment, their caregivers, or care providers become more pessimistic about the potential for improvement with care. Nevertheless, older home care clients who felt that they have the potential for functional improvement had higher odds of frequent attendance in this study, though this characteristic was not retained in the female subsample model.

Consistent with the finding that functional and cognitive impairment were associated with lower odds of frequent attendance, MAPLe score was associated with lower odds of frequent attendance in simple logistic regression models and was not retained in the final multivariable models. MAPLe is a composite measure indicating risk of institutionalization and caregiver distress and includes measures of functional impairment, cognitive impairment, and other characteristics such as behaviour symptoms, falls, poor nutrition status, and home environment issues. As individual items, these variables were also associated with lower odds of frequent attendance in simple logistic regression models but not in the final multivariable models.

In the literature, number of comorbidities and individual conditions have generally been found to be associated with higher odds of frequent attendance (Freeborn et al., 1990; Hajek & König, 2018; Menchetti et al., 2006; Press et al., 2012; Rennemark et al., 2009; Scherer et al., 2008; Sheehan et al., 2003; Van den Bussche et al., 2016). While increasing number of comorbidities was associated with higher odds in bivariate models in this study, it was not retained in the final models. Nevertheless, certain individual diagnoses were retained, with some differences between the overall sample, and male and female subsamples. In particular, cardiovascular conditions (i.e., congestive heart failure and irregularly irregular pulse) were associated with higher odds of frequent attendance, consistent with the findings in two of the articles reviewed (Freeborn et al., 1990; Van den Bussche et al., 2016). Cancer was also associated with higher odds of frequent attendance, which is logical considering that a cancer diagnosis often involves regular treatment and/or monitoring on an outpatient basis. Interestingly, certain diagnoses were associated with lower odds of frequent attendance, namely stroke (not significant in female subsample model), multiple sclerosis, Parkinsonism, arthritis (only significant in female subsample model), and hip fracture (not significant in female subsample model). It is possible that some of these conditions are managed on an inpatient basis and are therefore associated with lower odds of frequent contact on an outpatient basis. Further analyses are required to discern the mechanisms behind these associations.

Other variables that imply ongoing monitoring and/or care, as well as a need for medical care, are associated with higher odds of frequent attendance, namely treatments changed in last 90 days, nine or more medications, medical complexity and instability (CHESS ≥3), and risk of unplanned ED visits (DIVERT; not significant in the female subsample model). Two of the studies reviewed found no significant association between medication use and frequent attendance (Gilleard et al., 1998; Sheehan et al., 2003). This inconsistency may reflect differences in the measures of medication use and/or sample sizes. Issues of collinearity between DIVERT and its individual components included in the final multivariable GEE models (i.e., potential for functional improvement, cerebrovascular accident (stroke), and congestive heart failure) do not appear to be a concern as associations between these characteristics and frequent attendance remained in the same direction as in the simple logistic regression models.

Interestingly, unusually poor hygiene, an indicator of potential elder abuse, was retained in the final overall and male subsample models, and significantly associated with lower odds of frequent attendance. It may be that older home care clients who neglect to care for themselves, or who are not being regularly cared for, are less likely to seek care on a frequent basis. Urgent need for comprehensive follow-up assessment (AUA ≥4) was also found to be associated with lower odds of frequent attendance, but only in the overall sample model. AUA contains measures of caregiver distress, cognitive and functional impairment, poor mood, unstable conditions, and self-rated health. In bivariate analyses, many of these component items were associated with lower odds of frequent attendance. The reason AUA was not significant in the male or female subsample models may have been because of the presence of dementia and cognitive impairment within a smaller sample size.

Issues of collinearity between AUA and its individual components included in the final multivariable GEE models (i.e., locomotion) do not appear to be a concern as associations between these characteristics and frequent attendance remained in the same direction as in the simple logistic regression models.

Consistent with the literature reviewed, income and education were not retained as significantly associated with frequent attendance in the final models, nor were most social factors (e.g., primary caregiver present, caregiver distressed, loneliness) (Freeborn et al., 1990; Hajek & König, 2018; Hand et al., 2014; Press et al., 2012; Rennemark et al., 2009; Scherer et al., 2008; Sheehan et al., 2003). While significantly associated with higher odds of frequent attendance in bivariate analyses, none of the measures of mental health were retained in the final models, despite being generally considered an important determinant of frequent attendance in the literature (Freeborn et al., 1990; Gill & Sharpe, 1999; Kivelä et al., 2018; Menchetti et al., 2006; Press et al., 2012; Sheehan et al., 2003; Van den Bussche et al., 2016; Vedsted & Christensen, 2005; Welzel et al., 2017). Nevertheless, two of the studies reviewed did not find a significant association between mental health and frequent attendance either (Gilleard et al., 1998; Scherer et al., 2008)., although their findings may not be valid and generalizable to the sample of this study due to sample inclusion criteria and methodological limitations. The findings of this study suggest that physical health conditions are more important in predicting frequent attendance among older home care clients than mental health conditions.

6.4.3 interRAI HC Sample Model

Few of the variables retained in the final RAI-HC sample model were retained in the interRAI HC sample model and it had weak discriminatory power. The differences in the sample sizes may explain why many of the associations that were significant in the RAI-HC sample model were not significant in the interRAI HC sample model.

However, differences in how the dependent variable, frequent attendance, was operationalized in both samples may have had a greater impact than sample size. In both cases, the dependent variable was measured subsequent to the baseline independent characteristics and frequency of contact was counted within a 90 day time period. However, in the RAI-HC sample, the 90 day time period was directly following the RAI-HC assessment, while in the interRAI HC sample, the 90 day period was about three to nine months following the interRAI HC assessment. Further, frequent attendance, defined as the top 10% of clients with most frequent contact, corresponded to nine or more contacts in the RAI-HC sample but only three or more contacts in the interRAI HC sample. In the RAI-HC sample, contact was counted for any type of service provided and was not limited by fee code. Therefore, contact may have included office consultations, house visits, assessments, chronic disease shared appointments, outpatient procedures and interventions, telephone support, counselling, interviews with relatives on behalf of the client, the completion of forms on behalf of the client, and other services provided on an outpatient basis. Contact with certain specialties was excluded to avoid including diagnostic procedures in the number of contacts. In the interRAI HC, contact included visits to a physician, or authorized assistant or practitioner, as reported by the home care client or assessed through a review of clinical or transmittal records. This measure depends on the client and assessor's definition of a physician visit and likely does not capture the same breadth of types of contact with physicians as is captured in the measure of physician services use in the RAI-HC sample. The use of a cut-off point allowed for some mitigation of the difference in the actual number of contacts with physicians.

The variables that were retained were associated with frequent attendance in the same direction in both samples. None of the predisposing or enabling variables considered were significantly associated with frequent attendance, including age or sex. The main drivers were dementia diagnosis, potential for functional improvement (client perspective), cancer, and nine or more medications.

6.4.4 Implications

The findings of this study provide evidence to help understand the factors driving frequent contact with outpatient physician services by older home care clients in Ontario. It appears that the determinants are largely need variables, as is expected in an equitable health care system. There do not appear to be very notable differences in determinants between the sexes. A deeper investigation of these differences was beyond the scope of this study but may be interesting to pursue in future research.

Characteristics that were associated with higher odds of frequent attendance were largely intuitive and seemingly appropriate reasons for frequently seeking care (e.g., cardiovascular conditions, cancer, and medical complexity and instability). Determinants that were found to be associated with lower odds of frequent attendance are worth further consideration. Potential barriers preventing the oldest old and those with cognitive impairment (with or without a dementia diagnosis) from frequent contact with physician services in the community should be investigated. It may be that these sub-groups of home care clients are more reliant on inpatient care, in which case it would be appropriate to explore a more proactive approach to continuing caring for older adults in the community as they age and potentially become cognitively impaired. Another possibility is that they are not seeking care, or being offered care because of their age or a doubt of potential for their improvement. These older home care clients may benefit from the care of a geriatric specialist who would be equipped to tease apart the normal aging process, geriatric syndromes, and chronic conditions, and collaborate with the individual, their family, and other care providers to manage their care in a holistic manner according to patient goals and preferences. However, it is also possible that there are key differences between the youngest old and oldest old home care clients and their use of physician services that require further investigation.

The retention of impaired location outside of the home in the final model indicates that, despite need, some older home care clients may not be accessing care due to mobility or transportation issues. The impact of these issues on access to care for this vulnerable population and potential solutions should be investigated further.

The results of the interRAI HC sample analysis broadly suggest consistencies in associations in the home care sector over time. However, interRAI HC data were only very recently made available following the implementation of the updated tool in Ontario in 2018. Therefore, further research is needed to better understand any changes in the home care population over time and the nature of associations within these data. A deeper investigation into these data may be worthwhile to explore whether other variables that were not considered for inclusion would be significant in a final model in the interRAI HC sample and increase its discriminatory power. The discrepancy in the number of contacts with physicians in the interRAI HC and RAI-HC sample may require further investigation. interRAI may wish to explore how assessors and clients are defining and counting visits with physicians, and the association of this measure with actual contact as captured in administrative service use records.

6.4.5 Limitations

There were some limitations to this study which may have affected its findings. Contact with physicians was not limited by fee code in the RAI-HC sample. Therefore, the number of contacts may have been inflated. However, certain specialties not typically associated with consultations and monitoring, such as nuclear medicine, were excluded. Regardless of the type of contact, all fee codes represent some kind of interaction or involvement of a physician in the older home care client's care. Designating frequent attenders by percentile rather than a certain number of contacts allowed for a comparison between samples.

While both samples included long-stay home care clients, there were still differences in how each sample was selected which makes comparisons more difficult. The RAI-HC sample only included clients with an admission assessment during the study period and all independent variables were obtained from this initial assessment. There may be some differences between clients upon admission assessment and those receiving care on an on-going basis. The RAI-HC sample retained all home care clients regardless of whether they were discharged from home care for any reason before the end of the study period. The interRAI HC sample only included long-stay home care clients with more than one assessment in one year. As regular reassessment within a year is not required, clients who were reassessed may have been more high needs than the home care population at large. Both of the samples only included long-stay home care clients. There may be differences in the determinants of frequent attendance among short-stay clients as this segment of the population likely has different care needs.

6.5 Conclusions

While many of the factors driving frequent contact with physicians on an outpatient basis by older home care clients represent reasonable need and are consistent with the literature, several characteristics found to be significantly associated provide insight into potential barriers to care. Associations in the home care population as assessed by the RAI-HC prior to 2018 and as assessed by the interRAI HC in 2018 appear to be consistent. The findings suggest that there may be older home care clients who have frequent contact with physician services but would benefit from the holistic approach to care provided by specialists in geriatric medicine.

Chapter 7
Overall Discussion

7.1 Major Conclusions

There is a limited availability of specialized geriatric services (SGS) in Ontario, with a particular shortage in the number of geriatric medicine specialists. Provincial experts in the care of older adults generally agree that comprehensive geriatric assessment (CGA), and by extension SGS, should be targeted to a wide range of older adults with complex medical, functional, and psychosocial needs (Hogeveen, Marchewka, Hirdes, Milne, & Heckman, 2019). Stakeholders have expressed an interest in developing a mechanism to refer older adults to SGS in a rational and equitable manner based on need. However, it is difficult to study contact with SGS at a provincial level due to a lack of clear identifiers for these services in administrative data. Nevertheless, it is possible to examine contact with geriatric medicine on an out-patient basis as a component of the broader spectrum of community-based SGS using physician billing data.

7.1.1 Health Care Services Use by Older Home Care Clients

Home care clients represent a more complex and high needs subset of community-dwelling older adults, many of whom are admitted into home care following discharge from acute care settings and are at risk for long-term care placement. They are distinct from the general population of community-dwelling older adults, who tend to be healthier and more independent. Home care clients are, therefore, an appropriate group to begin targeting limited SGS. However, reviews of the literature have revealed little empirical evidence examining the use of SGS and geriatric medicine services specifically by older home care clients. This dissertation represents the first time home care assessment data have been linked with services use data to examine actual practice patterns and determinants of geriatric medicine contact by older home care clients in Ontario.

Access appeared to differ across the province, with greater odds of contact with geriatric medicine in some Local Health Integration Networks (LHINs) and lower odds of contact in others. In reality, only a small percentage of older home care clients were actually in contact with geriatric medicine provincially (~5%), despite having complex medical needs and a high rate of contact with outpatient physicians in general. Multiple contacts with family medicine resulted in subsequent contact with internal medicine, but not with geriatric medicine. This suggests there is a disconnect between the two disciplines. Nevertheless, the findings provide evidence that geriatric medicine care may alleviate pressure on the acute care sector.

7.1.2 Determinants of Physician Services Use by Older Home Care Clients

As is expected in a publicly-funded health care system, need variables are the strongest determinants of contact with geriatric medicine, although predisposing and enabling variables still play a role. The findings suggest that geriatric specialists mainly manage older home care clients with conditions typically associated with old age (i.e., dementia, Parkinsonism) while other community-based physicians generally do not. In many cases, variables that were associated with higher odds of geriatric medicine contact were associated with lower odds of frequent attendance. For example, impaired cognition, dementia diagnosis, and Parkinsonism were associated with higher odds of geriatric contact, but lower odds of frequent attendance. Other variables that were associated with higher odds of frequent attendance were associated with *lower* odds of geriatric medicine contact, including cardiorespiratory conditions, medical complexity and instability (CHESS), risk of unplanned ED visits (DIVERT), and cancer. Nevertheless, all of these factors were considered important for referral to CGA, and SGS, according to provincial experts (Hogeveen et al., 2019). There were no significant interactions in the models predicting either outcome, and sex differences were not particularly noteworthy based on the results reported in this dissertation. The findings suggest that impaired mobility and other issues of access may be barriers preventing older home care clients from accessing medical care. Cost, however, does not appear to be a barrier to care.

This dissertation provides the first analysis of interRAI HC data following its implementation in Ontario in 2018. While constructed differently, the interRAI HC sample was similar to the RAI-HC sample in many ways except that it was substantially more cognitively and functionally impaired. Findings suggest that factors found to be associated with frequent attendance in the RAI-HC may be consistent in the interRAI HC.

7.2 Recommendation for a Decision Support Tool to Guide Referral to Specialized Geriatric Services

The characteristics of older home care clients in contact with geriatric medicine do not match the breadth of the target population identified by provincial experts for referral to SGS. There was a segment of the home care population with complex medical needs that actually had lower odds of geriatric medicine contact despite having higher odds of frequent attendance, indicating a need for medical care. Due to limited resources, not every vulnerable, community-dwelling older adult may be cared for by SGS. Therefore, care must be targeted to the most vulnerable. Home care coordinators are well positioned to identify clients who may benefit from SGS in the community. A decision-support tool embedded in regular, standardized home care assessments may help not only home care coordinators, but also other care providers, to identify older adults with actual needs who would benefit from specialized geriatric care in a timely manner. Such a tool would also promote transparent, consistent, and equitable allocation of limited services and could be used to improve integration and collaboration across community-based care sectors. To date, there is only one tool that is compatible with the interRAI assessments and being used to identify potential need for referral to a geriatric specialist in Ontario: the Assessment Urgency Algorithm (AUA). However, the AUA is a simple algorithm based on a very limited subset of interRAI items. This dissertation proposes a tool that takes advantage of a more comprehensive set of individual measures to identify need for referral to SGS.

Based on the determinants of geriatric medicine contact identified in this research, past practice alone may not be appropriate to act as target outcome to guide decision support tool development for the broader spectrum of community-based SGS. An alternative approach is to use a combination of existing scales to capture a reasonably sized target population for referral to SGS. The proposed decision support tool would identify older home care clients for referral based on the following composite measures: 5M, MAPLe, and CHESS. The 5M score, based on the 5M Framework that describes the core competencies of geriatrics (Molnar, 2016; Molnar & Frank, 2019; Molnar et al., 2017; Tinetti et al., 2017) was found to be associated with higher odds of actual geriatric medicine contact based on administrative services use data (described in Chapter 4). The 5M Framework also resonates well with provincial experts, who felt that its components captured the characteristics of older adults who would benefit from referral to SGS (Hogeveen et al., 2019). The MAPLe score, which indicates risk of caregiver distress and institutionalization, was also associated with higher odds of geriatric medicine contact in the present analyses. Further, older home care clients with higher MAPLe scores who were in contact with geriatric medicine had lower odds of subsequent acute care services use. Provincial experts identified risk of caregiver distress and institutionalization as factors warranting referral to SGS (Hogeveen et al., 2019). Addressing caregiver distress, preventing premature institutionalization, and reducing strain on acute care services are also current health system priorities (Devlin et al., 2019). While the CHESS score was associated with lower odds of geriatric medicine contact (described in Chapter 4), it was associated with higher odds of frequent attendance, suggesting the presence of specialized care needs. CHESS is a measure of medical complexity and instability, factors identified by expert participants as important characteristics for referral to SGS (Hogeveen et al., 2019). Therefore, while older home care clients with higher CHESS scores may have had lower odds of contact with geriatric medicine in the past, they represent a population that might benefit from SGS.

A target group based on the combination of 5M, MAPLe, and CHESS would thus capture a population that reflects individuals who: a) currently see and benefit from geriatric medicine, or b) may have been missed by geriatric medicine in the past, but are frequent users of physician services. The size of the target group may be adjusted based on the cut-off points applied for each composite measure. For example, to obtain a target group for referral representing 9% of older home care clients, the following cut-off points should be applied: 5M=4 or 5 AND MAPLe=4 or 5 AND CHESS=3 to 5. A smaller target group of 3% could be obtained by applying more stringent criteria, such as: 5M=4 or 5 AND MAPLe=4 or 5 AND CHESS=4 or 5. Home care clients meeting the chosen criteria would be flagged during the home care assessment process to be considered for referral to SGS. This flag, or 'SGS Tool', could be included as a standardized output of interRAI assessments.

7.3 Implications for Clinical Care and Policy

7.3.1 Clinical Care

The findings of this dissertation have several implications for clinical care. First, they suggest that there are vulnerable clients with complex medical needs who systematically miss out on the specialist care provided by geriatric medicine. The precise reasons behind this observation are unclear at this time as it was beyond the scope of this study to explore referral practices. It is possible that family physicians and other care providers in a position to make referrals are uncertain of when and whom to refer. The limited availability of geriatric specialists and long wait times for care may also act as deterrents for other care providers to make referrals.

The SGS Tool may be used as a decision support aid to remove some of the guesswork and clarify care providers' understanding of when and whether to refer. This tool is not intended to replace clinical judgment, but to act as an information source for care providers to consider in the care planning process. Embedded within a standardized assessment system, the SGS Tool could also promote information sharing and collaboration between care providers. interRAI's assessment system allows for a common language and standardized information across care settings and sectors.

Better relationships are needed between community-based care providers, including home care, family medicine, geriatric medicine, and the broader spectrum of community-based SGS. A deeper understanding of each provider's role, and the scope of practice and specialized skillset of geriatric specialists may support appropriate and timely referral. Further, more upstream involvement of geriatric medicine may help to optimize care plans before clients progress to highly unstable or acute situations, or functional impairment when there is less opportunity for reversibility. Integrated care models involving the collaboration of multidisciplinary SGS teams with family medicine and home care have been demonstrated to lead to improvements in physical health, mental health, social functioning, and reduced rate of ED visits (Counsell et al., 2007). Experts in the care of older adults in Ontario have also emphasized the importance of connecting home and community care, primary care systems, and SGS, sharing medical information, and implementing a care plan that includes follow-up (Hogeveen et al., 2019).

Another approach to improve collaboration and understanding between care providers may be through education and training. There may be a lack of awareness about the availability and benefits of SGS, which may explain the observed disconnect between family medicine and geriatric medicine.

A better understanding among all care providers, including home and community care, of health changes in older adults and the role of SGS will allow for early identification, referral and intervention. Non-specialized medical students, residents, primary care physicians, specialists, and allied health professionals may need greater knowledge and skills to compensate for the limited SGS resources and manage conditions typically associated with old age. Physicians specialized in geriatric medicine may also benefit from additional training to increase their comfort in caring for older adults with medical complexity and instability, particularly cardiorespiratory conditions.

The results of this dissertation raise implications for the SGS referral process. In the Ontario health care system, family medicine acts as a gatekeeper, providing referrals to specialized care. However, it was not within the scope of this dissertation to discern exactly how clients were referred to geriatric medicine. If the SGS Tool is implemented, home care coordinators would be alerted to their clients' need for referral and prompted to take some sort of action. One option would be for home care coordinators to directly refer those clients to SGS, a practice that occurs in some regions in Ontario but not all. Another option would be for coordinators to alert their clients to discuss the need for referral to SGS with their family physician. interRAI is currently refining Personal Health Profiles (PHPs) that are meant to summarize the results of the home care assessment in a meaningful way for different target audiences (either the care recipient or other care providers, including primary care physicians). The SGS Tool may be included in the PHPs as a standard output for the client to take with them to facilitate a discussion with their family physician. It may also be included as a standard output in the care provider PHP, to directly alert family physicians to consider referral.

In order to facilitate referrals to SGS and responsibly manage limited resources, it may be beneficial to create an electronic, centralized referral process. Such a system could track referrals, wait times, and follow up processes and help to ensure that SGS are distributed in an equitable, consistent, and transparent way. System Coordinated Access is an eHealth Centre of Excellence program that supports the development of the Ocean eReferral Network, first launched in Waterloo-Wellington LHIN (Kivinen, 2017). The Ocean eReferral Network is an electronic referral system that is integrated with electronic medical record (EMR) systems. It allows health care providers to search for specialists and patient programs, view locations and wait times, make and track referrals (Ocean eReferral Network, n.d.). This technology allows standardized referral forms to be auto-populated with relevant information from the EMR (Kivinen, 2017). In 2017, the Ontario Ministry of Health and Long-term Care announced the expansion of this online eReferral system in several regions across the province (Ontario Ministry of Health and Long-Term Care, 2017). This kind of technology could be used to facilitate referrals to SGS from family physicians and home care providers. Further, the interRAI HC, containing an embedded SGS Tool and integrated into EMR systems, could be used to recommend clients for referral and auto-populate standardized referral forms.

Once referred to geriatric medicine or SGS, the clinician should be provided with the client's home care assessment. While the interRAI HC is a comprehensive clinical assessment with various decision support outputs that can be used for care planning and case management, it is not intended to be a diagnostic tool. To avoid duplication of assessment, geriatric specialists should use the information from the interRAI HC as a starting point to inform their care and begin to tease apart the complex issues affecting their patient. Clinicians may then develop a coordinated and integrated care plan in collaboration with other providers within the circle of care.

Finally, the findings suggest that transportation and accessibility issues may be a barrier for older adults to access care, whether SGS or other outpatient physician services. SGS may wish to consider approaches to overcome these barriers. One approach would be for SGS providers to make in-home consultations to care for housebound older home care clients. House Calls, launched by Mount Sinai

Hospital in Toronto, is an example of a program targeted towards marginalized, housebound seniors that provides care in the home for those unable to attend physician care services (Sinha, 2012).

7.3.2 Policy

In addition to the many clinical implications, the results of this dissertation have implications for policy at the national, provincial, and local levels.

7.3.2.1 National

Nationally, the findings support the continued use of the 5M Framework by the Canadian Geriatrics Society to communicate the core competencies of geriatrics (Molnar et al., 2017). This framework resonated with experts in the care of older adults. Client scores based on the operationalization of the framework using interRAI measures were associated with higher odds of contact with geriatric medicine in the current research. The Canadian Geriatrics Society should continue to raise the profile of geriatrics in Canada and inform other care providers and the public at large of the role and skillset that their members offer. In particular, they may wish to communicate their expertise in managing multiple complex issues in conjunction with conditions typically associated with old age.

Universities and health care training programs across the country should allocate more time and resources to training in geriatrics and gerontology. Continued efforts are needed to recruit students into specialized geriatric programs, including geriatric medicine and Care of the Elderly (COE) training for family physicians. In addition, specific training on the clinical use of interRAI systems should become part of the training curriculum given their pervasive use across Canada.

As work in this area continues and the possibilities of an SGS Tool are explored, the Canadian Institute for Health Information (CIHI) may wish to consider creating a quality standard to evaluate the processes of care for referral and access to community-based SGS. The standard should be developed in collaboration with stakeholders, based on best evidence and expert opinion. One option would be to set an ideal rate of referral following identification by the SGS Tool, accounting for clinical discretion in responding to its results.

7.3.2.2 Provincial

The results of this work have implications for several stakeholders at the provincial level. First, the findings will help the Regional Geriatric Programs of Ontario (RGPO) and the Provincial Geriatrics Leadership Office (PGLO) to understand the current landscape of geriatric medicine in Ontario as they continue to identify and map programs, services, and human resources delivering SGS.

The findings also suggest the need for a provincial human resources strategy to increase SGS capacity and distribution across the province. Contact with geriatric medicine has been found to be associated with lower odds of subsequent acute care services use. Preventing avoidable acute care services use is a major policy issue for the current provincial government (Devlin et al., 2019). As SGS have the potential to alleviate some pressure in this area, it would be worthwhile to invest in this sector. The SGS Tool may be applied at a population level to explore need among home care clients and plan capacity accordingly. More or less stringent cut-off points may be applied or additional interRAI HC outputs used to tailor volumes to current service capacity. The data also provide a means to project growth and plan for an expansion of SGS to meet the needs of a larger subset of the most vulnerable home care clients who would potentially benefit from SGS. Lastly, the data suggest that access to geriatric medicine varies by region. A provincial human resources strategy should also consider how to ensure that services are provided more equitably across Ontario. As part of this strategy, policy-makers should consider the roles of geriatric medicine specialists and the various other SGS and non-SGS care providers (e.g., family physicians with the COE designation), and consider how best to utilize these resources to complement the limited availability of geriatricians.

7.3.2.3 Local

As part of the current provincial government's health policies, local providers and services are forming teams to deliver integrated care that are held accountable for improving patient experience and health (Ontario Ministry of Health and Long-Term Care, 2019b). The Ontario Health Teams (OHTs) should specifically plan for the integration of community-based health services such as home care, primary care, and SGS, for vulnerable home care clients and other community-dwelling older adults. Further, they should make full use of the interRAI HC and other instruments within the interRAI suite of assessments to promote collaboration and information-sharing. The SGS Tool, embedded in the standardized assessments, could be a valuable resource for OHTs as they seek to allocate resources and provide care in an equitable, transparent, consistent, and sustainable manner.

7.4 Implications for Research

Future research should investigate the referral practices and processes involved in accessing SGS care in Ontario. Special attention should be paid to understanding the barriers related to access and impaired mobility, and potential solutions to this issue. Differential access in various regions across the province should also be explored further. It was not possible to identify specific LHINs in the current research. It would be more meaningful to explore access to geriatric medicine by region if the regions were identifiable and region-level characteristics and contexts could be considered. A more thorough sex- and gender-based analysis of the determinants of geriatric services use and frequent contact with outpatient physicians would be of interest. In particular, a qualitative or mixed-methods approach would be valuable in understanding the differences in determinants between the sexes. These methods would also allow for a better measurement of sex and gender as distinct characteristics, and the possibility to explore the interplay between them in their association with health services use by older home care clients.

The proposed SGS Tool should be elaborated and refined in continued collaboration with provincial stakeholders and experts in the care of older adults. It should be evaluated for its validity, feasibility, and acceptability. The interRAI Assessment Urgency Algorithm (AUA) is currently being used to identify frail older primary care clients for referral to a geriatric medicine specialist in one family health team in Waterloo-Wellington LHIN. The use of the AUA, based on a very limited set of interRAI items, and the SGS Tool, based on a more comprehensive set of items, should be compared.

The implementation of the SGS Tool within integrated care models involving home care, primary care, SGS, and potential use within a centralized referral process should be investigated. Following implementation of the SGS Tool, satisfaction with the tool and changes in referral processes should be evaluated. In particular, changes in ease of access to geriatric medicine and the broader spectrum of community-based SGS, and the population served should be investigated. It would also be of interest to explore changes in patient outcomes following the use of the SGS Tool. It is expected that as home care clients are more appropriately targeted for referral to geriatric medicine and SGS, there would be an average decrease or delay in acute care services use, long-term care admission, and death. The SGS Tool could also be used in randomized controlled trials (RCTs) to identify participants who may benefit from contact with geriatric medicine. Participants could then be randomized to actually receive geriatric medicine care or not, and then followed to examine changes in outcomes as a result of geriatric medicine care.

This study included the first analysis of interRAI HC data following its implementation in Ontario. Future research should explore these data further to investigate changes in the home care population over time. Finally, the generalizability of the findings to other jurisdictions should be investigated. As health systems and local contexts may differ considerably, the use of the SGS Tool should also be evaluated in other provinces and countries to examine its validity and relevance outside of Ontario.

7.4.1 interRAI

Following elaboration of the SGS Tool, interRAI may wish to incorporate this decision support tool into the standard output of home care assessments. interRAI should then also consider its application in other care sectors served by the interRAI suite of assessments, such as community support services, mental health, and acute care sectors. Finally, interRAI may wish to further explore the validity of the past physician visits measure and its association with administrative records of services use.

7.5 Conclusions

In summary, few older home care clients are in contact with geriatric medicine. It does not appear that contact with geriatric medicine follows frequent contact with family medicine or high services use in general. The factors associated with geriatric medicine contact are conditions typically associated with functional and cognitive loss in old age, but older home care clients with other complex medical needs do not appear to access their care. Nevertheless, geriatric medicine is well equipped to manage multiple, complex conditions in older adults in a holistic, patient-centred manner. There is even evidence that geriatric medicine care may alleviate strain elsewhere in the health care system by preventing acute care services use. A decision support tool identifying older home care clients for referral to SGS would allow for rational and equitable allocation of limited SGS resources, including community-based geriatric medicine, and promote integration, collaboration, and information sharing between community-based care providers.

References

Aday, L. A., & Andersen, R. M. (1974). A framework for the study of access to medical care. *Health Services Research*, *9*(3), 208–220. https://doi.org/10.3205/psm000089

Adepoju, O., Lin, S. H., Mileski, M., Kruse, C. S., & Mask, A. (2018). Mental health status and healthcare utilization among community dwelling older adults. *Journal of Mental Health*, *27*(6), 511–519. https://doi.org/10.1080/09638237.2018.1466030

Aiken, A. B., Mahar, A. L., Kurdyak, P., Whitehead, M., & Groome, P. A. (2016). A descriptive analysis of medical health services utilization of Veterans living in Ontario: A retrospective cohort study using administrative healthcare data. *BMC Health Services Research*, *16*(1), 1–11. https://doi.org/10.1186/s12913-016-1596-y

American Geriatrics Society. (2018). *State of the geriatrician workforce [PDF file]*. New York, NY. Retrieved from https://www.americangeriatrics.org/geriatrics-profession/about-geriatrics/geriatrics-workforce-numbers

Andersen, R. M. (1968). *Families' use of health services: A behavioral model of predisposing, enabling, and need components*. Purdue University.

Andersen, R. M. (1995). Revisiting the Behavioral Model and access to medical care : Does it matter ? *Journal of Health and Social Behavior*, *36*(1), 1–10.

Andersen, R. M., & Newman, J. F. (1973). Societal and individual determinants of medical care utilization in the United States. *The Milbank Memorial Fund Quarterly*, *51*(1), 95–124.

Auditor General of Ontario. (2015). CCACs - Community Care Access Centres - Home Care. In *2015 Annual Report of the Office of the Auditor General of Ontario* (pp. 70–115). Queen's Printer for Ontario. Retrieved from http://www.auditor.on.ca/en/content/annualreports/arreports/en15/3.01en15.pdf

Babitsch, B., Gohl, D., & von Lengerke, T. (2012). Re-revisiting Andersen ' s Behavioral Model of Health Services Use : A systematic review of studies from 1998-2011. *GMS Psycho-Social-Medicine 2*, *9*, 1–15. https://doi.org/10.3205/psm000089

Ballinger, G. A. (2004). Using generalized estimating equations for longitudinal data analysis. *Organizational Research Methods*, *7*(2), 127–150. https://doi.org/10.1177/1094428104263672

Bastedo, S. J., Krzyzanowska, M. K., Moineddin, R., Yun, L., Enright, K. A., & Grunfeld, E. (2017).

A population-based assessment of primary care visits during adjuvant chemotherapy for breast cancer. *Current Oncology*, *24*(2), 90–94. https://doi.org/10.3747/co.24.3431

Beauchet, O., Launay, C. P., Merjagnan, C., Kabeshova, A., & Annweiler, C. (2014). Quantified self and comprehensive geriatric assessment: Older adults are able to evaluate their own health and functional status. *PLoS ONE*, *9*(6), 1–7. https://doi.org/10.1371/journal.pone.0100636

Beaulieu, M. D., Samson, L., Rocher, G., Rioux, M., Boucher, L., & Del Grande, C. (2009). Investigating the barriers to teaching family physicians' and specialists' collaboration in the training environment: A qualitative study. *BMC Medical Education*, *9*(1), 1–9. https://doi.org/10.1186/1472-6920-9-31

Bertakis, K., Azari, R., Callahan, E. J., & Robbins, J. A. (2000). Gender differences in the utilization of health care services. *Journal of Family Practice*, *49*(2), 147–152.

Bodenheimer, T. (2008). Coordinating care - A perilous journey through the health care system. *New England Journal of Medicine*, *358*(10), 1064–1071. https://doi.org/10.1056/nejmhpr0706165

Bongue, B., Buisson, A., Dupre, C., Beland, F., Gonthier, R., & Crawford-Achour, É. (2017). Predictive performance of four frailty screening tools in community-dwelling elderly. *BMC Geriatrics*, *17*(1), 1–9. https://doi.org/10.1186/s12877-017-0633-y

Borrie, M., Kay, K., & Seitz, D. P. (2019). *Developing a current state view of Specialized Geriatric Services in Ontario: Contributor validation webinars [PDF file]*. Retrieved from https://www.rgps.on.ca/wp-content/uploads/2019-March-Provincial-Asset-Mapping-Project-Contributor-Validation-Webinars-physician-group-Mar21.pdf

Borrie, M., Seitz, D., Basu, M., Cooper, T., & Kay, K. (2019). *Specialized Geriatric Services in Ontario: Human resources mapping [PDF file]*.

Bowen, M. E., & Gonzalez, H. M. (2008). Racial/ethnic differences in the relationship between the use of health care services and functional disability: The Health and Retirement Study (1992-2004). *The Gerontologist*, *48*(5), 659–667. Retrieved from http://gerontologist.gerontologyjournals.org/cgi/content/abstract/48/5/659

Briggs, R., McDonough, A., Ellis, G., Bennett, K., O'Neill, D., & Robinson, D. (2017). Comprehensive Geriatric Assessment for community-dwelling, high-risk, frail, older people.

Cochrane Database of Systematic Reviews, *2017*(6). https://doi.org/10.1002/14651858.CD012705

Bronskill, S., Corbett, L., Gruneir, A., & Stevenson, J. (2011). *Health system use by frail Ontario seniors: An in-depth examination of four vulnerable cohorts*. Toronto, ON.

Burnette, D., & Mui, A. C. (1999). Physician utilization by hispanic elderly persons: National perspective. *Medical Care*, *37*(4), 362–374. https://doi.org/10.1097/00005650-199904000-00006

Burrows, A. B., Morris, J. N., Simon, S. E., Hirdes, J. P., & Phillips, C. (2000). Development of a minimum data set-based depression rating scale for use in nursing homes. *Age and Ageing*, *29*(2), 165–172. https://doi.org/10.1093/ageing/29.2.165

Butler-Jones, D. (2012). *The Chief Public Health Officer's report on the state of public health in Canada, 2012: Influencing health – the importance of sex and gender*. Retrieved from http://publichealth.gc.ca/CPHOreport

Caetano, S. J., Sonpavde, G., & Pond, G. R. (2018). C-statistic: A brief explanation of its construction, interpretation and limitations. *European Journal of Cancer*, *90*, 130–132. https://doi.org/10.1016/j.ejca.2017.10.027

Cameron, K. A., Song, J., Manheim, L. M., & Dunlop, D. D. (2010). Gender disparities in health and healthcare use among older adults. *Journal of Women's Health*, *19*(9), 1643–1650. https://doi.org/10.1089/jwh.2009.1701

Campbell, J. Y., Durso, S. C., Brandt, L. E., Finucane, T. E., & Abadir, P. M. (2013). The unknown profession: A geriatrician. *Journal of the American Geriatrics Society*, *61*(3), 447–449. https://doi.org/10.1111/jgs.12115

Canadian Home Care Association. (2013). *Portraits of home care in Canada*.

Canadian Institute for Health Information. (2009). *Alternate level of care in Canada*. *Analysis in Brief*. Retrieved from https://secure.cihi.ca/estore/productFamily.htm?pf=PFC3264&lang=en&media=0

Canadian Institute for Health Information. (2011). *Seniors and the health care system: What is the impact of multiple chronic conditions?* Retrieved from https://secure.cihi.ca/free_products/airchronic_disease_aib_en.pdf

Canadian Institute for Health Information. (2012a). *Data quality documentation, Discharge Abstract Database — Multi-year information*. Retrieved from https://www.cihi.ca/en/dad_multi-year_en.pdf

Canadian Institute for Health Information. (2012b). *Data quality documentation, National Ambulatory Care Reporting System — Multi-year information*. Retrieved from https://www.cihi.ca/sites/default/files/document/nacrs_multi-year_info_en.pdf

Canadian Institute for Health Information. (2012c). *Health care cost drivers : Physician expenditure — Technical report*. Ottawa, ON. Retrieved from http://www.cihi.ca/cihi-ext-portal/pdf/internet/health_costdriver_phys_tech_en

Canadian Institute for Health Information. (2016). *National Health Expenditure Trends , 1975 to 2016*. *Canadian Institute for Health Information* (Vol. 36). Ottawa, ON: CIHI. https://doi.org/10.1007/s10916-010-9605-x

Canadian Institute for Health Information. (2017). Infographic: Canada's seniors population outlook: Uncharted territory. Retrieved April 4, 2019, from https://www.cihi.ca/en/infographic-canadas-seniors-population-outlook-uncharted-territory

Canadian Institute for Health Information. (2018). NACRS emergency department visits and length of stay, 2017-2018 [Data file]. Retrieved from https://www.cihi.ca/en/nacrs-emergency-department-visits-and-length-of-stay-2017-2018

Canadian Institute for Health Information. (2019). *Physicians in Canada, 2017*. Ottawa, ON: CIHI. Retrieved from https://secure.cihi.ca/free_products/Physicians_in_Canada_2017.pdf

Canadian Medical Association. (2016). *The state of seniors health care in Canada*. Retrieved from https://www.cma.ca/sites/default/files/2018-11/the-state-of-seniors-health-care-in-canada-september-2016.pdf

Canadian Medical Association. (2018a). Family medicine profile [PDF file]. Retrieved from https://www.cma.ca/Assets/assets-library/document/en/advocacy/Family-e.pdf

Canadian Medical Association. (2018b). General internal medicine profile [PDF file]. Retrieved from https://legacy.cma.ca//Assets/assets-library/document/en/advocacy/profiles/internal-medicine-e.pdf

Canadian Medical Association. (2018c). Geriatric medicine profile [PDF file]. Retrieved from https://legacy.cma.ca//Assets/assets-library/document/en/advocacy/profiles/geriatric-e.pdf

Canadian Medical Association. (2018d). Number of physicians by province / territory and specialty , Canada , 2018 [Data file]. Retrieved from https://legacy.cma.ca//Assets/assets-library/document/en/advocacy/01-physicians-by-specialty-province-e.pdf

Cantor, M. D. (2017). We need more geriatricians, not more primary care physicians. *NEJM Catalyst*. Retrieved from https://catalyst.nejm.org/need-more-geriatricians-primary-care/

Carpenter, I., & Hirdes, J. P. (2013). Using interRAI assessment systems to measure and maintain quality of long-term care. In *A good life in old age? Monitoring and improving quality in long-term care* (pp. 93–140). Paris: OECD Publishing. https://doi.org/10.1787/9789264097759-en

Caspi, E., Silverstein, N. M., Porell, F., & Kwan, N. (2009). Physician outpatient contacts and hospitalizations among cognitively impaired elderly. *Alzheimer's and Dementia*, *5*(1), 30–42. https://doi.org/10.1016/j.jalz.2008.05.2493

Chan, B. T. B., & Austin, P. C. (2003). Patient, physician, and community factors affecting referrals to specialists in Ontario, Canada: A population-based, multi-level modelling approach. *Medical Care*, *41*(4), 500–511. https://doi.org/10.1097/00005650-200304000-00006

Chan, B. T. B., & Schultz, S. E. (2005). *Supply and utilization of general practitioner and family physician services in Ontario* (Vol. 54).

Chang, F., Patel, T., & Schulz, M. E. (2015). The "Rising Tide" of dementia in Canada: What does it mean for pharmacists and the people they care for? *Canadian Pharmacists Journal*, *148*(4), 193–199. https://doi.org/10.1177/1715163515588107

Chapman, E. N., Kaatz, A., & Carnes, M. (2013). Physicians and implicit bias: How doctors may unwittingly perpetuate health care disparities. *Journal of General Internal Medicine*, *28*(11), 1504–1510. https://doi.org/10.1007/s11606-013-2441-1

Chappell, N. L., & Blandford, A. A. (1987). Health service utilization by elderly persons. *Canadian Journal of Sociology*, *12*(3), 195. https://doi.org/10.2307/3340699

Chrisler, J. C., Barney, A., & Palatino, B. (2016). Ageism can be Hazardous to Women's Health:

Ageism, Sexism, and Stereotypes of Older Women in the Healthcare System. *Journal of Social Issues*, *72*(1), 86–104. https://doi.org/10.1111/josi.12157

Chun, A. K. (2011). When is it the right time to ask for a geriatrician ? *Mount Sinai Journal of Medicine*, *78*, 485–488. https://doi.org/10.1002/MSJ

Clow, B., Haworth-Broackman, M., & Bernier, J. (2009). *Rising to the challenge: Sex- and gender-based analysis for health planning, policy and research in Canada*. Retrieved from http://sgba-resource.ca/res/files/RisingToTheChallenge Author Names FINAL Mar28.pdf

Committee on Family Caregiving for Older Adults. (2016). *Family caregiving roles and impacts*. *Families Caring for an Aging America*. Washington, DC. https://doi.org/10.17226/23606

Costa, A., Hirdes, J., Arino-Blasco, S., Berg, K., Boscart, V., Carpenter, C., … Topinková, E. (2017). *interRAI Emergency Department (ED) Assessment System Manual: For Use with the interRAI ED Screener and ED Contact Assessment (ED-CA)* (9.3). Washington, DC: interRAI.

Costa, A., Hirdes, J. P., Bell, C. M., Bronskill, S. E., Heckman, G. A., Mitchell, L., … Stolee, P. (2015). Derivation and validation of the detection of indicators and vulnerabilities for emergency room trips scale for classifying the risk of emergency department use in frail community-dwelling older adults. *Journal of the American Geriatrics Society*, *63*(4), 763–769. https://doi.org/10.1111/jgs.13336

Counsell, S. R., Callahan, C. M., Clark, D. O., Tu, W., Buttar, A. B., Stump, T. E., & Ricketts, G. D. (2007). Geriatric care management for low-income seniors: A randomized controlled trial. *Journal of the American Medical Association*, *298*(22), 2623–2633. https://doi.org/10.1300/j005v21n01_05

Crilly, M., Bundred, P., Hu, X., Leckey, L., & Johnstone, F. (2007). Gender differences in the clinical management of patients with angina pectoris: A cross-sectional survey in primary care. *BMC Health Services Research*, *7*, 1–9. https://doi.org/10.1186/1472-6963-7-142

Daniels, R., van Rossum, E., Beurskens, A., van den Heuvel, W., & de Witte, L. (2012). The predictive validity of three self-report screening instruments for identifying frail older people in the community. *BMC Public Health*, *12*(1), 69. https://doi.org/10.1186/1471-2458-12-69

De Lepeleire, J., Iliffe, S., Mann, E., & Degryse, J. M. (2009). Frailty: An emerging concept for general practice. *British Journal of General Practice*, *59*(562), 177–182. https://doi.org/10.3399/bjgp09X420653

Demontiero, O., Vidal, C., & Duque, G. (2012). Aging and bone loss: New insights for the clinician. *Therapeutic Advances in Musculoskeletal Disease*, *4*(2), 61–76. https://doi.org/10.1177/1759720X11430858

Devlin, R., Brown, A., Clerici, C., Collins, B., Decter, M., Filion, S., … Sharkey, S. (2019). *Hallway health care: A system under strain*. Retrieved from http://www.health.gov.on.ca/en/public/publications/premiers_council/docs/premiers_council_report.pdf

Dunlop, D. D., Manheim, L. M., Song, J., & Chang, R. W. (2003). Health care utilization among older adults with arthritis. *Arthritis and Rheumatism*, *49*(2), 164–171. https://doi.org/10.1002/art.11003

Ellis, G., Gardner, M., Tsiachristas, A., Langhorne, P., Burke, O., Harwood, R. H., … Shepperd, S. (2017). Comprehensive geriatric assessment for older adults admitted to hospital. *Cochrane Database of Systematic Reviews*, *2017*(9). https://doi.org/10.1002/14651858.CD006211.pub3

Expert Group on Home and Community Care. (2015). *Bringing care home*. Retrieved from http://health.gov.on.ca/en/public/programs/ccac/docs/hcc_report.pdf

Feng, L., Yap, K. B., Kua, E. H., & Ng, T. P. (2009). Depressive symptoms, physician visits and hospitalization among community-dwelling older adults. *International Psychogeriatrics / IPA*, *21*(3), 568–575. https://doi.org/10.1017/S1041610209008965

Fillion, V., Sirois, M.-J., Gamache, P., Guertin, J. R., Morin, S. N., & Jean, S. (2019). Frailty and health services use among Quebec seniors with non-hip fractures: a population-based study using adminsitrative databases. *BMC Health Services Research*, *19*(1), 1–11. https://doi.org/10.1186/s12913-019-3865-z

Finucane, T. E. (2004). How is geriatrics different from general internal medicine ? *Geriatrics and Gerontology International 2004*, *4*, 259–261.

Fisher, K., Griffith, L., Gruneir, A., Panjwani, D., Gandhi, S., Sheng, L. (Lisa), … Ploeg, J. (2016). Comorbidity and its relationship with health service use and cost in community-living older adults with diabetes: A population-based study in Ontario, Canada. *Diabetes Research and Clinical Practice*, *122*, 113–123. https://doi.org/10.1016/j.diabres.2016.10.009

Foebel, A. D., Hirdes, J. P., Heckman, G. A., Kergoat, M. J., Patten, S., & Marrie, R. A. (2013). Diagnostic data for neurological conditions in interRAI assessments in home care, nursing home and mental health care settings: A validity study. *BMC Health Services Research*, *13*(1), 1–11. https://doi.org/10.1186/1472-6963-13-457

Frank, C., & Seguin, R. (2009). Care of the elderly training: Implications for family medicine. *Canadian Family Physician*, *55*, 510-511.e4.

Freeborn, D. K., Pope, C. R., Mullooly, J. P., & McFarland, B. H. (1990). Consistently high users of medical care among the elderly. *Medical Care*, *28*(6), 527–540.

Fridman, L., Scolnik, M., Macpherson, A., Rothman, L., Guttmann, A., Grool, A. M., … Zemek, R. L. (2018). Annual trends in follow-up visits for pediatric concussion in emergency departments and physicians' offices. *Journal of Pediatrics*, *192*, 184–188. https://doi.org/10.1016/j.jpeds.2017.09.018

Fried, L. P., & Hall, W. J. (2008). Leading on behalf of an aging society. *Journal of the American Geriatrics Society*, *26*(10), 1791–1795. https://doi.org/10.1111/j.1532-5415.2008.01939.x

Fries, B. E., Simon, S. E., Morris, J. N., Flodstrom, C., & Bookstein, F. L. (2001). Pain in U.S. nursing homes: Validating a pain scale for the minimum data set. *The Gerontologist*, *41*(2), 173–179. https://doi.org/10.1093/geront/41.2.173

Ganguli, M., Seaberg, E., Belle, S., Fischer, L., & Kuller, L. H. (1993). Cognitive impairment and the use of health services in an elderly rural population: the MoVIES project. *Journal of the American Geriatrics Society*, *41*(10), 1065.

Gerst-Emerson, K., & Jayawardhana, J. (2015). Loneliness as a public health issue: The impact of loneliness on health care utilization among older adults. *American Journal of Public Health*, *105*(5), 1013–1019. https://doi.org/10.2105/AJPH.2014.302427

Gill, D., & Sharpe, M. (1999). Frequent consulters in general practice: A systematic review of studies of prevalence, associations and outcome. *Journal of Psychosomatic Research*, *47*(2), 115–130. https://doi.org/10.1016/S0022-3999(98)00118-4

Gilleard, C. J., Francis, V., & Brown, M. (1998). Frequent attendance in primary care amongst older patients. *Aging and Mental Health*, *2*(3), 194–198. https://doi.org/10.1080/13607869856678

Glazier, R. H., Hutchison, B., & Kopp, A. (2015). *Comparison of family health teams to other Ontario primary health care models: 2004/05 to 2011/12*. Toronto, ON. Retrieved from https://www.ices.on.ca/Publications/Atlases-and-Reports/2015/Comparison-of-Family-Health-Teams

Gobbens, R. J. J., van Assen, M. A. L. M., Luijkx, K. G., & Schols, J. M. G. A. (2012). The predictive validity of the Tilburg Frailty Indicator: Disability, health care utilization, and quality of life in a population at risk. *The Gerontologist*, *52*(5), 619–631. https://doi.org/10.1093/geront/gnr135

Gordon, J. E. (2011). Updated survey of the geriatrics content of Canadian undergraduate and postgraduate medical curricula. *Canadian Geriatrics Journal*, *14*(2).

Gray, L. C., Berg, K., Fries, B. E., Henrard, J.-C., Hirdes, J. P., Steel, K., & Morris, J. N. (2009). Sharing clinical information across care settings: the birth of an integrated assessment system. *BMC Health Services Research*, *9*, 71. https://doi.org/10.1186/1472-6963-9-71

Gray, L. C., Onder, G., Cendoroglo, M. S., Dey, A., Di Tomasso, A. B. G., Fries, B. E., … Bernabei, R. (2016). International Gerontology and Geriatric Medicine. In J. B. Halter, J. G. Ouslander, S. Studenski, K. P. High, S. Asthana, M. A. Supiano, & C. Ritchie (Eds.), *Hazzard's Geriatric Medicine and Gerontology* (7th ed., pp. 83–110). McGraw-Hill Education.

Green, J. L., Hawley, J. N., & Rask, K. J. (2007). Is the number of prescribing physicians an independent risk factor for adverse drug events in an elderly outpatient population? *American Journal Geriatric Pharmacotherapy*, *5*(1), 31–39. https://doi.org/10.1016/j.amjopharm.2007.03.004

Griffith, L. E., Gruneir, A., Fisher, K., Panjwani, D., Gandhi, S., Sheng, L., … Ploeg, J. (2016). Patterns of health service use in community living older adults with dementia and comorbid conditions: a population-based retrospective cohort study in Ontario, Canada. *BMC Geriatrics*, *16*, 1–10. https://doi.org/10.1186/s12877-016-0351-x

Gruneir, A., Griffith, L. E., Fisher, K., Panjwani, D., Gandhi, S., Sheng, L., … Markle-Reid, M.

(2016). Increasing comorbidity and health services utilization in older adults with prior stroke. *Neurology*, *87*(20), 2091–2098. https://doi.org/10.1212/WNL.0000000000003329

Gruneir, A., Markle-Reid, M., Fisher, K., Reimer, H., Ma, X., & Ploeg, J. (2016). Comorbidity burden and health services use in community-living older adults with diabetes mellitus: A retrospective cohort study. *Canadian Journal of Diabetes*, *40*(1), 35–42. https://doi.org/10.1016/j.jcjd.2015.09.002

Hajek, A., Bock, J. O., & Konig, H. H. (2017). Which factors affect health care use among older Germans? Results of the German ageing survey. *BMC Health Services Research*, *17*(1), 30. https://doi.org/10.1186/s12913-017-1982-0

Hajek, A., & König, H.-H. (2018). Which factors lead to frequent attendance in the outpatient sector among individuals in the second half of life? Evidence from a population-based longitudinal study in Germany. *BMC Health Services Research*, *18*(1), 673. https://doi.org/10.1186/s12913-018-3487-x

Hand, C., Mccoll, M. A., Birtwhistle, R., Kotecha, J. A., Batchelor, D., & Barber, K. H. (2014). Social isolation in older adults who are frequent users of primary care services. *Canadian Family Physician*, *60*, 322–329.

Hanley, J. A., Negassa, A., Edwardes, M. D. deB, & Forrester, J. E. (2003). Statistical analysis of correlated data using generalized estimating equations: An orientation. *American Journal of Epidemiology*, *157*(4), 364–375. https://doi.org/10.1093/aje/kwf215

Haroun, D., Smits, F., van Etten-Jamaludin, F., Schene, A., van Weert, H., & ter Riet, G. (2016). The effects of interventions on quality of life, morbidity and consultation frequency in frequent attenders in primary care: A systematic review. *European Journal of General Practice*, *22*(2), 71–82. https://doi.org/10.3109/13814788.2016.1161751

Health Quality Ontario. (2016). *Income and health: Opportunities to achieve health equity in Ontario*. Toronto: Queen's Printer for Ontario. Retrieved from http://www.hqontario.ca/Portals/0/documents/system-performance/health-equity-report-en.pdf

Health Quality Ontario. (2017). Health Links: Excerpts from the 2016-2017 Q4 report [PowerPoint slides]. Retrieved from http://www.hqontario.ca/Quality-Improvement/Quality-Improvement-in-

Action/Health-Links

Health Quality Ontario [PDF file]. (2016). Coordinated care management. Retrieved from http://www.hqontario.ca/Portals/0/documents/qi/health-links/ccm-care-coordination-tool-en.pdf

Heckman, G. A., Hillier, L., Manderson, B., McKinnon-Wilson, J., Santi, S. M., & Stolee, P. (2013). Developing an integrated system of care for frail seniors. *Healthcare Management Forum*, *26*(4), 200–208. https://doi.org/10.1016/j.hcmf.2013.09.003

Heckman, G. A., Molnar, F. J., & Lee, L. (2013). Geriatric medicine leadership of health care transformation : To be or not to be ? *Canadian Geriatrics Journal*, *16*(4), 192–195.

Hernández-Aceituno, A., Pérez-Tasigchana, R. F., Guallar-Castillón, P., López-García, E., Rodríguez-Artalejo, F., & Banegas, J. R. (2017). Combined Healthy Behaviors and Healthcare Services Use in Older Adults. *American Journal of Preventive Medicine*, *53*(6), 872–881. https://doi.org/10.1016/j.amepre.2017.06.023

Hirdes, J. P. (2006a). Addressing the health needs of frail elderly people: Ontario's experience with an integrated health information system. *Age and Ageing*, *35*(4), 329–331. https://doi.org/10.1093/ageing/afl036

Hirdes, J. P. (2006b). Addressing the health needs of frail elderly people: Ontario's experience with an integrated health information system. *Age and Ageing*, *35*(4), 329–331. https://doi.org/10.1093/ageing/afl036

Hirdes, J. P., Fries, B. E., Morris, J. N., Steel, K., Mor, V., Frijters, D., … Jónsson, P. (1999). Integrated health information systems based on the RAI/MDS series of instruments. *Healthcare Management Forum*, *12*(4), 30–40. https://doi.org/10.1016/S0840-4704(10)60164-0

Hirdes, J. P., Frijters, D. H., & Teare, G. F. (2003). The MDS-CHESS Scale: A new measure to predict mortality in institutionalized older people. *Journal of the American Geriatrics Society*, *51*(1), 96–100. https://doi.org/10.1034/j.1601-5215.2002.51017.x

Hirdes, J. P., Ljunggren, G., Morris, J. N., Frijters, D. H. M., Finne Soveri, H., Gray, L., … Gilgen, R. (2008). Reliability of the interRAI suite of assessment instruments: a 12-country study of an integrated health information system. *BMC Health Services Research*, *8*, 277. https://doi.org/10.1186/1472-6963-8-277

Hirdes, J. P., Mitchell, L., Maxwell, C. J., & White, N. (2011). Beyond the "iron lungs of gerontology": Using evidence to shape the future of nursing homes in Canada. *Canadian Journal on Aging*, *30*(3), 371–390. https://doi.org/10.1017/S0714980811000304

Hirdes, J. P., Poss, J. W., & Curtin-Telegdi, N. (2008). The Method for Assigning Priority Levels (MAPLe): A new decision-support system for allocating home care resources. *BMC Medicine*, *6*, 9. https://doi.org/10.1186/1741-7015-6-9

Hirdes, J. P., Poss, J. W., Mitchell, L., Korngut, L., & Heckman, G. (2014). Use of the interRAI CHESS Scale to predict mortality among persons with neurological conditions in three care settings. *PLoS ONE*, *9*(6), e99066. https://doi.org/10.1371/journal.pone.0099066

Hogan, D. B., Borrie, M., Basran, J. F. S., Chung, A. M., Jarrett, P. G., Morais, J. A., … Woolmore-Goodwin, S. (2012). Specialist Physicians in Geriatrics— Report of the Canadian Geriatrics Society Physician Resource Work Group. *Canadian Geriatrics Journal*, *15*(3). https://doi.org/10.5770/cgj.15.41

Hogeveen, S. E., Chen, J., & Hirdes, J. P. (2017). Evaluation of data quality of interRAI assessments in home and community care. *BMC Medical Informatics and Decision Making*, *17*(1), 1–15. https://doi.org/10.1186/s12911-017-0547-9

Hogeveen, S. E., Marchewka, M. M., Hirdes, J. P., Milne, K., & Heckman, G. A. (2019). *Specialized geriatric services for seniors in home care*. Toronto, ON: Regional Geriatric Programs of Ontario.

Howe, A., Parry, G., Pickvance, D., & Hockley, B. (2002). Defining frequent attendance: Evidence for routine age and sex correction in studies from primary care settings. *British Journal of General Practice*, *52*(480), 561–562.

Huber, M., Stanciole, A., Wahlbeck, K., Tamsma, N., Torres, F., Jelfs, E., & Bremner, J. (2008). *Quality in and equality of access to healthcare services*. Brussels.

Iverson, G. D., Coleridge, S. T., Fulda, K. G., & Licciardone, J. C. (2005). What factors influence a family physician's decision to refer a patient to a specialist? *Rural and Remote Health*, *5*(3), 413.

Jaakkimainen, L., & Upshur, R. E. G. (2006). *Primary Care in Ontario: ICES Atlas*. Toronto, ON:

Institute for Clinical Evaluative Sciences.

Johnson, J., Greaves, L., & Repta, R. (2007). *Better Science With Sex and Gender. A Primer for Health Research*. Retrieved from http://people.stfx.ca/accamero/gender and health/Health Research/better-science-with-sex-and-gender-a-primer.pdf

Johnson, J., Greaves, L., & Repta, R. (2009). Better science with sex and gender: Facilitating the use of a sex and gender-based analysis in health research. *International Journal for Equity in Health*, *8*, 1–11. https://doi.org/10.1186/1475-9276-8-14

Kay, K. (2019). *Planning for health services for older adults living with frailty : Asset mapping of specialized geriatric services (SGS) in Ontario*. Regional Geriatric Programs of Ontario.

Kay, K., Hawkins, S. A., Day, A., Briscoe, M., Daly, D., & Wong, K. (2017). *A competency framework for interprofessional comprehensive geriatric assessment*. Regional Geriatric Programs of Ontario.

Kerse, N., & Clark, F. (1994). Case finding in the elderly: a postal questionnaire. *New Zealand Medical Journal*, *107*(971), 33–36.

Kivelä, K., Elo, S., & Kääriäinen, M. (2018). Frequent attenders in primary health care: A concept analysis. *International Journal of Nursing Studies*, *86*(December 2017), 115–124. https://doi.org/10.1016/j.ijnurstu.2018.06.003

Kivinen, H. (2017). Electronic Referral (eReferral) now available to all primary care providers in Waterloo Wellington. eHealth Centre of Excellence. Retrieved from http://ehealthce.ca/blog/ereferral-now-available-to-all-primary-care-providers-in-ww.htm

Korten, A. E., Jacomb, P. A., Jiao, Z., Christensen, H., Jorm, A. F., Henderson, A. S., & Rodgers, B. (1998). Predictors of GP service use: A community survey of an elderly Australian sample. *Australian and New Zealand Journal of Public Health*, *22*(5), 609–615. https://doi.org/10.1111/j.1467-842X.1998.tb01447.x

Kuo, H. K., Scandrett, K. G., Dave, J., & Mitchell, S. L. (2004). The influence of outpatient comprehensive geriatric assessment on survival: A meta-analysis. *Archives of Gerontology and Geriatrics*, *39*(3), 245–254. https://doi.org/10.1016/j.archger.2004.03.009

Lacas, A., & Rockwood, K. (2012). Frailty in primary care: A review of its conceptualization and implications for practice. *BMC Medicine*, *10*(1), 4. https://doi.org/10.1186/1741-7015-10-4

Landi, F., Tua, E., Onder, G., Carrara, B., Sgadari, A., Rinaldi, C., … Bernabei, R. (2000). Minimum Data Set for Home Care: A valid instrument to assess frail older people living in the community. *Medical Care*, *38*(12), 1184–1190.

Lee, L., Patel, T., Hillier, L., Locklin, J., Milligan, J., Pefanis, J., … Boscart, V. (2018). Frailty screening and case-finding for complex chronic conditions in older adults in primary care. *Geriatrics*, *3*(3), 39. https://doi.org/10.3390/geriatrics3030039

Lee, L., Patel, T., Hillier, L. M., Maulkhan, N., Slonim, K., & Costa, A. (2017). Identifying frailty in primary care: A systematic review. *Geriatrics and Gerontology International*, *17*(10), 1358–1377. https://doi.org/10.1111/ggi.12955

Lehnert, T., Heider, D., Leicht, H., Heinrich, S., Corrieri, S., Luppa, M., … König, H. H. (2011). Review: Health care utilization and costs of elderly persons with multiple chronic conditions. *Medical Care Research and Review*, *68*(4), 387–420. https://doi.org/10.1177/1077558711399580

Leipzig, R. M., Sauvign, K., Granville, L. J., Harper, G. M., Kirk, L. M., Levine, S. A., … Fernandez, H. M. (2014). What is a geriatrician ? American Geriatrics Society and Association of Directors of Geriatric Academic Programs geriatric medicine end-of-training entrustable professional activities for geriatric medicine. *Journal of the American Geriatrics Society*, *62*, 924–929. https://doi.org/10.1111/jgs.12825

León-Muñoz, L. M., Guallar-Castillón, P., López-García, E., Banegas, J. R., Gutierrez-Fisac, J. L., & Rodríguez-Artalejo, F. (2005). Relationship of BMI, waist circumference, and weight change with use of health services by older adults. *Obesity Research*, *13*(8), 1398–1404. https://doi.org/10.1038/oby.2005.169

León-Muñoz, L. M., López-García, E., Graciani, A., Guallar-Castillón, P., Banegas, J. R., & Rodríguez-Artalejo, F. (2007). Functional status and use of health care services: Longitudinal study on the older adult population in Spain. *Maturitas*, *58*(4), 377–386. https://doi.org/10.1016/j.maturitas.2007.09.008

Liang, L., & Zeger, S. (1986). Longitudinal data analysis using generalized linear models.

Biometrika, *73*, 13–22.

Lim, K. K., & Chan, A. (2017). Association of loneliness and healthcare utilization among older adults in Singapore. *Geriatrics and Gerontology International*, *17*(11), 1789–1798. https://doi.org/10.1111/ggi.12962

Luciano, J. V., Fernández, A., Pinto-Meza, A., Luján, L., Bellón, J. A., Garcia-Campayo, J., … Serrano-Blanco, A. (2010). Frequent attendance in primary care: Comparison and implications of different definitions. *British Journal of General Practice*, *60*(571), 95–100. https://doi.org/10.3399/bjgp10X483139

Mahar, A., Aiken, A. B., Cramm, H., Whitehead, M., Groome, P., & Kurdyak, P. (2018). Access to health care and medical health services use for Canadian military families posted to Ontario: a retrospective cohort study. *Journal of Military, Veteran and Family Health*, *4*(2), 61–70. https://doi.org/10.3138/jmvfh.2018-0014

Maly, R. C., Hirsch, S. H., & Reuben, D. B. (1997). The performance of simple instruments in detecting geriatric conditions and selecting community-dwelling older people for geriatric assessment. *Age and Ageing*, *26*(3), 223–231. https://doi.org/10.1093/ageing/26.3.223

Man-Son-Hing, M., Power, B., Byszewski, A., & Dalziel, W. B. (1997). Referral to specialized geriatric services: Which elderly people living in the community are likely to benefit? *Canadian Family Physician*, *43*(MAY), 925–930.

Manski, R. J., Moeller, J. F., Chen, H., Schimmel, J., St. Clair, P. A., & Pepper, J. V. (2013). Patterns of older Americans' health care utilization over time. *American Journal of Public Health*, *103*(7), 1314–1324. https://doi.org/10.2105/AJPH.2012.301124

Mcgahan, C. (2017). Using a Population Average Model to Investigate the Success of a Customer Retention Strategy Colleen E McGahan , British Columbia Cancer Agency, 1–19.

Menchetti, M., Cevenini, N., De Ronchi, D., Quartesan, R., & Berardi, D. (2006). Depression and frequent attendance in elderly primary care patients. *General Hospital Psychiatry*, *28*(2), 119–124. https://doi.org/10.1016/j.genhosppsych.2005.10.007

Metzelthin, S. F., Daniëls, R., van Rossum, E., de Witte, L., van den Heuvel, W. J. A., & Kempen, G. I. J. M. (2010). The psychometric properties of three self-report screening instruments for identifying frail older people in the community. *BMC Public Health*, *10*, 176. https://doi.org/10.1186/1471-2458-10-176

Michael Garron Hospital. (2019). Geriatric Assessment. Retrieved from https://www.tehn.ca/programs-services/medicine/geriatric-assessment

Missisauga Halton Local Health Integration Network (LHIN). (2007). *Aging at Home Strategy: Directional plan*. Retrieved from http://news.ontario.ca/mohltc/en/2010/08/aging-at-home-strategy.html

Mitchell, L. A., Hirdes, J. P., Poss, J. W., Slegers-Boyd, C., Caldarelli, H., & Martin, L. (2015). Informal caregivers of clients with neurological conditions: Profiles, patterns and risk factors for distress from a home care prevalence study. *BMC Health Services Research*, *15*(1), 350. https://doi.org/10.1186/s12913-015-1010-1

Molnar, F. J. (2016). Editor's response: Improving communication, speaking in plain language to our patients and partners. *Canadian Geriatrics Society Journal of Continuing Medical Education*, *6*(2).

Molnar, F. J., & Frank, C. C. (2019). Optimizing geriatric care with the GERIATRIC 5Ms. *Canadian Family Physician*, *65*, 39.

Molnar, F. J., Huang, A., & Tinetti, M. (2017). Update: The public launch of the Geriatric 5Ms. *Canadian Geriatrics Society Journal of Continuing Medical Education*, (April), 1–2.

Morley, J. E. (2017). Geriatricians : The super specialists. *Journal of the American Geriatrics Society*, *65*, 866–868. https://doi.org/10.1111/jgs.14702

Morris, J. N., Bernabei, R., Ikegami, N., Gilgen, R., Frijters, D., Hirdes, J., … Henrard, J. (1999). *RAI-Home Care (RAI-HC) Assessment Manual for Version 2.0.* Washington, DC: interRAI Corporation.

Morris, J. N., Fries, B. E., Mehr, D. R., Hawes, C., Phillips, C., Mor, V., & Lipsitz, L. A. (1994). MDS Cognitive Performance Scale. *Journal of Gerontology: Medical Sciences*, *49*(0022–1422), M174--M182.

Morris, J. N., Fries, B. E., & Morris, S. A. (1999). Scaling ADLs within the MDS. *Journal of Gerontology: Medical Sciences*, *54*(11), M546–M553.

https://doi.org/10.1093/gerona/54.11.M546

Morris, J. N., Fries, B. E., Steel, K., Ikegami, N., Bernabei, R., Carpenter, G. I., … Topinková, E. (1997). Comprehensive clinical assessment in community setting: Applicability of the MDS-HC. *Journal of the American Geriatrics Society*, *45*(8), 1017–1024. https://doi.org/10.1111/j.1532-5415.1997.tb02975.x

Morris, J. N., Howard, E. P., Steel, K., Perlman, C., Fries, B. E., Garms-Homolova, V., … Szczerbinska, K. (2016). Updating the Cognitive Performance Scale. *Journal of Geriatric Psychiatry*, *29*(1), 47–55. https://doi.org/10.1177/0891988715598231

Newall, N., McArthur, J., & Menec, V. H. (2015). A longitudinal examination of social participation, loneliness, and use of physician and hospital services. *Journal of Aging and Health*, *27*(3), 500–518. https://doi.org/10.1177/0898264314552420

Nguyen, G. C., Bouchard, S., & Diong, C. (2019). Access to specialists and emergency department visits in inflammatory bowel disease: A population-based study. *Journal of Crohn's and Colitis*, *13*(3), 330–336. https://doi.org/10.1093/ecco-jcc/jjy161

Nie, J. X., Wang, L., Tracy, C. S., Moineddin, R., Upshur, R. E. G., & Ccfp, M. A. (2010). A population-based cohort study of ambulatory care service utilization among older adults. *Journal of Evaluation in Clinical Practice*, *16*(294), 825–831. https://doi.org/10.1111/j.1365-2753.2009.01218.x

North Simcoe Muskoka Specialized Geriatric Services. (2019). Specialized geriatric services - Clinical services. Retrieved from http://www.nsmsgs.ca/29/SGS_Clinical_Services/

North York General. (2019). Specialized geriatric services. Retrieved from http://www.nygh.on.ca/Default.aspx?cid=1192&lang=1

Ocean eReferral Network. (n.d.). About eReferrals. Retrieved from https://www.oceanereferralnetwork.ca/about/

OECD. (2017). *Health at a glance 2017: OECD indicators*. Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/health_glance-2017-en

Ontario Ministry of Finance. (2018). *Ontario population projections update, 2017-2041*. Queen's Printer for Ontario.

Ontario Ministry of Government and Consumer Services. (2017). Registered Persons Database (RPDB). Retrieved May 6, 2019, from https://www.ontario.ca/data/registered-persons-database-rpdb

Ontario Ministry of Health and Long-Term Care. (2012a). About Health Links. Retrieved from https://news.ontario.ca/mohltc/en/2012/12/about-health-links.html?_ga=2.129490767.2118008832.1498234525-182587401.1464893086

Ontario Ministry of Health and Long-Term Care. (2012b). *Ontario's Action Plan For Health Care: Better patient care through better value from our health care dollars*. https://doi.org/800/01/12 Cat.# 016827 ISBN 978-1-4435-8942-0.

Ontario Ministry of Health and Long-Term Care. (2015a). *Guide to the Advanced Health Links model*. Retrieved from http://www.health.gov.on.ca/en/pro/programs/transformation/docs/Guide-to-the-Advanced-Health-Links-Model.pdf

Ontario Ministry of Health and Long-Term Care. (2015b). *Patients First: A roadmap to strengthen home and community care*. https://doi.org/May 2015

Ontario Ministry of Health and Long-Term Care. (2016). The Patients First Act. Retrieved from https://news.ontario.ca/mohltc/en/2016/12/the-patients-first-act.html

Ontario Ministry of Health and Long-Term Care. (2017). New wait times data now available for surgeries and procedures across Ontario: Province investing in new online tools to improve patient experience. Retrieved from https://news.ontario.ca/mohltc/en/2017/8/new-wait-times-data-now-available-for-surgeries-and-procedures-across-ontario.html

Ontario Ministry of Health and Long-Term Care. (2019a). Building a connected public health care system for the patient. Retrieved from https://news.ontario.ca/mohltc/en/2019/02/building-a-connected-public-health-care-system-for-the-patient.html

Ontario Ministry of Health and Long-Term Care. (2019b). Ontario passes legislation that puts patients at the centre of an integrated health care system. Retrieved from https://news.ontario.ca/mohltc/en/2019/04/ontario-passes-legislation-that-puts-patients-at-the-centre-of-an-integrated-health-care-system.html

Osborn, R., Moulds, D., Squires, D., Doty, M. M., & Anderson, C. (2014). International survey of older adults finds shortcomings in access, coordination, and patient-centered care. *Health Affairs*, *33*(12), 2247–2255. https://doi.org/10.1377/hlthaff.2014.0947

Ouellette-Kuntz, H., Smith, G., Fulford, C., & Cobigo, V. (2018). Are we making a difference in primary care for adults with intellectual and developmental disabilities? *Revista Panamericana de Salud Pública*, *42*(2), 1–10. https://doi.org/10.26633/rpsp.2018.154

Overcash, J. A., Beckstead, J., Extermann, M., & Cobb, S. (2005). The abbreviated comprehensive geriatric assessment (aCGA): A retrospective analysis. *Critical Reviews in Oncology/Hematology*, *54*(2), 129–136. https://doi.org/10.1016/j.critrevonc.2004.12.002

Palmer, K., & Onder, G. (2018). Comprehensive geriatric assessment: Benefits and limitations. *European Journal of Internal Medicine*, *54*(February), e8–e9. https://doi.org/10.1016/j.ejim.2018.02.016

Parker, S. G., Mccue, P., Phelps, K., Mccleod, A., Arora, S., Nockels, K., … Conroy, S. (2018). What is Comprehensive Geriatric Assessment (CGA)? An umbrella review. *Age and Ageing*, *47*(1), 149–155. https://doi.org/10.1093/ageing/afx166

Parker, S. G., Mcleod, A., Mccue, P., Phelps, K., Bardsley, M., Roberts, H. C., & Conroy, S. P. (2017). New horizons in comprehensive geriatric assessment. *Age and Ageing*, *46*(5), 713–721. https://doi.org/10.1093/ageing/afx104

Patterson, C., Hogan, D. B., & Bergman, H. (2012). The choices facing geriatrics. *Canadian Geriatrics Journal*, *15*(2), 24–27. https://doi.org/10.5770/cgj.15.33

Perkins, A. J., & Clark, D. O. (2001). Assessing the association of walking with health services use and costs among socioeconomically disadvantaged older adults. *Preventive Medicine*, *32*(6), 492–501. https://doi.org/10.1006/pmed.2001.0832

Perlman, C., Kirkham, J., Velkers, C., Leung, R. H., Whitehead, M., & Seitz, D. (2019). Access to psychiatrist services for older adults in long-term care: A population-based study. *Journal of the American Medical Directors Association*, *20*(5), 610-616.e2. https://doi.org/10.1016/j.jamda.2019.01.121

Peters, L. L., Boter, H., Buskens, E., & Slaets, J. P. J. (2012). Measurement properties of the groningen frailty indicator in home-dwelling and institutionalized elderly people. *Journal of the American Medical Directors Association*, *13*(6), 546–551. https://doi.org/10.1016/j.jamda.2012.04.007

Phelan, E. A., Genshaft, S., Williams, B., LoGerfo, J. P., & Wagner, E. H. (2008). How "geriatric" is care provided by fellowship-trained geriatricians compared to that of generalists? *Journal of the American Geriatrics Society*, *56*(10), 1807–1811. https://doi.org/10.1111/j.1532-5415.2008.01942.x.How

Pialoux, T., Goyard, J., & Lesourd, B. (2012). Screening tools for frailty in primary health care: a systematic review. *Geriatrics & Gerontology International*, *12*(2), 189–197. https://doi.org/10.1111/j.1447-0594.2011.00797.x

Pilotto, A., Cella, A., Pilotto, A., Daragjati, J., Veronese, N., Musacchio, C., … Panza, F. (2017). Three decades of comprehensive geriatric assessment: Evidence coming from different healthcare settings and specific clinical conditions. *Journal of the American Medical Directors Association*, *18*(2), 192.e1-192.e11. https://doi.org/10.1016/j.jamda.2016.11.004

Press, Y., Tandeter, H., Romem, P., Hazzan, R., & Farkash, M. (2012). Depressive symptomatology as a risk factor for increased health service utilization among elderly patients in primary care. *Archives of Gerontology and Geriatrics*, *54*(1), 127–130. https://doi.org/10.1016/j.archger.2011.02.009

Providence Care. (n.d.). Geriatric medicine clinic. Retrieved from https://www.providencecare.ca/services-referrals/geriatric-medicine-clinic/

Raîche, M., Hébert, R., & Dubois, M. F. (2008). PRISMA-7: A case-finding tool to identify older adults with moderate to severe disabilities. *Archives of Gerontology and Geriatrics*, *47*(1), 9–18. https://doi.org/10.1016/j.archger.2007.06.004

Reckrey, J. M., DeCherrie, L. V, Kelley, A. S., & Ornstein, K. (2013). Health care utilization among homebound elders: Does caregiver burden play a role? *Journal of Aging and Health*, *25*(6), 1036–1049. https://doi.org/10.1177/0898264313497509

Reeve, A., Simcox, E., & Turnbull, D. (2014). Ageing and Parkinson's disease: Why is advancing age the biggest risk factor? *Ageing Research Reviews*, *14*(1), 19–30.

https://doi.org/10.1016/j.arr.2014.01.004

Reinhard, S. C. (2017). Home alone: Family caregivers providing complex care. *The Gerontologist*, *56*(Suppl_3), 636–636. https://doi.org/10.1093/geront/gnw162.2578

Rennemark, M., Holst, G., Fagerstrom, C., & Halling, A. (2009). Factors related to frequent usage of the primary healthcare services in old age: Findings from the Swedish National Study on Aging and Care. *Health and Social Care in the Community*, *17*(3), 304–311. https://doi.org/10.1111/j.1365-2524.2008.00829.x

Ricketts, T. C., & Goldsmith, L. J. (2005). Access in health services research: The battle of the frameworks. *Nursing Outlook*, *53*(6), 274–280. https://doi.org/10.1016/j.outlook.2005.06.007

Romanow, R. (2002). *Building on values: The future of health care in Canada*. Commission on the Future of Health Care in Canada Building. https://doi.org/10.12927/hcpap.2003.17376

Rougé Bugat, M.-E., Cestac, P., Oustric, S., Vellas, B., & Nourhashemi, F. (2012). Detecting frailty in primary care: a major challenge for primary care physicians. *Journal of the American Medical Directors Association*, *13*(8), 669–672. https://doi.org/10.1016/j.jamda.2012.07.015

Sari, N. (2011). Exercise, physical activity and healthcare utilization: A review of literature for older adults. *Maturitas*, *70*(3), 285–289. https://doi.org/10.1016/j.maturitas.2011.08.004

Scherer, M., Himmel, W., Kochen, M. M., Koschack, J., Ahrens, D., Chenot, J., … Herrmann-Lingen, C. (2008). Psychosocial determinants for frequent primary health care utilisation in patients with heart failure. *Psycho-Social-Medicine*, *5*, 1–7.

Seniors Care Network. (2019). Geriatric assessment and intervention network. Retrieved from http://seniorscarenetwork.ca/programs-initiatives/programs/geriatric-assessment-and-intervention-network/

Sheehan, B., Bass, C., Briggs, R., & Jacoby, R. (2003). Somatization among older primary care attenders. *Psychological Medicine*, *33*(5), 867–877. https://doi.org/10.1017/S003329170300789X

Simmonds, B., Fox, K., Davis, M., Ku, P. W., Gray, S., Hillsdon, M., … Trayers, T. (2014). Objectively assessed physical activity and subsequent health service use of UK adults aged 70 and over: A four to five year follow up study. *PLoS ONE*, *9*(5), 1–9.

https://doi.org/10.1371/journal.pone.0097676

Simpson, D., Leipzig, R. M., Sauvigne, K., & Reynolds, D. W. (2017). The 2025 big " G " geriatrician: Defining job roles to guide fellowship training. *Journal of the American Geriatrics Society*, *65*, 2308–2312. https://doi.org/10.1111/jgs.14995

Sinha, S. K. (2012). *Living Longer, Living Well*. Ontario's Seniors Strategy. https://doi.org/10.1176/appi.pn.2016.4a51

Slade, S., Shrichand, A., & DiMillo, S. (2019). *Health care for an aging population: A study of how physicians care for seniors in Canada*. Ottawa, ON: The Royal College of Physicians and Surgeons of Canada.

Smits, F. T. M., Mohrs, J. J., Beem, E. E., Bindels, P. J. E., & Van Weert, H. C. P. M. (2008). Defining frequent attendance in general practice. *BMC Family Practice*, *9*, 1–6. https://doi.org/10.1186/1471-2296-9-21

St. Joseph's Health Care London. (2019). Specialized geriatric services: Access to programs and services. Retrieved from https://www.sjhc.london.on.ca/areas-care/specialized-geriatric-services/programs-and-services/access-programs-and-services

Statistics Canada. (2019). *Health Fact Sheets, Primary health care providers*. Retrieved from https://www150.statcan.gc.ca/n1/en/pub/82-625-x/2019001/article/00001-eng.pdf?st=cW6MSW_f

Steel, K. (1999). Systems of care for frail older persons. *Transactions of the American Clinical and Climatological Association*, *110*, 30–37.

Sternberg, S. A., Schwartz, A. W., Karunananthan, S., Bergman, H., & Clarfield, A. M. (2011). The identification of frailty: A systematic literature review. *Journal of the American Geriatrics Society*, *59*, 2129–2138.

Steverink, N., Slaets, J. P. J., Schuurmans, H., & van Lis, M. (2001). Measuring frailty: Developing and testing the GFI (Groningen Frailty Indicator). *The Gerontologist*, *41*(1), 236–237.

Stinchcombe, A., Kuran, N., & Powell, S. (2014). *Seniors' falls in Canada: Second report: Key highlights* (Vol. 34). Public Health Agency of Canada. Retrieved from https://www.canada.ca/en/public-health/services/reports-publications/health-promotion-chronic-disease-prevention-canada-research-policy-practice/vol-34-no-2-3-2014/report-summary-seniors-falls-canada-second-report-key-highlights.html

Stuck, A. E., Siu, A. L., Wieland, G. D., Adams, J., & Rubenstein, L. Z. (1993). Comprehensive geriatric assessment: A meta-analysis of controlled trials. *The Lancet*, *Volume 342*(Issue 8878, 23 October 1993), Pages 1032–1036.

Stump, T. E., Johnson, R. J., & Wolinsky, F. D. (1995). Changes in physician utilization over time among older adults. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *50 B*(1), S45–S58. https://doi.org/10.1093/geronb/50B.1.S45

Szczerbińska, K., Hirdes, J. P., & Życzkowska, J. (2012). Good news and bad news: Depressive symptoms decline and undertreatment increases with age in home care and institutional settings. *The American Journal of Geriatric Psychiatry*, *20*(12), 1045–1056. https://doi.org/10.1097/JGP.0b013e3182331702

The College of Family Physicians of Canada, Canadian Medical Association, & The Royal College of Physicians and Surgeons of Canada. (2014). National Physician Survey, 2014. Results for internal medicine specialists [Data file]. Retrieved from http://nationalphysiciansurvey.ca/result/2014-results-ontario/

The Regional Geriatric Program of Eastern Ontario. (2019). In the community (out-patient). Retrieved from http://www.rgpeo.com/en/health-care-practitioners/rgpeo-specialized-geriatric-services/in-the-community-(out-patient).aspx

The Regional Geriatric Programs of Ontario. (2016). The RGPs of Ontario: Three frequently asked questions. Retrieved from https://www.rgps.on.ca/wp-content/uploads/rgps-faq-cga-and-sgs-mar-6-2016_0.pdf

The Royal College of Physicians. (2018). 2017-2018 consultant census data tool [Data file]. Retrieved from https://www.rcplondon.ac.uk/projects/outputs/focus-physicians-2017-18-census-uk-consultants-and-higher-specialty-trainees

The World Bank. (2018). Population, total. Retrieved from https://data.worldbank.org/indicator/SP.POP.TOTL?view=chart

Tinetti, M. (2016a). Letter to the editor. *Canadian Geriatrics Society Journal of Continuing Medical*

Education, *6*(2).

Tinetti, M. (2016b). Mainstream or extinction : Can defining who we are save geriatrics? *Journal of the American Geriatrics Society*, *64*, 1400–1404. https://doi.org/10.1111/jgs.14181

Tinetti, M., Huang, A., & Molnar, F. J. (2017). The Geriatric 5Ms: A new way of communication what we do. *Journal of the American Geriatrics Society*, *65*(9), 2115. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/jgs.14979

Tolppanen, A. M., Taipale, H., Purmonen, T., Koponen, M., Soininen, H., & Hartikainen, S. (2015). Hospital admissions, outpatient visits and healthcare costs of community-dwellers with Alzheimer's disease. *Alzheimer's and Dementia*, *11*(8), 955–963. https://doi.org/10.1016/j.jalz.2014.10.005

Travis, C. B. (2005). 2004 Carolyn sherif award address: Heart disease and gender inequity. *Psychology of Women Quarterly*, *29*(1), 15–23. https://doi.org/10.1111/j.1471-6402.2005.00163.x

Turcotte, M. (2011). *Women and health*. Ottawa, ON: Minister of Industry, Statistics Canada.

Valtorta, N. K., Moore, D. C., Barron, L., Stow, D., & Hanratty, B. (2018). Older adults' social relationships and health care utilization: A systematic review. *American Journal of Public Health*, *108*(4), e1–e10. https://doi.org/10.2105/AJPH.2017.304256

Van den Bussche, H., Kaduszkiewicz, H., Schäfer, I., Koller, D., Hansen, H., Scherer, M., & Schön, G. (2016). Overutilization of ambulatory medical care in the elderly German population? An empirical study based on national insurance claims data and a review of foreign studies. *BMC Health Services Research*, *16*(1). https://doi.org/10.1186/s12913-016-1357-y

Van den Bussche, H., Schön, G., Kolonko, T., Hansen, H., Wegscheider, K., Glaeske, G., & Koller, D. (2011). Patterns of ambulatory medical care utilization in elderly patients with special reference to chronic diseases and multimorbidity: Results from a claims data based observational study in Germany. *BMC Geriatrics*, *11*(1), 54. https://doi.org/10.1186/1471-2318-11-54

Vedsted, P., & Christensen, M. B. (2005). Frequent attenders in general practice care: A literature review with special reference to methodological considerations. *Public Health*, *119*(2), 118–

137. https://doi.org/10.1016/j.puhe.2004.03.007

Vegda, K., Nie, J. X., Wang, L., Tracy, C. S., Moineddin, R., & Upshur, R. E. G. (2009). Trends in health services utilization, medication use, and health conditions among older adults : A 2-year retrospective chart review in a primary care practice, *7*, 1–7. https://doi.org/10.1186/1472-6963-9-217

Warshaw, G. A., Bragg, E. J., Fried, L. P., & Hall, W. J. (2008). Which patients benefit the most from a geriatrician's care? Consensus among directors of geriatrics academic programs. *Journal of the American Geriatrics Society*, *56*, 1796–1801. https://doi.org/10.1111/j.1532-5415.2008.01940.x

Waterloo Wellington Local Health Integration Network. (2017). Putting patients first. Retrieved from http://www.waterloowellingtonlhin.on.ca/patientsfirst.aspx

Welzel, F. D., Stein, J., Hajek, A., König, H. H., & Riedel-Heller, S. G. (2017). Frequent attenders in late life in primary care: A systematic review of European studies. *BMC Family Practice*, *18*(1), 1–14. https://doi.org/10.1186/s12875-017-0700-7

Wong, C. L., Von, M., Md, M., Mcfarlan, A., Huang, A., Lee, L., … Wong, C. (2017). Leading best practices: Emerging cross-specialty collaborative care models. *Canadian Geriatrics Society Journal of Continuing Medical Education*, *7*(1). Retrieved from http://canadiangeriatrics.ca/wp-content/uploads/2017/07/LEADING-BEST-PRACTICES-EMERGING.pdf

Wyman, M. F., Shiovitz-Ezra, S., & Bengel, J. (2018). Ageism in the health care system: Providers, patients, and systems. In L. Ayalon & C. Tesch-Römer (Eds.), *Contemporary Perspectives on Ageism* (pp. 193–212). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-73820-8_13

Appendix A

Steering Committee

Debra Bell	Manager, Community Care at Ministry of Health and Long-Term Care
Jo-Anne Clarke, MD, FRCPC	Clinical Lead, North East Specialized Geriatric Care
George Heckman, MD, FRCPC	Associate Professor (Schlegel Research Chair in Geriatric Medicine) Assistant Clinical Professor of Medicine, McMaster University
Sophie Hogeveen, PhD(c)	School of Public Health and Health Systems, University of Waterloo
Leslie Eckel, PhD(c), RSW	Knowledge Exchange Associate School of Public Health and Health Systems, University of Waterloo
Maria Gruending, MA	Team Lead, Strategic Policy Ministry of Health and Long Term Care
John Hirdes, PhD, FCAHS	Professor School of Public Health and Health Systems, University of Waterloo
Kelly Kay, PhD	Executive Director, Seniors Care Network
Jane McKinnon-Wilson, MSc, H.B.	Regional Geriatric Program Director, Hamilton Health Sciences, St. Peter's Hospital
Janet McMullan, RN, BScN, MN	Clinical Program Lead, Health Shared Services Ontario
Karen-Lee Miller, PhD, MSW	Senior Policy Advisor, Ministry of Health and Long Term Care
Kelly Milne	Director, Regional Geriatric Program of Eastern Ontario
Frank Molnar, MSc, MDCM, FRCPC	Associate Professor of Medicine, University of Ottawa Division of Geriatric Medicine, The Ottawa Hospital

	Medical Director, Regional Geriatric Program of Eastern Ontario
Amy Olmstead	Director, Home and Community Care Ministry of Health and Long Term Care
Linda Friis Petersen, MPP	Project Implementation and Team Lead Home and Community Care Branch, Health System Accountability and Performance Division Ministry of Health and Long-Term Care
Jessica Riehm, MPP	Senior Policy Advisor, Home and Community Care Branch Ministry of Health and Long-Term Care
Ann Schrager	Manager, Ministry of Health and Long Term Care
Samir Sinha, MD, DPhil FRCPC	Director of Geriatrics, Sinai Health System Assistant Professor of Medicine University of Toronto and the Johns Hopkins University School of Medicine Mount Sinai Hospital

Appendix B

Background Questionnaire

By completing this background questionnaire, you are indicated your consent to participate in this phase of the study. You are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

---

1. What is your gender?
    a. Female
    b. Male
    c. Non-binary/third gender
    d. Prefer to self-describe ________________
    e. Prefer not to say

2. What is your age range?
    a. 18-24 years old
    b. 24-34 years old
    c. 35-44 years old
    d. 45-54 years old
    e. 55-64 years old
    f. 65 years or older

3. Where do you work?
    a. Local Health Integration Network (LHIN):

    b. Organization:

4. What is your profession/role?

5. How long have you been working in this role?

6. What is your educational/training background?

7. When did you graduate from your training?

8. For how many years have you worked with seniors?

9. In which setting do you work?

    a. Urban OR Rural
    b. Academic centre OR community

10. In your experience, what barriers exist for referrals to CGA?

11. What are some of the facilitators for access to CGA?

12. What should the idea CHA referral process look like?

    a. Who should do referrals?

    b. What types of information should be provided?

    c. When should referrals occur in the patient's trajectory?

    d. Other features?

Appendix C
Interview Questions

1. In your opinion, what are the characteristics of a person *__most likely to benefit__* from a Comprehensive Geriatric Assessment?

__Probes:__

- What conditions or geriatric syndromes warrant a referral for CGA? E.g. (5M)
  - Mental health? (e.g. cognition, mood, anxiety, psychosis)
    - On a scale of 1 (not at all important) to 4 (very important), how important are these characteristics for referral for CGA?
  - Mobility? (e.g. falls, gait, fractures)
    - On a scale of 1 (not at all important) to 4 (very important), how important are these characteristics for referral for CGA?
  - Medications (e.g. appropriateness, optimal)
    - On a scale of 1 (not at all important) to 4 (very important), how important are these characteristics for referral for CGA?
  - Multimorbidity (how many? Which ones?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these characteristics for referral for CGA?
  - Frailty (e.g. loss of reserves that increase vulnerability to stressors)
    - On a scale of 1 (not at all important) to 4 (very important), how important are these characteristics for referral for CGA?

- Do particular circumstances warrant a referral for CGA? E.g.:
  - Recent and significant decline / potential for reversibility
    - What might suggest this?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these circumstances for referral for CGA?
  - Risk of institutionalization
    - On a scale of 1 (not at all important) to 4 (very important), how important are these circumstances for referral for CGA?
  - Multiple acute care visits?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these circumstances for referral for CGA?
  - Need for pro-active referral is warranted, e.g., pre-operative assessment, end-of-life)
    - On a scale of 1 (not at all important) to 4 (very important), how important are these circumstances for referral for CGA?

- What qualifiers might prompt a more urgent referral? E.g.:
  - Recent and significant decline / potential for reversibility : what might suggest this?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these qualifiers for referral for CGA?
  - Acute illness/event triggering major change from premorbid status, function, cognition, etc.
    - On a scale of 1 (not at all important) to 4 (very important), how important are these qualifiers for referral for CGA?
  - Repeated falls?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these qualifiers for referral for CGA?
  - Caregiver distress?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these qualifiers for referral for CGA?
  - Multiple acute care visits?
    - On a scale of 1 (not at all important) to 4 (very important), how important are these qualifiers for referral for CGA?

Clarify:

- If terms such as frailty, multimorbidity or polypharmacy are used, please ask the interviewee to provide a more specific definition
- If not mentioned, inquire about social, economic, psychological, environmental and caregiver characteristics that could enter into decision-making about referrals for CGA

Are there key combinations of geriatric syndromes, co-morbidities, living arrangements, marital status, informal caregiver proximity, cultural factors, or financial that would warrant a CGA?

Probes:

- Examples might include:
  - Chronic illness complicated by dementia? Caregiver distress?
  - Multicomplexity (poverty, social isolation), caregiver stress and emergency department visits?
  - Lifelong history of severe mental illness, poverty and chronic physical health problems

2. **Is there anything that you would like me to know that we haven't already discussed?**

Appendix D

Summary of literature review: Determinants of contact with outpatient physician services by community-dwelling older adults

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Adepoju et al., 2018 US	N=1,860 Nationally representation sample of older adults (≥65)	Prospective Data source: Interviews Analytic methods: Negative binomial model	• Office-based physician visits (1 year)	• Age • Gender **• Education level** • Marital status • Race	**• Have usual care provider** • Health insurance • Income level **• Urban/rural**	• Cognitive limitation **• Comorbidities** ***• Mental health status (Short Form-12)*** • Physical health (Short Form-12) • Perceived general health
Bowen & Gonzalez, 2008 US	N=8,947 Community-dwelling older adults	Prospective Data source: Interviews	• Physician visits (1 year)	• Age • Gender • Education ***• Race/ethnicity***	• Income • Health insurance • Wealth	• ADL disability • Medical conditions **• Mobility** • Self-rated health

Study	**Sample**	**Design**	**Dependent variable**	**Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)**		
				Predisposing	**Enabling**	**Need**
	(>50)	Analytic methods: Multilevel statistical modelling (hierarchical linear model) and nonlinear models				
Cameron et al., 2010 US	N=9,164 Community-dwelling older adults ≥65	Prospective Data source: Interviews Analytic methods: logistic regression	• # of times saw or spoke to medical doctor (including emergency department and clinic visits (2 years)	• Age • *Gender* • Education • Living arrangement • Race/ethnicity	• Health insurance • Income • Wealth	• Disability (ADL/IADL) • Functional health (stair climbing, mobility) • Medical conditions (chronic conditions)

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Dunlop et al., 2003 US	N=6,230 Older Americans living in the community (≥70)	Prospective Data source: Interviews Analytic methods: logistic regression	• # of times saw or spoke to medical doctor (including emergency department and clinic visits (2 years)	• Age • Sex • Education • Ethnicity • Marital status	• Family income • Health insurance	**• *Arthritis*** • BMI • Comorbidities
Feng, 2009 Singapore	N=973 Community-dwelling Chinese older adults (≥55)	Prospective Data source: Interviews, assessments, tests Analytic method: Poisson regression analyses	• Physician visits reported (2 months)	• Age • Gender • Education **• Ethnicity** •Marital status • Living arrangements • Frequency of visits or calls by children/relative/friends • Having confidant/ helper	• Financial ability to pay for medical care • Housing type	**• Depressive symptoms** **• Chronic disorders /comorbidities** • Cognitive impairment • Functional disability **• Self-rated physical health**

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
				• Religious or spiritual support		
Fillion et al., 2019 Canada	N=178,304 • Community-dwelling older adults with non-hip fracture (≥65)	Retrospective Data source : Administrative dataset Analytic method: multivariate GEE modeling	• # of primary care provider visits (1 year pre- and post-fracture)	• Age • Sex	• Material and social deprivation index • Urban/rural	• ***Frailty*** • **Number of comorbidities**
Fisher et al., 2015 Canada	N=376,421 Community-dwelling older adults with existing diagnosis of diabetes	Retrospective Data source : Administrative dataset	•# of physician visits (includes primary and specialist)	• **Age** • Sex/gender	• Neighbourhood Income	• ***# and type of chronic conditions (top 10)***

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
	(≥66)	Analytic method: Descriptive statistics				
Gerst-Emerson & Jayawardhana, 2014 US	N=3,530 Adults living in the community (≥60)	Prospective Data source: Interview and self-administered questionnaire Analytic method: Panel negative binomial regression	• # of times seen or talked to medical doctor (2 years)	• Age • Gender **• Education** **• Marital status** • Race/ethnicity	• Health insurance • Satisfaction with financial situation	**• ADL impairment** **• Chronic conditions** **• Depressive symptoms** **• *Loneliness*** • Self-rated health
Griffith et al., 2016	N=100,630	Retrospective	• # of physician visits (includes	• Age • Sex	• Neighbourhood Income	***• # and type of chronic conditions (top 10)***

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Canada	Community-dwelling older adults with diagnosis of dementia (≥66)	Data source: Administrative datasets Analytic method: Descriptive statistics	primary and specialist)			
Gruneir et al., 2016 Canada	N=29,673 Community-dwelling older adults with diagnosis of stroke (≥66)	Retrospective Data source: Administrative datasets Analytic method: Descriptive statistics	• # of physician visits (includes primary and specialist)	• Age • Sex	• Neighbourhood Income	• ***# and type of chronic conditions (top 10)***

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Gruneir et al., 2015 Canada	N=448,736 Community-dwelling older adults with diagnosis of diabetes (≥66)	Retrospective Data source: Administrative datasets Analytic method: Descriptive statistics	• # of physician visits (includes primary and specialist)	• Age • Sex		• ***# of chronic conditions and which ones*** • Duration of diabetes
Hajek, Bock, & Konig, 2017 Germany	N=1,372 Community-dwelling population (≥40)	Prospective Data source: Interviews, standardized questionnaire	• # of outpatient physician services (including visits to general practitioner, specialists) (1 year)	• Age • Sex/gender • Educational level • **Employment status** • Family status • Place of birth	• Self-rated accessibility of doctors • Income	• Current smoking status • **Excess weight** • **Morbidity** • **Physical activity** • **Subjective health**

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
		Analytic method: Poisson regression analysis				
Hernandez-Aceituno et al., 2017 Spain	N=2,021 • Non-institutionalized population (≥60)	Prospective Data source: Interview, home visit Analytic method: Logistic regression	• # of visits to primary care provider, medical specialist (1 year)	• Age • Sex • Educational attainment	• *Social network*	• **Alcohol consumption** • Blood pressure • BMI • Chronic conditions/ comorbidities • Diabetes • ***Diet health*** • Hypercholesterolemia • ***Physical activity*** • ***Sedentary behaviour*** • ***Sleep duration*** • ***Smoking status*** • **Total energy intake**

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Korten et al., 1998 Australia	N=624 Elderly (≥70)	Prospective Data source: Interviews, health insurance data Analytic method: logistic regression, Poisson regression	• Contact with general practitioner (1 year)	• Age • Sex • Living arrangement • Occupational status **• Personality** • Years of education	**• Social support**	**• ADL** • Cognitive performance **• Current symptoms** **• Hearing/vision impairment** **• Medical conditions** • Psychological health • Self-rated health
Leon-Munoz et al., 2005 Spain	N=2,919 Non-institutionalized older adult population	Prospective Data source: Interviews, physical exam	• # of home visits by doctor • # of health centre or primary care provider	• Age • Sex • Education • Size of place of residence		• Alcohol consumption ***• BMI*** **• Chronic diseases** • Tobacco use ***• Waist circumference*** ***• Weight change***

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
	(≥60)	Analytic method: Logistic regression				
Leon-Munoz et al., 2007 Spain	N=2,806 Non-institutionalized older adult population (≥60)	Prospective Data source: Interviews, physical exam Analytic method: Logistic regression	• # of home visits by doctor • # of health centre or primary care provider	• Age • Sex/gender • Head-of-family status	• Education • Marital status • Head-of-family employment status • Cohabitation • Frequent contact with family • Frequent contact with friends	• Arterial hypertension • Blood pressure at baseline • Chronic diseases ***• Functional status (IADLs)*** • Physical and mental components of quality of life • Physical activity during leisure time • Smoking

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Lim & Chan, 2017 Singapore	N=2,738 Community-dwelling adults (≥60)	Prospective Data source: Survey Analytic method: Hurdle negative binomial regression	•# of times seen or talked to doctor (1 month)	• Age, • Sex/gender • Education • Employment status • **Ethnicity** • Social capital: **marital status,** number of children, household size • Social network strength	• **Monthly household income** • Public or private health insurance • Medical savings	• *Change in loneliness status* • **Depression** • **History of chronic disease** • **Limitation in ADLs, IADLs** • ***Loneliness*** • **Pain in last 30 days** • **Self-assessed health**
Newall, McArthur, & Menec, 2015 Canada	N=954 Middle-aged to older adults (≥45)	Prospective Data source: In-home interviews	• # of physician visits	• **Age** • Gender • Education • Living arrangements		• **Chronic health conditions** • ***Loneliness*** • Self-rated health • *Social participation*

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
		Analytic method: Negative binomial regression, logistic regression				
Perkins & Clark, 2001 US	N=695 Low socioeconomic, chronically ill urban community-dwelling population (≥55)	Prospective Data source: Interview, medical records Analytic method: Regression models	Patient encounters with primary care (1 year)	• Age • Gender • Ethnicity • Frequency of contact with close family and friends • Living arrangement • Years of formal education	• Income	**• Chronic disease** • Mobility • Perceived health • *Physical activity*

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Reckrey et al., 2013 US	N=214 Homebound elders	Prospective Data source: Interview, patient chart Analytic method: Logistic regression	• # of phone calls (6 months) • # of home visits by medical service provider (6 months)	• Age • Sex • Education • Ethnicity • Living arrangement • Occupational status • Relationship to caregiver	• *Caregiver burden*	• Dependence in ADLs • More than one year in program prior to caregiver assessment
Simmonds et al., 2014 England	N=213 City-dwelling older people (≥70)	Prospective Data source: Primary care records, comprehensive assessment Analytic method:	• # of face-to-face consultations, telephone calls, treatment room appointments, home visits involving at least one primary care	•Age group • Gender • Highest level of education	•IMD area of residence	• # of existing illness/conditions • BMI • Lower limb function • *Physical activity*

Study	**Sample**	**Design**	**Dependent variable**	**Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)**		
				Predisposing	**Enabling**	**Need**
		Negative binomial regression, fixed effects method	provider (4-5 years)			
Stump et al., 1995 US	N=2,262 Older adults enrolled in Longitudinal Study on Aging (≥55)	Prospective Data source: Medicare administrative data, interviews Analytic method: Hierarchical regression analysis	• # of physician visits	• Age • Sex • Education • Living arrangements • Kin supports • Non-kin supports • Race	• Financial dependence on social security • Geographic region • Population density • Private health insurance • Residential stability • Valid medicaid card	**• ADLs** **• Comorbidities** **• IADLs** **• Perceived health status**

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
van den Bussche et al., 2011 Germany	N=123,224 Patients, members of one insurance company (≥65)	Retrospective Data source: Claims data Analytic method: Linear regression	• Contact with physicians in ambulatory medical care sector	• **Age** • Sex		• ***Chronic conditions*** • Statutory nursing dependency as proxy for disability
ADL: Activities of daily living; *BMI*: Body mass index; *GEE*: Generalized estimating equation; *IADL*: Instrumental activities of daily living; *US*: United States						

Appendix E

Odds of contact with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Predisposing						
Female sex (Ref = Male)	-0.10 (0.02)	<.0001	0.90 (0.87-0.94)			
Age (Ref = 60-64)						
65-69	1.08 (0.10)	<.0001	2.95 (2.41-3.61)			
70-74	1.59 (0.10)	<.0001	4.92 (4.07-5.96)			
75-79	1.89 (0.09)	<.0001	6.64 (5.51-7.99)			
80-84	1.99 (0.09)	<.0001	7.31 (6.08-8.79)			
85-89	1.90 (0.09)	<.0001	6.68 (5.55-8.03)			
≥90	1.57 (0.10)	<.0001	4.83 (3.99-5.84)			
Married (Ref = No)	0.15 (0.02)	<.0001	1.16 (1.12-1.21)	0.14 (0.02)	<.0001	1.15 (1.10-1.20)
Lives alone (Ref = No)	-0.22 (0.02)	<.0001	0.80 (0.77-0.84)	-0.17 (0.02)	<.0001	0.84 (0.81-0.88)
Education (Ref = less than high school)						
High school or more	0.09 (0.03)	0.0009	1.09 (1.04-1.15)	0.13 (0.03)	<.0001	1.14 (1.08-1.20)
Unknown	0.23 (0.03)	<.0001	1.25 (1.19-1.32)	0.08 (0.03)	0.005	1.08 (1.02-1.14)
Interpreted needed (Ref = No)	0.36 (0.03)	<.0001	1.43 (1.35-1.51)	0.03 (0.03)	0.38	1.03 (0.97-1.09)
Enabling						
Primary caregiver lives with client (Ref = No such helper)						
Yes	0.63 (0.09)	<.0001	1.89 (1.59-2.23)	0.54 (0.09)	<.0001	1.72 (1.45-2.03)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
No	0.43 (0.09)	<.0001	1.54 (1.30-1.83)	0.36 (0.09)	<.0001	1.43 (1.21-1.70)
Secondary caregiver lives with client (Ref = No such helper)						
Yes	0.30 (0.03)	<.0001	1.35 (1.27-1.44)	0.17 (0.03)	<.0001	1.18 (1.11-1.26)
No	0.22 (0.02)	<.0001	1.24 (1.19-1.30)	0.18 (0.02)	<.0001	1.19 (1.14-1.25)
Caregiver unable to continue (Ref = No)	0.29 (0.03)	<.0001	1.33 (1.26-1.41)	0.20 (0.03)	<.0001	1.22 (1.15-1.29)
Caregiver not satisfied with support (Ref = No)	0.45 (0.04)	<.0001	1.56 (1.44-1.70)	0.36 (0.04)	<.0001	1.44 (1.32-1.57)
Caregiver distressed (Ref = 0)	0.59 (0.02)	<.0001	1.81 (1.74-1.89)	0.58 (0.02)	<.0001	1.79 (1.71-1.87)
Environment CAP triggered (Ref = Not triggered)	0.01 (0.04)	0.8108	1.01 (0.93-1.10)	0.11 (0.04)	0.01	1.12 (1.02-1.22)
Impaired locomotion inside home (Ref = No impairment)	-0.33 (0.06)	<.0001	0.72 (0.64-0.81)	-0.41 (0.06)	<.0001	0.67 (0.59-0.75)
Impaired locomotion outside home (Ref = No impairment)	-0.33 (0.03)	<.0001	0.72 (0.68-0.76)	-0.38 (0.03)	<.0001	0.69 (0.65-0.72)
Lighting environment issue (Ref = No issue)	-0.05 (0.17)	0.76	0.95 (0.69-1.32)	0.06 (0.17)	0.73	1.06 (0.76-1.47)
Flooring and carpeting environment issue (Ref = No issue)	-0.09 (0.06)	0.12	0.91 (0.81-1.02)	0.04 (0.06)	0.48	1.04 (0.93-1.17)
Bathroom and toilet room environment issue (Ref = No issue)	-0.03 (0.05)	0.57	0.97 (0.87-1.08)	0.04 (0.05)	0.47	1.04 (0.94-1.16)
Kitchen environment issue (Ref = No issue)	0.06 (0.15)	0.70	1.06 (0.80-1.41)	0.16 (0.15)	0.28	1.17 (0.88-1.57)
Heating and cooling environment issue (Ref = No issue)	-0.31 (0.20)	0.13	0.73 (0.49-1.09)	-0.11 (0.21)	0.60	0.90 (0.60-1.34)
Personal safety issue (Ref = No issue)	0.67 (0.10)	<.0001	1.95 (1.60-2.38)	0.85 (0.10)	<.0001	2.33 (1.91-2.85)
Access to home issue (Ref = No issue)	-0.41 (0.04)	<.0001	0.66 (0.62-0.72)	-0.41 (0.04)	<.0001	0.66 (0.61-0.72)
Access to rooms in home issue (Ref = No issue)	-0.25 (0.04)	<.0001	0.78 (0.72-0.83)	-0.29 (0.04)	<.0001	0.75 (0.70-0.80)
Any home environment issues (Ref = None)	-0.21 (0.03)	<.0001	0.81 (0.77-0.85)	-0.19 (0.03)	<.0001	0.83 (0.79-0.87)
Economic trade-offs made (Ref = No)	-0.34 (0.10)	0.0005	0.71 (0.59-0.86)	-0.05 (0.10)	0.64	0.96 (0.79-1.16)
Need						
Cognition						
Alzheimer's (Ref = No)	1.28 (0.03)	<.0001	3.59 (3.40-3.79)	1.17 (0.03)	<.0001	3.22 (3.05-3.40)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Dementia other than Alzheimer's disease (Ref = No)	1.12 (0.02)	<.0001	3.06 (2.93-3.20)	1.07 (0.02)	<.0001	2.93 (2.80-3.06)
CPS ≥3(Ref = 0,1,2)	0.86 (0.03)	<.0001	2.36 (2.24-2.49)	0.81 (0.03)	<.0001	2.24 (2.13-2.37)
Short-term memory problem (Ref = Ok)	1.34 (0.02)	<.0001	3.81 (3.63-3.99)	1.29 (0.03)	<.0001	1.29 (0.03-2645.98)
Procedural memory problem (Ref = Ok)	1.00 (0.02)	<.0001	2.71 (2.60-2.82)	0.97 (0.02)	<.0001	2.63 (2.52-2.74)
Cognitive skills for daily decision-making (Ref = Independent)						
Modified independence	0.95 (0.03)	<.0001	2.59 (2.45-2.73)	0.90 (0.03)	<.0001	2.46 (2.32-2.60)
Minimally impaired	1.47 (0.03)	<.0001	4.35 (4.11-4.61)	1.43 (0.03)	<.0001	4.18 (3.94-4.43)
Moderately impaired	1.59 (0.04)	<.0001	4.91 (4.58-5.26)	1.54 (0.04)	<.0001	4.66 (4.34-5.00)
Severely impaired	1.51 (0.06)	<.0001	4.52 (4.06-5.03)	1.43 (0.06)	<.0001	4.18 (3.75-4.66)
Worsening of decision-making (Ref = No)	0.94 (0.02)	<.0001	2.57 (2.47-2.68)	0.92 (0.02)	<.0001	2.51 (2.40-2.61)
Sudden or new onset/change in mental function over last 7 days (Ref = No)	0.74 (0.05)	<.0001	2.11 (1.92-2.31)	0.75 (0.05)	<.0001	2.13 (1.93-2.34)
Agitated or disoriented in last 90 days (Ref = No)	0.77 (0.04)	<.0001	2.17 (2.02-2.32)	0.79 (0.04)	<.0001	2.21 (2.06-2.37)
Communication/Hearing/Vision Patterns						
Communication decline (Ref = No)	0.63 (0.03)	<.0001	1.89 (1.79-1.99)	0.62 (0.03)	<.0001	1.86 (1.76-1.96)
Vision decline (Ref = No)	-0.15 (0.04)	0.0004	0.86 (0.79-0.94)	-0.06 (0.04)	0.15	0.94 (0.87-1.02)
Mood and Behaviour Patterns, Mental Health						
Any psychiatric diagnosis (Ref = 0)	0.19 (0.03)	<.0001	1.21 (1.15-1.28)	0.33 (0.03)	<.0001	1.40 (1.32-1.48)
DRS ≥3 (Ref = 0,1,2)	0.29 (0.02)	<.0001	1.34 (1.28-1.40)	0.33 (0.02)	<.0001	1.39 (1.33-1.46)
Mood decline (Ref = No)	0.27 (0.02)	<.0001	1.30 (1.25-1.37)	0.30 (0.02)	<.0001	1.36 (1.29-1.42)
Wandering problem (Ref = No)						
Exhibited on 1-2 of last 3 days	1.03 (0.05)	<.0001	2.80 (2.52-3.11)	0.99 (0.05)	<.0001	2.69 (2.42-3.00)
Exhibited on each of last 3 days	1.08 (0.09)	<.0001	2.94 (2.44-3.54)	1.04 (0.10)	<.0001	2.82 (2.33-3.40)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted *p*-value	Adjusted Odds Ratio (95% CI)
Verbally abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	0.80 (0.05)	<.0001	2.23 (2.03-2.45)	0.77 (0.05)	<.0001	2.15 (1.95-2.37)
Exhibited on each of last 3 days	1.04 (0.07)	<.0001	2.82 (2.45-3.24)	0.99 (0.07)	<.0001	2.68 (2.32-3.09)
Physically abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	1.11 (0.10)	<.0001	3.03 (2.51-3.66)	1.04 (0.10)	<.0001	2.82 (2.33-3.42)
Exhibited on each of last 3 days	0.95 (0.16)	<.0001	2.57 (1.87-3.54)	0.90 (0.17)	<.0001	2.45 (1.77-3.40)
Socially inappropriate/disruptive behaviours (Ref = None)						
Exhibited on 1-2 of last 3 days	0.62 (0.09)	<.0001	1.86 (1.57-2.20)	0.62 (0.09)	<.0001	1.85 (1.56-2.20)
Exhibited on each of last 3 days	0.86 (0.10)	<.0001	2.36 (1.93-2.90)	0.89 (0.11)	<.0001	2.43 (1.98-2.99)
Resists care (Ref = No)						
Exhibited on 1-2 of last 3 days	0.82 (0.04)	<.0001	2.26 (2.08-2.46)	0.76 (0.04)	<.0001	2.13 (1.96-2.32)
Exhibited on each of last 3 days	0.78 (0.05)	<.0001	2.18 (1.97-2.41)	0.78 (0.05)	<.0001	2.18 (1.97-2.42)
Changes in behaviour symptoms (Ref = No)	0.83 (0.03)	<.0001	2.30 (2.17-2.45)	0.86 (0.03)	<.0001	2.37 (2.23-2.53)
Lonely (Ref = No)	0.04 (0.03)	0.17	1.04 (0.98-1.10)	0.07 (0.03)	0.02	1.07 (1.01-1.14)
Delusions (Ref = No)	0.97 (0.05)	<.0001	2.63 (2.37-2.92)	0.95 (0.05)	<.0001	2.58 (2.32-2.87)
Hallucinations (Ref = No)	0.99 (0.04)	<.0001	2.68 (2.46-2.92)	0.96 (0.04)	<.0001	2.62 (2.40-2.85)
Physical Functioning						
ADLH ≥3 (Ref = 0,1,2)	-0.04 (0.03)	0.30	0.97 (0.90-1.03)	-0.09 (0.04)	0.009	0.91 (0.85-0.98)
IADL-C ≥3 (Ref = 0,1,2)	0.33 (0.03)	<.0001	1.39 (1.31-1.46)	0.19 (0.03)	<.0001	1.22 (1.15-1.28)
ADL decline (Ref = No)	-0.11 (0.02)	<.0001	0.90 (0.86-0.94)	-0.15 (0.02)	<.0001	0.86 (0.82-0.89)
Functional improvement potential - client perspective (Ref = No)	-0.63 (0.03)	<.0001	0.53 (0.51-0.56)	-0.58 (0.03)	<.0001	0.56 (0.53-0.59)
Functional improvement potential - caregiver perspective (Ref = No)	-0.51 (0.04)	<.0001	0.60 (0.56-0.64)	-0.50 (0.04)	<.0001	0.61 (0.57-0.65)
Good prospects of recovery (Ref = No)	-0.81 (0.04)	<.0001	0.45 (0.41-0.49)	-0.78 (0.04)	<.0001	0.46 (0.42-0.50)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Continence						
Worsening of bladder incontinence (Ref = No)	0.20 (0.03)	<.0001	1.23 (1.16-1.30)	0.16 (0.03)	<.0001	1.17 (1.10-1.24)
Disease Diagnoses						
Number of diagnoses - collapsed (Ref = 0)						
1	0.21 (0.10)	0.04	1.23 (1.02-1.49)	0.20 (0.10)	0.05	1.22 (1.00-1.48)
2	0.29 (0.10)	0.002	1.34 (1.11-1.62)	0.25 (0.10)	0.01	1.28 (1.06-1.55)
3	0.30 (0.10)	0.002	1.35 (1.12-1.63)	0.25 (0.10)	0.01	1.28 (1.06-1.55)
4	0.29 (0.10)	0.002	1.34 (1.11-1.62)	0.25 (0.10)	0.01	1.28 (1.06-1.55)
5	0.28 (0.10)	0.005	1.32 (1.09-1.59)	0.26 (0.10)	0.01	1.30 (1.07-1.57)
≥6	0.21 (0.10)	0.03	1.23 (1.02-1.49)	0.23 (0.10)	0.02	1.26 (1.04-1.53)
Cerebrovascular accident (stroke) (Ref = No)	-0.01 (0.03)	0.75	0.99 (0.93-1.05)	-0.01 (0.03)	0.77	0.99 (0.93-1.05)
Congestive heart failure (Ref = No)	-0.25 (0.04)	<.0001	0.78 (0.72-0.83)	-0.26 (0.04)	<.0001	0.77 (0.72-0.83)
Coronary artery disease (Ref = No)	-0.23 (0.03)	<.0001	0.80 (0.76-0.84)	-0.21 (0.03)	<.0001	0.81 (0.77-0.85)
Hypertension (Ref = No)	-0.07 (0.02)	0.0003	0.93 (0.89-0.97)	-0.13 (0.02)	<.0001	0.88 (0.84-0.92)
Irregularly irregular pulse (Ref = No)	-0.15 (0.03)	<.0001		-0.15 (0.03)	<.0001	0.86 (0.81-0.92)
Peripheral vascular disease (Ref = No)	-0.47 (0.05)	<.0001	0.63 (0.56-0.70)	-0.31 (0.05)	<.0001	0.73 (0.66-0.82)
Head trauma (Ref = No)	0.19 (0.10)	0.06	1.21 (1.00-1.47)	0.36 (0.10)	0.0004	1.43 (1.18-1.75)
Hemiplegia/hemiparesis (Ref = No)	-0.75 (0.14)	<.0001	0.47 (0.36-0.62)	-0.61 (0.14)	<.0001	0.54 (0.41-0.71)
Multiple sclerosis (Ref = No)	-1.17 (0.27)	<.0001	0.31 (0.18-0.53)	-0.76 (0.27)	0.005	0.47 (0.27-0.79)
Parkinsonism (Ref = No)	0.47 (0.04)	<.0001	1.59 (1.46-1.74)	0.39 (0.05)	<.0001	1.48 (1.36-1.62)
Arthritis (Ref = No)	-0.20 (0.02)	<.0001	0.82 (0.79-0.85)	-0.19 (0.02)	<.0001	0.83 (0.80-0.87)
Hip fracture (Ref = No)	-0.37 (0.07)	<.0001	0.69 (0.61-0.79)	-0.43 (0.07)	<.0001	0.65 (0.57-0.74)
Other fractures (Ref = No)	-0.24 (0.04)	<.0001	0.79 (0.73-0.85)	-0.24 (0.04)	<.0001	0.78 (0.72-0.85)
Osteoporosis (Ref = No)	0.15 (0.03)	<.0001	1.17 (1.11-1.23)	0.10 (0.03)	0.0003	1.10 (1.05-1.16)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	Estimate (Standard Error)	*p*-value	Odds Ratio (95% CI)	Estimate (Standard Error)	*p*-value	Odds Ratio (95% CI)
Cataract (Ref = No)	0.00 (0.03)	0.89	1.00 (0.94-1.07)	-0.02 (0.03)	0.55	0.98 (0.92-1.05)
Glaucoma (Ref = No)	-0.01 (0.04)	0.85	0.99 (0.92-1.08)	-0.04 (0.04)	0.40	0.97 (0.89-1.05)
HIV infection (Ref = No)	-0.50 (0.51)	0.33	0.61 (0.23-1.65)	-0.12 (0.51)	0.81	0.89 (0.32-2.42)
Pneumonia (Ref = No)	-0.40 (0.07)	<.0001	0.67 (0.59-0.77)	-0.35 (0.07)	<.0001	0.70 (0.61-0.80)
Tuberculosis (Ref = No)	-0.39 (0.38)	0.31	0.68 (0.32-1.44)	-0.38 (0.39)	0.32	0.68 (0.32-1.46)
Urinary tract infection (Ref = No)	0.01 (0.05)	0.89	1.01 (0.92-1.10)	0.05 (0.05)	0.31	1.05 (0.96-1.15)
Cancer (Ref = No)	-0.80 (0.04)	<.0001	0.45 (0.42-0.49)	-0.65 (0.04)	<.0001	0.52 (0.48-0.56)
Diabetes (Ref = No)	-0.12 (0.02)	<.0001	0.88 (0.84-0.93)	-0.12 (0.02)	<.0001	0.89 (0.85-0.94)
Emphysema/COPD/asthma (Ref = No)	-0.48 (0.03)	<.0001	0.62 (0.58-0.66)	-0.38 (0.03)	<.0001	0.68 (0.64-0.73)
Renal failure (Ref = No)	-0.31 (0.05)	<.0001	0.73 (0.67-0.80)	-0.33 (0.05)	<.0001	0.72 (0.66-0.79)
Thyroid disease (hyper or hypo) (Ref = No)	-0.06 (0.03)	0.05	0.95 (0.89-1.00)	-0.03 (0.03)	0.34	0.97 (0.92-1.03)
Health Conditions						
Pain Scale (Ref = 0)						
1	-0.02 (0.03)	0.44	0.98 (0.92-1.04)	-0.01 (0.03)	0.66	0.99 (0.93-1.05)
2	-0.36 (0.02)	<.0001	0.70 (0.67-0.73)	-0.34 (0.02)	<.0001	0.71 (0.68-0.75)
3	-0.58 (0.04)	<.0001	0.56 (0.52-0.60)	-0.52 (0.04)	<.0001	0.60 (0.55-0.64)
Falls - collapsed (Ref = 0)						
1	0.05 (0.03)	0.03	1.06 (1.01-1.11)	0.01 (0.03)	0.65	1.01 (0.96-1.06)
2	0.20 (0.03)	<.0001	1.22 (1.14-1.31)	0.18 (0.03)	<.0001	1.20 (1.12-1.28)
3	0.36 (0.03)	<.0001	1.43 (1.34-1.52)	0.39 (0.03)	<.0001	1.47 (1.38-1.57)
Unsteady gait (Ref = No)	-0.12 (0.02)	<.0001	0.89 (0.85-0.93)	-0.16 (0.02)	<.0001	0.85 (0.82-0.89)
Poor self-reported health (Ref = No)	-0.32 (0.03)	<.0001	0.72 (0.68-0.76)	-0.30 (0.03)	<.0001	0.74 (0.70-0.78)
Unstable conditions (Ref = No)		<.0001	1.67 (1.61-1.74)	0.64 (0.02)	<.0001	1.90 (1.82-1.98)
Flare-up of recurrent or chronic condition (Ref = No)	-0.30 (0.04)	<.0001	0.74 (0.69-0.80)	-0.25 (0.04)	<.0001	0.78 (0.73-0.84)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Treatments changed in last 30 days (Ref = No)	-0.37 (0.03)	<.0001	0.69 (0.66-0.73)	-0.32 (0.03)	<.0001	0.73 (0.69-0.77)
Elder Abuse						
Abuse CAP (Ref = 0)						
1	0.13 (0.23)	0.58	1.14 (0.72-1.79)	0.25 (0.23)	0.28	1.29 (0.81-2.03)
2	0.33 (0.09)	0.0003	1.39 (1.16-1.67)	0.45 (0.09)	<.0001	1.57 (1.31-1.88)
Fearful of family/caregiver (Ref = No)	0.33 (0.16)	0.04	1.39 (1.02-1.89)	0.36 (0.16)	0.02	1.44 (1.05-1.97)
Unusually poor hygiene (Ref = No)	0.33 (0.11)	0.002	1.39 (1.13-1.72)	0.49 (0.11)	<.0001	1.63 (1.31-2.02)
Unexplained injuries (Ref = No)	0.54 (0.47)	0.25	1.71 (0.69-4.27)	0.61 (0.48)	0.20	1.83 (0.72-4.65)
Neglected, abused, or mistreated (Ref = No)	0.19 (0.20)	0.34	1.20 (0.82-1.77)	0.31 (0.20)	0.11	1.37 (0.93-2.02)
Physically restrained (Ref = No)	-0.50 (0.29)	0.09	0.61 (0.34-1.08)	-0.50 (0.30)	0.09	0.61 (0.34-1.08)
Service Utilization						
Overall change in care needs (Ref = Improved)						
No change	0.47 (0.06)	<.0001	1.60 (1.42-1.80)	0.43 (0.06)	<.0001	1.54 (1.37-1.74)
Deteriorated	0.52 (0.06)	<.0001	1.68 (1.50-1.89)	0.46 (0.06)	<.0001	1.59 (1.42-1.79)
Medications						
≥9 medications (Ref = No)	-0.19 (0.02)	<.0001	0.82 (0.79-0.86)	-0.14 (0.02)	<.0001	0.87 (0.83-0.90)
Other Scales						
CHESS ≥3 (Ref = 0,1,2)	-0.09 (0.03)	0.0005	0.92 (0.87-0.96)	-0.02 (0.03)	0.49	0.98 (0.93-1.03)
MAPLe ≥3 (Ref = 1,2)	1.08 (0.03)	<.0001	2.94 (2.76-3.13)	0.99 (0.03)	<.0001	2.70 (2.53-2.88)
AUA (Ref = 1)						
2	-0.22 (0.18)	0.24	0.80 (0.56-1.15)	-0.17 (0.19)	0.36	0.84 (0.59-1.21)
3	0.11 (0.08)	0.17	1.12 (0.95-1.32)	0.28 (0.08)	0.0006	1.33 (1.13-1.56)
4	0.66 (0.05)	<.0001	1.94 (1.76-2.14)	0.60 (0.05)	<.0001	1.82 (1.65-2.01)
5	0.76 (0.05)	<.0001	2.14 (1.92-2.38)	0.64 (0.06)	<.0001	1.90 (1.71-2.12)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
6	1.07 (0.05)	<.0001	2.92 (2.65-3.22)	1.01 (0.05)	<.0001	2.75 (2.50-3.04)
DIVERT (Ref = 1)						
2	-0.15 (0.04)	<.0001	0.86 (0.80-0.92)	-0.16 (0.04)	<.0001	0.85 (0.80-0.92)
3	-0.33 (0.04)	<.0001	0.72 (0.67-0.78)	-0.35 (0.04)	<.0001	0.70 (0.65-0.76)
4	-0.41 (0.04)	<.0001	0.66 (0.62-0.71)	-0.39 (0.04)	<.0001	0.68 (0.63-0.73)
5	-0.51 (0.04)	<.0001	0.60 (0.55-0.65)	-0.48 (0.04)	<.0001	0.62 (0.57-0.67)
6	-0.53 (0.05)	<.0001	0.59 (0.53-0.65)	-0.44 (0.05)	<.0001	0.64 (0.58-0.71)

Appendix F

Odds of contact with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015: Males (n=79,252)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Predisposing						
Age (Ref = 60-64)						
65-69	1.37 (0.16)	<.0001	3.93 (2.85-5.42)			
70-74	1.86 (0.16)	<.0001	6.44 (4.74-8.75)			
75-79	2.16 (0.15)	<.0001	8.69 (6.43-11.74)			
80-84	2.26 (0.15)	<.0001	9.57 (7.10-12.90)			
85-89	2.15 (0.15)	<.0001	8.57 (6.35-11.58)			
≥90	1.83 (0.16)	<.0001	6.25 (4.58-8.52)			
Married (Ref = No)	0.25 (0.03)	<.0001	1.29 (1.21-1.38)	0.18 (0.03)	<.0001	1.20 (1.12-1.29)
Lives alone (Ref = No)	-0.31 (0.04)	<.0001	0.73 (0.68-0.79)	-0.24 (0.04)	<.0001	0.79 (0.73-0.85)
Education (Ref = less than high school)						
High school or more	0.14 (0.04)	0.0005	1.16 (1.07-1.25)	0.16 (0.04)	0.0002	1.17 (1.08-1.27)
Unknown	0.26 (0.04)	<.0001	1.30 (1.20-1.41)	0.09 (0.04)	0.03	1.10 (1.01-1.19)
Interpreted needed (Ref = No)	0.39 (0.05)	<.0001	1.47 (1.34-1.61)	0.02 (0.05)	0.71	1.02 (0.93-1.12)
Enabling						
Primary caregiver lives with client (Ref = No such helper)						
Yes	0.53 (0.12)	<.0001	1.70 (1.34-2.16)	0.42 (0.12)	0.0007	1.52 (1.19-1.94)
No	0.29 (0.12)	0.02	1.33 (1.04-1.70)	0.19 (0.13)	0.13	1.21 (0.94-1.55)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
Secondary caregiver lives with client (Ref = No such helper)						
Yes	0.26 (0.05)	<.0001	1.29 (1.18-1.42)	0.08 (0.05)	0.09	1.09 (0.99-1.19)
No	0.21 (0.04)	<.0001	1.24 (1.15-1.32)	0.13 (0.04)	0.0005	1.13 (1.06-1.22)
Caregiver unable to continue (Ref = No)	0.27 (0.04)	<.0001	1.31 (1.21-1.42)	0.17 (0.04)	<.0001	1.18 (1.09-1.28)
Caregiver not satisfied with support (Ref = No)	0.41 (0.07)	<.0001	1.51 (1.32-1.73)	0.32 (0.07)	<.0001	1.37 (1.20-1.58)
Caregiver distressed (Ref = 0)	0.56 (0.03)	<.0001	1.76 (1.65-1.87)	0.54 (0.03)	<.0001	1.72 (1.61-1.84)
Environment CAP triggered (Ref = Not triggered)	-0.01 (0.07)	0.86	0.99 (0.87-1.12)	0.10 (0.07)	0.14	1.10 (0.97-1.26)
Impaired locomotion inside home (Ref = No impairment)	-0.36 (0.09)	<.0001	0.70 (0.58-0.83)	-0.45 (0.09)	<.0001	0.64 (0.53-0.77)
Impaired locomotion outside home (Ref = No impairment)	-0.35 (0.05)	<.0001	0.71 (0.65-0.77)	-0.42 (0.05)	<.0001	0.66 (0.60-0.72)
Lighting environment issue (Ref = No issue)	-0.08 (0.24)	0.74	0.92 (0.58-1.47)	0.08 (0.24)	0.74	1.08 (0.68-1.73)
Flooring and carpeting environment issue (Ref = No issue)	-0.09 (0.09)	0.33	0.92 (0.77-1.09)	0.05 (0.09)	0.58	1.05 (0.88-1.25)
Bathroom and toilet room environment issue (Ref = No issue)	-0.04 (0.08)	0.59	0.96 (0.82-1.12)	0.04 (0.08)	0.59	1.04 (0.89-1.22)
Kitchen environment issue (Ref = No issue)	-0.30 (0.24)	0.21	0.74 (0.46-1.18)	-0.20 (0.24)	0.42	0.82 (0.51-1.33)
Heating and cooling environment issue (Ref = No issue)	-0.47 (0.31)	0.13	0.63 (0.34-1.14)	-0.24 (0.31)	0.44	0.79 (0.43-1.45)
Personal safety issue (Ref = No issue)	0.58 (0.16)	0.0003	1.79 (1.31-2.45)	0.77 (0.16)	<.0001	2.16 (1.57-2.98)
Access to home issue (Ref = No issue)	-0.48 (0.06)	<.0001	0.62 (0.55-0.70)	-0.48 (0.06)	<.0001	0.62 (0.55-0.70)
Access to rooms in home issue (Ref = No issue)	-0.18 (0.05)	0.0007	0.84 (0.75-0.93)	-0.21 (0.05)	<.0001	0.81 (0.73-0.90)
Any home environment issues (Ref = None)	-0.20 (0.04)	<.0001	0.82 (0.76-0.88)	-0.17 (0.04)	<.0001	0.84 (0.78-0.91)
Economic trade-offs made (Ref = No)	-0.47 (0.15)	0.001	0.62 (0.47-0.83)	-0.14 (0.15)	0.36	0.87 (0.65-1.17)
Need						
Cognition						
Alzheimer's (Ref = No)	1.28 (0.04)	<.0001	3.60 (3.31-3.90)	1.16 (0.04)	<.0001	3.18 (2.93-3.46)
Dementia other than Alzheimer's disease (Ref = No)	1.14 (0.03)	<.0001	3.12 (2.93-3.33)	1.09 (0.03)	<.0001	2.96 (2.77-3.17)

Variable	Unadjusted: Estimate (Standard Error)	Unadjusted: *p*-value	Unadjusted: Odds Ratio (95% CI)	Adjusted for LHIN, age, sex: Estimate (Standard Error)	Adjusted for LHIN, age, sex: *p*-value	Adjusted for LHIN, age, sex: Odds Ratio (95% CI)
CPS ≥3 (Ref = 0,1,2)	0.83 (0.04)	<.0001	2.29 (2.12-2.47)	0.78 (0.04)	<.0001	2.19 (2.02-2.37)
Short-term memory problem (Ref = Ok)		<.0001	3.78 (3.50-4.07)	1.26 (0.04)	<.0001	3.52 (3.27-3.80)
Procedural memory problem (Ref = Ok)	1.01 (0.03)	<.0001	2.75 (2.58-2.92)	0.98 (0.03)	<.0001	2.66 (2.49-2.83)
Cognitive skills for daily decision-making (Ref = Independent)						
Modified independence	1.02 (0.04)	<.0001	2.76 (2.53-3.01)	0.95 (0.04)	<.0001	2.58 (2.36-2.82)
Minimally impaired	1.49 (0.05)	<.0001	4.44 (4.06-4.85)	1.43 (0.05)	<.0001	4.16 (3.80-4.55)
Moderately impaired	1.62 (0.05)	<.0001	5.03 (4.52-5.59)	1.56 (0.05)	<.0001	4.74 (4.26-5.28)
Severely impaired	1.54 (0.08)	<.0001	4.65 (3.95-5.47)	1.44 (0.08)	<.0001	4.24 (3.59-5.00)
Worsening of decision-making (Ref = No)	0.94 (0.03)	<.0001	2.57 (2.41-2.73)	0.92 (0.03)	<.0001	2.51 (2.35-2.67)
Sudden or new onset/change in mental function over last 7 days (Ref = No)	0.69 (0.07)	<.0001	1.99 (1.72-2.29)	0.69 (0.07)	<.0001	2.00 (1.73-2.31)
Agitated or disoriented in last 90 days (Ref = No)	0.71 (0.05)	<.0001	2.04 (1.84-2.26)	0.75 (0.05)	<.0001	2.12 (1.90-2.35)
Communication/Hearing/Vision Patterns						
Communication decline (Ref = No)	0.65 (0.04)	<.0001	1.92 (1.78-2.07)	0.64 (0.04)	<.0001	1.89 (1.75-2.05)
Vision decline (Ref = No)	-0.08 (0.06)	0.23	0.93 (0.82-1.05)	0.00 (0.06)	0.99	1.00 (0.88-1.14)
Mood and Behaviour Patterns, Mental Health						
Any psychiatric diagnosis (Ref = 0)	0.17 (0.05)	0.0006	1.18 (1.07-1.30)	0.30 (0.05)	<.0001	1.34 (1.22-1.48)
DRS ≥3 (Ref = 0,1,2)	0.23 (0.04)	<.0001	1.26 (1.17-1.36)	0.26 (0.04)	<.0001	1.30 (1.21-1.41)
Mood decline (Ref = No)	0.24 (0.04)	<.0001	1.27 (1.18-1.37)	0.28 (0.04)	<.0001	1.33 (1.24-1.43)
Wandering problem (Ref = No)						
Exhibited on 1-2 of last 3 days	0.96 (0.08)	<.0001	2.61 (2.23-3.05)	0.94 (0.08)	<.0001	2.56 (2.19-3.00)
Exhibited on each of last 3 days	1.08 (0.14)	<.0001	2.93 (2.25-3.83)	1.03 (0.14)	<.0001	2.80 (2.14-3.68)
Verbally abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	0.73 (0.07)	<.0001	2.07 (1.81-2.36)	0.71 (0.07)	<.0001	2.04 (1.78-2.33)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
Exhibited on each of last 3 days	0.90 (0.11)	<.0001	2.45 (2.00-3.02)	0.84 (0.11)	<.0001	2.32 (1.88-2.86)
Physically abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	1.09 (0.15)	<.0001	2.97 (2.24-3.95)	1.01 (0.15)	<.0001	2.75 (2.06-3.67)
Exhibited on each of last 3 days	1.00 (0.24)	<.0001	2.72 (1.71-4.31)	0.92 (0.24)	0.0001	2.51 (1.57-4.02)
Socially inappropriate/disruptive behaviours (Ref = None)						
Exhibited on 1-2 of last 3 days	0.41 (0.13)	0.0023	1.50 (1.16-1.95)	0.45 (0.14)	0.0008	1.57 (1.21-2.05)
Exhibited on each of last 3 days	0.91 (0.15)	<.0001	2.48 (1.84-3.34)	0.95 (0.16)	<.0001	2.57 (1.90-3.49)
Resists care (Ref = No)						
Exhibited on 1-2 of last 3 days	0.74 (0.07)	<.0001	2.09 (1.84-2.38)	0.70 (0.07)	<.0001	2.02 (1.77-2.30)
Exhibited on each of last 3 days	0.68 (0.08)	<.0001	1.97 (1.68-2.32)	0.68 (0.08)	<.0001	1.97 (1.67-2.33)
Changes in behaviour symptoms (Ref = No)	0.81 (0.05)	<.0001	2.24 (2.05-2.45)	0.85 (0.05)	<.0001	2.34 (2.13-2.57)
Lonely (Ref = No)	-0.05 (0.05)	0.31	0.95 (0.86-1.05)	-0.03 (0.05)	0.62	0.98 (0.88-1.08)
Delusions (Ref = No)	0.97 (0.08)	<.0001	2.63 (2.23-3.10)	0.94 (0.09)	<.0001	2.57 (2.17-3.04)
Hallucinations (Ref = No)	1.00 (0.06)	<.0001	2.71 (2.39-3.08)	1.01 (0.07)	<.0001	2.75 (2.41-3.13)
Physical Functioning						
ADLH ≥3 (Ref = 0,1,2)	0.03 (0.05)	0.55	1.03 (0.94-1.14)	-0.02 (0.05)	0.70	0.98 (0.89-1.08)
IADL-C ≥3 (Ref = 0,1,2)	0.53 (0.05)	<.0001	1.71 (1.56-1.87)	0.37 (0.05)	<.0001	1.45 (1.32-1.59)
ADL decline (Ref = No)	-0.01 (0.03)	0.82	0.99 (0.93-1.06)	-0.07 (0.03)	0.04	0.94 (0.88-1.00)
Functional improvement potential - client perspective (Ref = No)	-0.57 (0.04)	<.0001	0.56 (0.52-0.61)	-0.52 (0.04)	<.0001	0.59 (0.54-0.64)
Functional improvement potential - caregiver perspective (Ref = No)	-0.49 (0.05)	<.0001	0.61 (0.55-0.68)	-0.46 (0.05)	<.0001	0.63 (0.57-0.70)
Good prospects of recovery (Ref = No)	-0.72 (0.07)	<.0001	0.49 (0.43-0.56)	-0.69 (0.07)	<.0001	0.50 (0.44-0.58)
Continence						
Worsening of bladder incontinence (Ref = No)	0.30 (0.04)	<.0001	1.36 (1.25-1.48)	0.24 (0.04)	<.0001	1.27 (1.16-1.38)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
Disease Diagnoses						
Number of diagnoses - collapsed (Ref = 0)						
1	0.25 (0.14)	0.07	1.29 (0.98-1.70)	0.24 (0.14)	0.09	1.28 (0.97-1.68)
2	0.45 (0.14)	0.001	1.57 (1.20-2.05)	0.40 (0.14)	0.004	1.49 (1.14-1.95)
3	0.49 (0.14)	0.0004	1.63 (1.25-2.13)	0.42 (0.14)	0.002	1.53 (1.17-2.00)
4	0.42 (0.14)	0.003	1.52 (1.16-1.98)	0.37 (0.14)	0.007	1.45 (1.11-1.90)
5	0.42 (0.14)	0.003	1.52 (1.15-2.00)	0.40 (0.14)	0.005	1.49 (1.13-1.97)
≥6	0.33 (0.14)	0.02	1.39 (1.06-1.83)	0.35 (0.14)	0.01	1.42 (1.08-1.88)
Cerebrovascular accident (stroke) (Ref = No)	0.02 (0.04)	0.68	1.02 (0.94-1.11)	0.02 (0.04)	0.63	1.02 (0.94-1.11)
Congestive heart failure (Ref = No)	-0.28 (0.05)	<.0001	0.76 (0.68-0.84)	-0.30 (0.05)	<.0001	0.74 (0.67-0.83)
Coronary artery disease (Ref = No)	-0.23 (0.04)	<.0001	0.79 (0.74-0.85)	-0.21 (0.04)	<.0001	0.81 (0.75-0.87)
Hypertension (Ref = No)	-0.06 (0.03)	0.08	0.95 (0.89-1.01)	-0.11 (0.03)	0.0005	0.90 (0.84-0.95)
Irregularly irregular pulse (Ref = No)	-0.17 (0.05)	0.0004	0.84 (0.76-0.93)	-0.17 (0.05)	0.0007	0.84 (0.77-0.93)
Peripheral vascular disease (Ref = No)	-0.55 (0.08)	<.0001	0.58 (0.50-0.67)	-0.36 (0.08)	<.0001	0.70 (0.60-0.81)
Head trauma (Ref = No)	0.25 (0.13)	0.06	1.29 (0.99-1.67)	0.45 (0.13)	0.0008	1.58 (1.21-2.05)
Hemiplegia/hemiparesis (Ref = No)	-0.65 (0.17)	0.0001	0.52 (0.38-0.73)	-0.51 (0.17)	0.003	0.60 (0.43-0.84)
Multiple sclerosis (Ref = No)	-1.15 (0.45)	0.01	0.32 (0.13-0.77)	-0.75 (0.45)	0.10	0.47 (0.19-1.15)
Parkinsonism (Ref = No)	0.55 (0.06)	<.0001	1.73 (1.55-1.92)	0.48 (0.06)	<.0001	1.62 (1.45-1.80)
Arthritis (Ref = No)	-0.09 (0.03)	0.005	0.91 (0.85-0.97)	-0.08 (0.03)	0.02	0.93 (0.87-0.99)
Hip fracture (Ref = No)	-0.38 (0.12)	0.002	0.69 (0.54-0.87)	-0.46 (0.13)	0.0002	0.63 (0.49-0.81)
Other fractures (Ref = No)	-0.14 (0.07)	0.07	0.87 (0.75-1.01)	-0.13 (0.08)	0.08	0.88 (0.76-1.02)
Osteoporosis (Ref = No)	0.29 (0.06)	<.0001	1.34 (1.20-1.50)	0.18 (0.06)	0.002	1.20 (1.07-1.34)
Cataract (Ref = No)	0.10 (0.05)	0.04	1.11 (1.00-1.22)	0.07 (0.05)	0.17	1.07 (0.97-1.18)
Glaucoma (Ref = No)	0.03 (0.07)	0.63	1.03 (0.91-1.18)	-0.01 (0.07)	0.88	0.99 (0.87-1.13)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted *p*-value	Adjusted Odds Ratio (95% CI)
HIV infection (Ref = No)	-1.43 (1.00)	0.15	0.24 (0.03-1.70)	-1.02 (1.01)	0.31	0.36 (0.05-2.61)
Pneumonia (Ref = No)	-0.35 (0.09)	0.0002	0.71 (0.59-0.85)	-0.31 (0.09)	0.001	0.74 (0.61-0.88)
Tuberculosis (Ref = No)	-0.15 (0.51)	0.77	0.86 (0.32-2.36)	-0.09 (0.52)	0.86	0.92 (0.33-2.52)
Urinary tract infection (Ref = No)	0.02 (0.08)	0.81	1.02 (0.87-1.19)	0.02 (0.08)	0.81	1.02 (0.87-1.19)
Cancer (Ref = No)	-0.81 (0.05)	<.0001	0.45 (0.40-0.49)	-0.66 (0.05)	<.0001	0.52 (0.47-0.57)
Diabetes (Ref = No)	-0.13 (0.03)	0.0002	0.88 (0.82-0.94)	-0.11 (0.04)	0.002	0.90 (0.84-0.96)
Emphysema/COPD/asthma (Ref = No)	-0.51 (0.05)	<.0001	0.60 (0.55-0.66)	-0.44 (0.05)	<.0001	0.65 (0.59-0.71)
Renal failure (Ref = No)	-0.29 (0.06)	<.0001	0.75 (0.66-0.84)	-0.33 (0.06)	<.0001	0.72 (0.64-0.81)
Thyroid disease (hyper or hypo) (Ref = No)	0.06 (0.06)	0.28	1.06 (0.95-1.18)	0.05 (0.06)	0.39	1.05 (0.94-1.17)
Health Conditions						
Pain Scale (Ref = 0)						
1	0.01 (0.05)	0.89	1.01 (0.92-1.11)	0.03 (0.05)	0.57	1.03 (0.93-1.13)
2	-0.31 (0.04)	<.0001	0.73 (0.68-0.78)	-0.27 (0.04)	<.0001	0.76 (0.71-0.82)
3	-0.53 (0.06)	<.0001	0.59 (0.52-0.66)	-0.42 (0.06)	<.0001	0.66 (0.58-0.74)
Falls - collapsed (Ref = 0)						
1	0.12 (0.04)	0.003	1.13 (1.04-1.22)	0.06 (0.04)	0.11	1.07 (0.99-1.16)
2	0.30 (0.05)	<.0001	1.35 (1.22-1.49)	0.27 (0.05)	<.0001	1.31 (1.19-1.45)
≥3	0.37 (0.04)	<.0001	1.45 (1.33-1.59)	0.40 (0.05)	<.0001	1.49 (1.36-1.62)
Unsteady gait (Ref = No)	-0.05 (0.03)	0.12	0.95 (0.89-1.01)	-0.10 (0.03)	0.003	0.90 (0.85-0.97)
Poor self-reported health (Ref = No)	-0.39 (0.04)	<.0001	0.68 (0.62-0.74)	-0.35 (0.04)	<.0001	0.71 (0.65-0.77)
Unstable conditions (Ref = No)	0.50 (0.03)	<.0001	1.65 (1.55-1.76)	0.62 (0.03)	<.0001	1.87 (1.75-1.99)
Flare-up of recurrent or chronic condition (Ref = No)	-0.31 (0.05)	<.0001	0.73 (0.66-0.81)	-0.27 (0.05)	<.0001	0.76 (0.69-0.85)
Treatments changed in last 30 days (Ref = No)	-0.38 (0.04)	<.0001	0.69 (0.64-0.74)	-0.32 (0.04)	<.0001	0.73 (0.67-0.78)
Elder Abuse						

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
Abuse CAP (Ref = 0)						
1	-0.02 (0.34)	0.95	0.98 (0.50-1.92)	0.11 (0.35)	0.75	1.12 (0.57-2.21)
2	0.29 (0.14)	0.03	1.34 (1.02-1.76)	0.42 (0.14)	0.003	1.53 (1.16-2.01)
Fearful of family/caregiver (Ref = No)	0.60 (0.27)	0.03	1.81 (1.06-3.09)	0.54 (0.28)	0.05	1.72 (1.00-2.95)
Unusually poor hygiene (Ref = No)	0.15 (0.15)	0.34	1.16 (0.86-1.56)	0.32 (0.16)	0.04	1.38 (1.02-1.88)
Unexplained injuries (Ref = No)	1.24 (0.63)	0.05	3.45 (1.00-11.93)	1.57 (0.66)	0.02	4.80 (1.30-17.65)
Neglected, abused, or mistreated (Ref = No)	0.28 (0.33)	0.40	1.32 (0.69-2.51)	0.42 (0.33)	0.20	1.53 (0.79-2.93)
Physically restrained (Ref = No)	-0.30 (0.39)	0.40	1.32 (0.69-2.51)	-0.27 (0.39)	0.48	0.76 (0.36-1.63)
Service Utilization						
Overall change in care needs (Ref = Improved)						
No change	0.29 (0.09)	0.0009	1.34 (1.13-1.59)	0.26 (0.09)	0.003	1.30 (1.10-1.55)
Deteriorated	0.38 (0.08)	<.0001	1.47 (1.24-1.73)	0.33 (0.09)	0.0001	1.39 (1.17-1.64)
Medications						
≥9 medications (Ref = No)	-0.17 (0.03)	<.0001	0.84 (0.79-0.90)	-0.14 (0.03)	<.0001	0.87 (0.82-0.93)
Other Scales						
CHESS ≥3 (Ref = 0,1,2)	-0.16 (0.04)	<.0001	0.85 (0.79-0.92)	-0.09 (0.04)	0.02	0.92 (0.85-0.99)
MAPLe ≥3 (Ref = 1,2)	1.21 (0.06)	<.0001	3.35 (3.00-3.73)	1.10 (0.06)	<.0001	3.00 (2.69-3.35)
AUA (Ref = 1)						
2	-0.15 (0.29)	0.60	0.86 (0.49-1.52)	-0.09 (0.29)	0.76	0.92 (0.52-1.62)
3	0.18 (0.13)	0.15	1.20 (0.94-1.53)	0.34 (0.13)	0.007	1.41 (1.10-1.80)
4	0.89 (0.08)	<.0001	2.45 (2.09-2.86)	0.80 (0.08)	<.0001	2.22 (1.89-2.59)
5	1.02 (0.08)	<.0001	2.78 (2.36-3.28)	0.89 (0.09)	<.0001	2.43 (2.06-2.87)
6	1.29 (0.08)	<.0001	3.63 (3.12-4.22)	1.20 (0.08)	<.0001	3.31 (2.84-3.86)
DIVERT (Ref = 1)						

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
2	-0.02 (0.06)	0.78	0.99 (0.88-1.10)	-0.03 (0.06)	0.62	0.97 (0.87-1.09)
3	-0.24 (0.06)	<.0001	0.79 (0.70-0.89)	-0.26 (0.06)	<.0001	0.78 (0.69-0.87)
4	-0.38 (0.06)	<.0001	0.68 (0.61-0.77)	-0.36 (0.06)	<.0001	0.70 (0.62-0.78)
5	-0.49 (0.07)	<.0001	0.61 (0.54-0.69)	-0.47 (0.07)	<.0001	0.62 (0.55-0.71)
6	-0.52 (0.07)	<.0001	0.59 (0.51-0.69)	-0.43 (0.07)	<.0001	0.65 (0.56-0.75)

Appendix G

Odds of contact with geriatric medicine in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015: Females (n=117,192)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Predisposing						
Age (Ref = 60-64)						
65-69	0.86 (0.13)	<.0001	2.37 (1.83-3.08)			
70-74	1.40 (0.12)	<.0001	4.04 (3.16-5.15)			
75-79	1.70 (0.12)	<.0001	5.47 (4.31-6.93)			
80-84	1.80 (0.12)	<.0001	6.03 (4.77-7.62)			
85-89	1.72 (0.12)	<.0001	5.61 (4.44-7.10)			
90+	1.40 (0.12)	<.0001	4.07 (3.20-5.18)			
Married (Ref = No)	0.04 (0.03)	0.13	1.04 (0.99-1.10)	0.11 (0.03)	0.0002	1.12 (1.05-1.18)
Lives alone (Ref = No)	-0.16 (0.03)	<.0001	0.86 (0.81-0.90)	-0.13 (0.03)	<.0001	0.87 (0.83-0.92)
Education (Ref = less than high school)						
High school or more	0.04 (0.04)	0.27	1.04 (0.97-1.11)	0.12 (0.04)	0.0012	1.12 (1.05-1.20)
Unknown	0.20 (0.03)	<.0001	1.22 (1.14-1.30)	0.07 (0.03)	0.05	1.07 (1.00-1.15)
Interpreted needed (Ref = No)	0.35 (0.04)	<.0001	1.43 (1.33-1.53)	0.03 (0.04)	0.41	1.03 (0.96-1.11)
Enabling						
Primary caregiver lives with client (Ref = No such helper)						
Yes	0.71 (0.12)	<.0001	2.04 (1.61-2.58)	0.64 (0.12)	<.0001	1.90 (1.50-2.41)
No	0.56 (0.12)	<.0001	1.75 (1.38-2.22)	0.49 (0.12)	<.0001	1.63 (1.28-2.07)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Secondary caregiver lives with client (Ref = No such helper)						
Yes	0.34 (0.04)	<.0001	1.41 (1.30-1.53)	0.23 (0.04)	<.0001	1.26 (1.16-1.37)
No	0.23 (0.03)	<.0001	1.26 (1.19-1.34)	0.22 (0.03)	<.0001	1.24 (1.17-1.32)
Caregiver unable to continue (Ref = No)	0.29 (0.04)	<.0001	1.33 (1.23-1.44)	0.23 (0.04)	<.0001	1.26 (1.16-1.36)
Caregiver not satisfied with support (Ref = No)	0.47 (0.06)	<.0001	1.60 (1.43-1.79)	0.39 (0.06)	<.0001	1.48 (1.33-1.66)
Caregiver distressed (Ref = 0)	0.61 (0.03)	<.0001	1.84 (1.74-1.95)	0.61 (0.03)	<.0001	1.84 (1.74-1.95)
Environment CAP triggered (Ref = Not triggered)	0.02 (0.06)	0.67	1.03 (0.92-1.15)	0.12 (0.06)	0.04	1.12 (1.00-1.26)
Impaired locomotion inside home (Ref = No impairment)	-0.30 (0.08)	<.0001	0.74 (0.64-0.86)	-0.38 (0.08)	<.0001	0.69 (0.59-0.80)
Impaired locomotion outside home (Ref = No impairment)	-0.31 (0.04)	<.0001	0.74 (0.69-0.79)	-0.36 (0.04)	<.0001	0.70 (0.65-0.75)
Lighting environment issue (Ref = No issue)	-0.04 (0.24)	0.87	0.96 (0.61-1.53)	0.03 (0.24)	0.88	1.04 (0.65-1.65)
Flooring and carpeting environment issue (Ref = No issue)	-0.10 (0.08)	0.22	0.91 (0.78-1.06)	0.03 (0.08)	0.67	1.04 (0.89-1.21)
Bathroom and toilet room environment issue (Ref = No issue)	-0.02 (0.07)	0.74	0.98 (0.85-1.12)	0.03 (0.07)	0.63	1.04 (0.90-1.19)
Kitchen environment issue (Ref = No issue)	0.32 (0.18)	0.08	1.37 (0.96-1.97)	0.42 (0.19)	0.03	1.52 (1.05-2.18)
Heating and cooling environment issue (Ref = No issue)	-0.19 (0.27)	0.50	0.83 (0.49-1.42)	0.01 (0.28)	0.98	1.01 (0.59-1.73)
Personal safety issue (Ref = No issue)	0.73 (0.13)	<.0001	2.08 (1.61-2.68)	0.90 (0.13)	<.0001	2.45 (1.89-3.18)
Access to home issue (Ref = No issue)	-0.36 (0.05)	<.0001	0.70 (0.63-0.77)	-0.36 (0.05)	<.0001	0.70 (0.63-0.77)
Access to rooms in home issue (Ref = No issue)	-0.31 (0.05)	<.0001	0.73 (0.67-0.81)	-0.35 (0.05)	<.0001	0.71 (0.65-0.78)
Any home environment issues (Ref = None)	-0.22 (0.03)	<.0001	0.80 (0.75-0.86)	-0.20 (0.03)	<.0001	0.82 (0.76-0.87)
Economic trade-offs made (Ref = No)	-0.24 (0.13)	0.06	0.79 (0.61-1.01)	0.03 (0.13)	0.84	1.03 (0.80-1.32)
Need						
Cognition						
Alzheimer's (Ref = No)	1.27 (0.04)	<.0001	3.58 (3.33-3.84)	1.17 (0.04)	<.0001	3.24 (3.01-3.48)
Dementia other than Alzheimer's disease (Ref = No)	1.10 (0.03)	<.0001	3.01 (2.84-3.18)	1.07 (0.03)	<.0001	2.90 (2.74-3.08)

Variable	Unadjusted			Adjusted for LHIN, age, sex		
	Estimate (Standard Error)	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
CPS ≥3 (Ref = 0,1,2)	0.88 (0.04)	<.0001	2.40 (2.24-2.58)	0.83 (0.04)	<.0001	2.29 (2.13-2.46)
Short-term memory problem (Ref = Ok)	1.34 (0.03)	<.0001	3.81 (3.58-4.06)	1.30 (0.03)	<.0001	3.68 (3.45-3.93)
Procedural memory problem (Ref = Ok)	0.98 (0.03)	<.0001	2.67 (2.53-2.82)	0.96 (0.03)	<.0001	2.60 (2.46-2.75)
Cognitive skills for daily decision-making (Ref = Independent)						
Modified independence	0.90 (0.04)	<.0001	2.47 (2.30-2.65)	0.86 (0.04)	<.0001	2.37 (2.21-2.55)
Minimally impaired	1.46 (0.04)	<.0001	4.29 (3.98-4.62)	1.43 (0.04)	<.0001	4.20 (3.89-4.53)
Moderately impaired	1.57 (0.05)	<.0001	4.82 (4.40-5.27)	1.53 (0.05)	<.0001	4.61 (4.20-5.05)
Severely impaired	1.49 (0.07)	<.0001	4.42 (3.83-5.10)	1.42 (0.07)	<.0001	4.15 (3.59-4.80)
Worsening of decision-making (Ref = No)	0.94 (0.03)	<.0001	2.56 (2.43-2.71)	0.92 (0.03)	<.0001	2.50 (2.37-2.65)
Sudden or new onset/change in mental function over last 7 days (Ref = No)	0.79 (0.06)	<.0001	2.19 (1.94-2.49)	0.80 (0.06)	<.0001	2.23 (1.96-2.53)
Agitated or disoriented in last 90 days (Ref = No)	0.82 (0.05)	<.0001	2.26 (2.07-2.48)	0.83 (0.05)	<.0001	2.29 (2.08-2.51)
Communication/Hearing/Vision Patterns						
Communication decline (Ref = No)	0.61 (0.04)	<.0001	1.84 (1.71-1.97)	0.60 (0.04)	<.0001	1.82 (1.70-1.96)
Vision decline (Ref = No)	-0.19 (0.06)	0.0004	0.82 (0.74-0.92)	-0.11 (0.06)	0.06	0.90 (0.81-1.00)
Mood and Behaviour Patterns, Mental Health						
Any psychiatric diagnosis (Ref = 0)	0.23 (0.04)	<.0001	1.25 (1.17-1.34)	0.36 (0.04)	<.0001	1.43 (1.33-1.53)
DRS ≥3 (Ref = 0,1,2)	0.34 (0.03)	<.0001	1.41 (1.33-1.49)	0.37 (0.03)	<.0001	1.45 (1.37-1.54)
Mood decline (Ref = No)	0.28 (0.03)	<.0001	1.33 (1.25-1.41)	0.32 (0.03)	<.0001	1.38 (1.30-1.47)
Wandering problem (Ref = No)						
Exhibited on 1-2 of last 3 days	1.08 (0.07)	<.0001	2.94 (2.56-3.39)	1.04 (0.07)	<.0001	2.82 (2.44-3.26)
Exhibited on each of last 3 days	1.07 (0.13)	<.0001	2.91 (2.24-3.77)	1.04 (0.13)	<.0001	2.83 (2.18-3.69)
Verbally abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	0.86 (0.07)	<.0001	2.36 (2.06-2.71)	0.83 (0.07)	<.0001	2.29 (1.99-2.63)

Variable	Unadjusted: Estimate (Standard Error)	Unadjusted: *p*-value	Unadjusted: Odds Ratio (95% CI)	Adjusted for LHIN, age, sex: Estimate (Standard Error)	Adjusted for LHIN, age, sex: *p*-value	Adjusted for LHIN, age, sex: Odds Ratio (95% CI)
Exhibited on each of last 3 days	1.15 (0.10)	<.0001	3.16 (2.62-3.82)	1.12 (0.10)	<.0001	3.06 (2.52-3.71)
Physically abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	1.12 (0.13)	<.0001	3.06 (2.39-3.93)	1.06 (0.13)	<.0001	2.89 (2.24-3.73)
Exhibited on each of last 3 days	0.89 (0.23)	<.0001	2.43 (1.56-3.80)	0.88 (0.23)	0.0001	2.41 (1.53-3.78)
Socially inappropriate/disruptive behaviours (Ref = None)						
Exhibited on 1-2 of last 3 days	0.79 (0.11)	<.0001	2.20 (1.76-2.75)	0.75 (0.12)	<.0001	2.12 (1.69-2.66)
Exhibited on each of last 3 days	0.82 (0.14)	<.0001	2.26 (1.71-2.99)	0.84 (0.15)	<.0001	2.32 (1.75-3.09)
Resists care (Ref = No)						
Exhibited on 1-2 of last 3 days	0.87 (0.06)	<.0001	2.39 (2.14-2.67)	0.80 (0.06)	<.0001	2.23 (1.99-2.50)
Exhibited on each of last 3 days	0.85 (0.07)	<.0001	2.33 (2.04-2.66)	0.85 (0.07)	<.0001	2.34 (2.04-2.67)
Changes in behaviour symptoms (Ref = No)	0.85 (0.04)	<.0001	2.34 (2.16-2.54)	0.88 (0.04)	<.0001	2.41 (2.21-2.61)
Lonely (Ref = No)	0.11 (0.04)	0.003	1.11 (1.04-1.19)	0.12 (0.04)	0.001	1.12 (1.05-1.21)
Delusions (Ref = No)	0.97 (0.07)	<.0001	2.65 (2.31-3.03)	0.95 (0.07)	<.0001	2.58 (2.25-2.97)
Hallucinations (Ref = No)	0.97 (0.06)	<.0001	2.64 (2.35-2.96)	0.92 (0.06)	<.0001	2.52 (2.24-2.83)
Physical Functioning						
ADLH ≥3 (Ref = 0,1,2)	-0.11 (0.05)	0.028	0.90 (0.82-0.99)	-0.16 (0.05)	0.001	0.85 (0.78-0.94)
IADL-C ≥3 (Ref = 0,1,2)	0.20 (0.03)	<.0001	1.22 (1.14-1.30)	0.10 (0.03)	0.004	1.10 (1.03-1.18)
ADL decline (Ref = No)	-0.18 (0.03)	<.0001	0.84 (0.79-0.89)	-0.22 (0.03)	<.0001	0.81 (0.76-0.85)
Functional improvement potential - client perspective (Ref = No)	-0.66 (0.04)	<.0001	0.52 (0.48-0.55)	-0.62 (0.04)	<.0001	0.54 (0.50-0.58)
Functional improvement potential - caregiver perspective (Ref = No)	-0.53 (0.05)	<.0001	0.59 (0.54-0.64)	-0.53 (0.05)	<.0001	0.59 (0.54-0.65)
Good prospects of recovery (Ref = No)	-0.86 (0.06)	<.0001	0.43 (0.38-0.48)	-0.84 (0.06)	<.0001	0.43 (0.39-0.48)
Continence						
Worsening of bladder incontinence (Ref = No)	0.13 (0.04)	0.0006	1.14 (1.06-1.23)	0.09 (0.04)	0.02	1.10 (1.02-1.18)

Variable	Unadjusted: Estimate (Standard Error)	Unadjusted: *p*-value	Unadjusted: Odds Ratio (95% CI)	Adjusted for LHIN, age, sex: Estimate (Standard Error)	Adjusted for LHIN, age, sex: *p*-value	Adjusted for LHIN, age, sex: Odds Ratio (95% CI)
Disease Diagnoses						
Number of diagnoses - collapsed (Ref = 0)						
1	0.16 (0.14)	0.26	1.17 (0.89-1.53)	0.13 (0.14)	0.34	1.14 (0.87-1.50)
2	0.15 (0.13)	0.27	1.16 (0.89-1.51)	0.09 (0.14)	0.53	1.09 (0.84-1.42)
3	0.15 (0.13)	0.28	1.16 (0.89-1.50)	0.07 (0.13)	0.58	1.08 (0.83-1.40)
4	0.19 (0.13)	0.16	1.21 (0.93-1.57)	0.12 (0.14)	0.40	1.12 (0.86-1.46)
5	0.16 (0.14)	0.24	1.17 (0.90-1.53)	0.11 (0.14)	0.42	1.12 (0.86-1.46)
≥6	0.11 (0.14)	0.43	1.11 (0.85-1.45)	0.10 (0.14)	0.47	1.10 (0.84-1.44)
Cerebrovascular accident (stroke) (Ref = No)	-0.06 (0.04)	0.19	0.95 (0.87-1.03)	-0.04 (0.04)	0.35	0.96 (0.88-1.05)
Congestive heart failure (Ref = No)	-0.24 (0.05)	<.0001	0.78 (0.71-0.86)	-0.23 (0.05)	<.0001	0.79 (0.72-0.87)
Coronary artery disease (Ref = No)	-0.25 (0.04)	<.0001	0.78 (0.72-0.84)	-0.21 (0.04)	<.0001	0.81 (0.75-0.87)
Hypertension (Ref = No)	-0.08 (0.03)	0.004	0.92 (0.88-0.98)	-0.15 (0.03)	<.0001	0.87 (0.82-0.91)
Irregularly irregular pulse (Ref = No)	-0.13 (0.05)	0.003	0.87 (0.80-0.96)	-0.13 (0.05)	0.004	0.88 (0.80-0.96)
Peripheral vascular disease (Ref = No)	-0.41 (0.08)	<.0001	0.66 (0.57-0.77)	-0.26 (0.08)	0.001	0.77 (0.66-0.90)
Head trauma (Ref = No)	0.09 (0.15)	0.55	1.09 (0.81-1.47)	0.25 (0.15)	0.11	1.28 (0.95-1.73)
Hemiplegia/hemiparesis (Ref = No)	-0.96 (0.23)	<.0001	0.38 (0.24-0.60)	-0.78 (0.23)	0.0008	0.46 (0.29-0.72)
Multiple sclerosis (Ref = No)	-1.17 (0.34)	0.0005	0.31 (0.16-0.60)	-0.77 (0.34)	0.02	0.46 (0.24-0.90)
Parkinsonism (Ref = No)	0.27 (0.08)	0.0006	1.31 (1.12-1.52)	0.23 (0.08)	0.0033	1.26 (1.08-1.48)
Arthritis (Ref = No)	-0.25 (0.03)	<.0001	0.78 (0.74-0.82)	-0.26 (0.03)	<.0001	0.77 (0.73-0.82)
Hip fracture (Ref = No)	-0.34 (0.08)	<.0001	0.71 (0.61-0.83)	-0.42 (0.08)	<.0001	0.66 (0.57-0.77)
Other fractures (Ref = No)	-0.26 (0.05)	<.0001	0.78 (0.70-0.85)	-0.29 (0.05)	<.0001	0.75 (0.68-0.83)
Osteoporosis (Ref = No)	0.18 (0.03)	<.0001	1.20 (1.13-1.27)	0.08 (0.03)	0.01	1.08 (1.02-1.14)
Cataract (Ref = No)	-0.05 (0.04)	0.21	0.95 (0.87-1.03)	-0.08 (0.04)	0.06	0.92 (0.85-1.00)
Glaucoma (Ref = No)	-0.02 (0.05)	0.64	0.98 (0.88-1.08)	-0.05 (0.05)	0.34	0.95 (0.86-1.06)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted *p*-value	Adjusted Odds Ratio (95% CI)
HIV infection (Ref = No)	0.18 (0.60)	0.76	1.20 (0.37-3.85)	0.52 (0.61)	0.39	1.68 (0.51-5.49)
Pneumonia (Ref = No)	-0.47 (0.10)	<.0001	0.63 (0.52-0.76)	-0.41 (0.10)	<.0001	0.67 (0.55-0.81)
Tuberculosis (Ref = No)	-0.65 (0.59)	0.27	0.52 (0.17-1.65)	-0.67 (0.59)	0.25	0.51 (0.16-1.62)
Urinary tract infection (Ref = No)	0.02 (0.06)	0.76	1.02 (0.91-1.13)	0.06 (0.06)	0.30	1.06 (0.95-1.18)
Cancer (Ref = No)	-0.82 (0.05)	<.0001	0.44 (0.40-0.49)	-0.64 (0.05)	<.0001	0.53 (0.47-0.59)
Diabetes (Ref = No)	-0.14 (0.03)	<.0001	0.87 (0.82-0.93)	-0.12 (0.03)	0.0003	0.89 (0.83-0.95)
Emphysema/COPD/asthma (Ref = No)	-0.45 (0.04)	<.0001	0.64 (0.59-0.69)	-0.34 (0.04)	<.0001	0.71 (0.66-0.78)
Renal failure (Ref = No)	-0.37 (0.07)	<.0001	0.69 (0.61-0.80)	-0.33 (0.07)	<.0001	0.72 (0.63-0.82)
Thyroid disease (hyper or hypo) (Ref = No)	-0.07 (0.03)	0.04	0.93 (0.87-1.00)	-0.06 (0.04)	0.11	0.95 (0.88-1.01)
Health Conditions						
Pain Scale (Ref = 0)						
1	-0.05 (0.04)	0.29	0.96 (0.88-1.04)	-0.05 (0.04)	0.23	0.95 (0.87-1.03)
2	-0.38 (0.03)	<.0001	0.68 (0.64-0.72)	-0.39 (0.03)	<.0001	0.67 (0.63-0.72)
3	-0.60 (0.05)	<.0001	0.55 (0.50-0.60)	-0.58 (0.05)	<.0001	0.56 (0.51-0.61)
Falls - collapsed (Ref = 0)						
1	0.02 (0.03)	0.58	1.02 (0.96-1.09)	-0.02 (0.03)	0.47	0.98 (0.92-1.04)
2	0.11 (0.05)	0.02	1.12 (1.02-1.23)	0.11 (0.05)	0.03	1.11 (1.01-1.22)
≥3	0.33 (0.04)	<.0001	1.39 (1.27-1.52)	0.38 (0.05)	<.0001	1.47 (1.35-1.61)
Unsteady gait (Ref = No)	-0.17 (0.03)	<.0001	0.84 (0.80-0.89)	-0.20 (0.03)	<.0001	0.82 (0.78-0.87)
Poor self-reported health (Ref = No)	-0.28 (0.04)	<.0001	0.76 (0.70-0.81)	-0.26 (0.04)	<.0001	0.77 (0.72-0.83)
Unstable conditions (Ref = No)	0.52 (0.03)	<.0001	1.68 (1.59-1.77)	0.65 (0.03)	<.0001	1.92 (1.82-2.03)
Flare-up of recurrent or chronic condition (Ref = No)	-0.29 (0.05)	<.0001	0.75 (0.68-0.82)	-0.23 (0.05)	<.0001	0.80 (0.73-0.87)
Treatments changed in last 30 days (Ref = No)	-0.37 (0.03)	<.0001	0.69 (0.65-0.74)	-0.31 (0.04)	<.0001	0.73 (0.68-0.78)
Elder Abuse						

Variable	Unadjusted			Adjusted for LHIN, age, sex		
	Estimate (Standard Error)	*p*-value	Odds Ratio (95% CI)	Estimate (Standard Error)	*p*-value	Odds Ratio (95% CI)
Abuse CAP (Ref = 0)						
1	0.25 (0.31)	0.42	1.28 (0.70-2.36)	0.38 (0.32)	0.23	1.46 (0.79-2.71)
2	0.36 (0.12)	0.004	1.43 (1.12-1.81)	0.47 (0.12)	0.0002	1.59 (1.25-2.03)
Fearful of family/caregiver (Ref = No)	0.23 (0.20)	0.24	1.26 (0.86-1.85)	0.27 (0.20)	0.17	1.31 (0.89-1.93)
Unusually poor hygiene (Ref = No)	0.51 (0.15)	0.0009	1.66 (1.23-2.24)	0.67 (0.15)	<.0001	1.95 (1.44-2.64)
Unexplained injuries (Ref = No)	-0.02 (0.73)	0.98	0.98 (0.24-4.07)	-0.05 (0.73)	0.95	0.95 (0.23-4.00)
Neglected, abused, or mistreated (Ref = No)	0.15 (0.24)	0.53	1.17 (0.72-1.88)	0.25 (0.25)	0.30	1.29 (0.80-2.09)
Physically restrained (Ref = No)	-0.75 (0.45)	0.10	0.47 (0.20-1.15)	-0.76 (0.45)	0.10	0.47 (0.19-1.14)
Service Utilization						
Overall change in care needs (Ref = Improved)						
No change	0.61 (0.08)	<.0001	1.83 (1.56-2.16)	0.57 (0.08)	<.0001	1.77 (1.50-2.09)
Deteriorated	0.63 (0.08)	<.0001	1.88 (1.60-2.20)	0.58 (0.08)	<.0001	1.78 (1.52-2.09)
Medications						
≥9 medications (Ref = No)	-0.21 (0.03)	<.0001	0.81 (0.77-0.86)	-0.15 (0.03)	<.0001	0.86 (0.81-0.91)
Other Scales						
CHESS ≥3 (Ref = 0,1,2)	-0.03 (0.03)	0.30	0.97 (0.91-1.03)	0.04 (0.03)	0.27	1.04 (0.97-1.11)
MAPLe ≥3 (Ref = 1,2)	1.00 (0.04)	<.0001	2.71 (2.50-2.93)	0.93 (0.04)	<.0001	2.54 (2.34-2.75)
AUA (Ref = 1)						
2	-0.27 (0.24)	0.25	0.76 (0.48-1.22)	-0.24 (0.24)	0.32	0.79 (0.49-1.27)
3	0.07 (0.11)	0.54	1.07 (0.86-1.32)	0.25 (0.11)	0.02	1.28 (1.03-1.59)
4	0.50 (0.07)	<.0001	1.65 (1.45-1.87)	0.45 (0.07)	<.0001	1.56 (1.37-1.78)
5	0.55 (0.07)	<.0001	1.73 (1.50-2.00)	0.44 (0.07)	<.0001	1.56 (1.35-1.80)
6	0.91 (0.06)	<.0001	2.48 (2.18-2.81)	0.87 (0.06)	<.0001	2.38 (2.09-2.70)
DIVERT (Ref = 1)						

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
2	-0.24 (0.05)	<.0001	0.79 (0.72-0.86)	-0.24 (0.05)	<.0001	0.78 (0.72-0.86)
3	-0.40 (0.05)	<.0001	0.67 (0.61-0.74)	-0.42 (0.05)	<.0001	0.66 (0.60-0.73)
4	-0.44 (0.05)	<.0001	0.65 (0.59-0.71)	-0.41 (0.05)	<.0001	0.66 (0.60-0.73)
5	-0.52 (0.06)	<.0001	0.59 (0.53-0.66)	-0.47 (0.06)	<.0001	0.62 (0.56-0.70)
6	-0.55 (0.07)	<.0001	0.58 (0.51-0.66)	-0.43 (0.07)	<.0001	0.65 (0.57-0.74)

Appendix H

Summary of literature review: Determinants of frequent use of outpatient physician services by community-dwelling older adults

Study	Sample	Design	Dependent variable	Determinants Tested (Italic = Independent variable of interest) (Bold = Significant Effect)		
				Predisposing	**Enabling**	**Need**
Freeborn et al., 1990 US	N=501 Members ≥65 years old continuously enrolled in HMO for 6 years	Cross-sectional Medical record information, mail survey Multivariate discriminant analysis	Top tertile of ambulatory care contacts each year	• **Older age** • Sex (female) • Education • Marital status • Perceived social class	• Income • **Patient satisfaction** • **Regular physician**	• **Number and type of reported physical and mental health conditions** • **Poor perceived health status**
Gilleard et al., 1998 UK	N=919 Older patients (≥65) registered in primary care practice	Cross-sectional Computerized medical records, interviews, postal survey	Top 10% in previous 12 months (>15 contacts with primary care)	• Age • Gender • Ethnicity • Occupational status		• Psychiatric morbidity • Self-reported depression • Use of hypnotic, antipsychotic medication

Study	Sample	Design	Dependent variable	**Determinants Tested** **(Italic = Independent variable of interest)** **(Bold = Significant Effect)**		
Hajek et al., 2018 Germany	N=1049 Non-institutionalized individuals (≥40)	Longitudinal study Interviews Conditional fixed effects logistic regression	≥6 visits to GP in past year ≥6 visits to specialist in past year	• **Age** • Gender • Marital status • Occupational status	• Household net income	• Depression • Loneliness • **Number of physical illnesses** • **Physical functioning** • **Self-rated health**
Hand et al., 2014 Canada	N=40 Frequent attenders at primary care practice (≥70)	Cross-sectional Questionnaire Regression analysis	≥12 primary care appointments in previous year	• Age • Sex • Education • Marital status • Living situation • *Social isolation*	• Income	• Chronic conditions • Depression • Function • Incontinence • Self-reported health status • Vision or hearing problems
Menchetti et al., 2006 Italy	N=606 Older primary care patients (≥60)	Cross-sectional Clinical judgment, medical charts Logistic regression	>1 contact to GP per month in 6 months	• Age • Gender • Civil status • Occupation		• ***Depression*** • **Moderate or severe physical illness** • **Unexplained somatic symptoms**

Study	Sample	Design	Dependent variable	**Determinants Tested** **(Italic = Independent variable of interest)** **(Bold = Significant Effect)**		
Press et al, 2012 Israel	N=180 Primary care patients, community-dwelling, aged ≥65	Cross-sectional Interviews, medical record Logistic regression	≥16 visits to FP per year	• Age • Gender • Education • Lives alone • Marital status • Place of birth	• No caregiver	• **Comorbidity** • **Depressive symptomatology (Geriatric Depression Scale)** • Functional status • **Memory complaints**
Rennemark et al., 2009 Sweden	N=643 Patients (≥60) Registered with Swedish National Study on Aging and Care	Cross-sectional Questionnaires, cognitive tests, medical records Hierarchical logistic regression	Top 30% most frequent attenders to primary health care (≥3 contacts in 12 months)	• Age • Gender • Education level • ***Internal locus of control*** • ***Sense of coherence*** • *Social anchorage*		• Functional ability • **Physical comorbidity**
Scherer et al., 2008 Germany	N=310 General practice network patients with diagnosis of	Cohort study Questionnaires, interviews	>17 primary health care contacts in 9 months	• **Female sex** • **Living alone** • Social support		• *Anxiety* • *Depression* • *Disease coping* • *Psychological distress* • Quality of life

Study	**Sample**	**Design**	**Dependent variable**	**Determinants Tested** **(Italic = Independent variable of interest)** **(Bold = Significant Effect)**		
	heart failure (mean age = 72.9, SD 9)	Logistic regression				• **Physical problems** • Severity of heart failure
Sheehan et al., 2003 Ireland	N=140 Primary care attenders (≥65), attending at home or at centre	Cross-sectional Patient interview, medical records, clinical judgment Chi square statistics, multiple linear regression analysis	Top tertile of contact with GP in 9 months	• Age • Gender • Previous occupation • **Low social support**		• Depression • **Physical disorder** • Prescriptions • **Somatic symptom reporting**
Van den Bussche et al., 2016 Germany	N=123,224 Patients (≥65) registered with insurance company	Cross-sectional Insurance claims data, medical records data	≥50 contacts with physician practices in 12 months (14.2% of sample)	• **Higher age** • **Gender**		• **Dependency on nursing care** • **High impact somatic diseases** • **Multi-morbidity**

Study	**Sample**	**Design**	**Dependent variable**	**Determinants Tested** **(Italic = Independent variable of interest)** **(Bold = Significant Effect)**
FP: family practice; *GP*: general practice; *HMO*: health maintenance organization; *SD*: standard deviation; *UK*: United Kingdom; *US*: United States				

Appendix I

Odds of frequent attendance in the 90 days post-assessment by older, long-stay home care clients, Ontario, 2012-2015 (n=196,444)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Predisposing						
Female sex (Ref = Male)	-0.36 (0.01)	<.0001	0.70 (0.68-0.72)			
Age (Ref = 60-64)						
65-69	-0.13 (0.03)	<.0001	0.88 (0.83-0.94)			
70-74	-0.29 (0.03)	<.0001	0.75 (0.71-0.79)			
75-79	-0.48 (0.03)	<.0001	0.62 (0.58-0.65)			
80-84	-0.69 (0.03)	<.0001	0.50 (0.48-0.53)			
85-89	-0.94 (0.03)	<.0001	0.39 (0.37-0.42)			
≥90	-1.28 (0.04)	<.0001	0.28 (0.26-0.30)			
Married (Ref = No)	0.41 (0.01)	<.0001	1.51 (1.47-1.56)	0.24 (0.02)	<.0001	1.27 (1.24-1.31)
Lives alone (Ref = No)	-0.23 (0.02)	<.0001	0.79 (0.77-0.82)	-0.09 (0.02)	<.0001	0.92 (0.89-0.95)
Education (Ref = less than high school)						
High school or more	0.37 (0.02)	<.0001	1.45 (1.40-1.51)	0.25 (0.02)	<.0001	1.29 (1.24-1.33)
Unknown	0.36 (0.02)	<.0001	1.44 (1.39-1.49)	0.23 (0.02)	<.0001	1.25 (1.21-1.30)
Interpreted needed (Ref = No)	-0.23 (0.02)	<.0001	0.79 (0.76-0.83)	-0.32 (0.03)	<.0001	0.73 (0.69-0.77)
Enabling						
Primary caregiver lives with client (Ref = No such helper)						
Yes	-0.02 (0.04)	0.67	0.98 (0.90-1.07)	0.15 (0.05)	0.0007	1.17 (1.07-1.27)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
No	-0.28 (0.05)	<.0001	0.76 (0.69-0.83)	0.08 (0.05)	0.09	1.08 (0.99-1.18)
Secondary caregiver lives with client (Ref = No such helper)						
Yes	-0.22 (0.02)	<.0001	0.80 (0.77-0.84)	-0.17 (0.02)	<.0001	0.85 (0.81-0.89)
No	-0.19 (0.02)	<.0001	0.83 (0.80-0.85)	0.00 (0.02)	0.87	1.00 (0.97-1.03)
Caregiver unable to continue (Ref = No)	-0.13 (0.02)	<.0001	0.88 (0.84-0.92)	-0.12 (0.02)	<.0001	0.89 (0.85-0.93)
Caregiver not satisfied with support (Ref = No)	-0.34 (0.04)	<.0001	0.72 (0.66-0.78)	-0.30 (0.04)	<.0001	0.74 (0.68-0.80)
Caregiver distressed (Ref = 0)	-0.23 (0.02)	<.0001	0.79 (0.77-0.82)	-0.21 (0.02)	<.0001	0.81 (0.78-0.84)
Impaired locomotion inside home (Ref = No impairment)	-0.22 (0.04)	<.0001	0.80 (0.74-0.87)	-0.24 (0.04)	<.0001	0.79 (0.73-0.85)
Impaired locomotion outside home (Ref = No impairment)	-0.17 (0.02)	<.0001	0.84 (0.81-0.88)	-0.15 (0.02)	<.0001	0.86 (0.83-0.90)
Environment CAP triggered (Ref = Not triggered)	-0.32 (0.03)	<.0001	0.73 (0.68-0.78)	-0.30 (0.03)	<.0001	0.74 (0.70-0.79)
Lighting environment issue (Ref = No issue)	-0.24 (0.12)	0.05	0.78 (0.62-1.00)	-0.37 (0.13)	0.003	0.69 (0.54-0.88)
Flooring and carpeting environment issue (Ref = No issue)	-0.38 (0.05)	<.0001	0.68 (0.63-0.75)	-0.32 (0.05)	<.0001	0.73 (0.67-0.80)
Bathroom and toilet room environment issue (Ref = No issue)	-0.30 (0.04)	<.0001	0.74 (0.69-0.81)	-0.28 (0.04)	<.0001	0.76 (0.70-0.82)
Kitchen environment issue (Ref = No issue)	-0.58 (0.13)	<.0001	0.56 (0.43-0.72)	-0.73 (0.13)	<.0001	0.48 (0.37-0.63)
Heating and cooling environment issue (Ref = No issue)	-0.65 (0.16)	<.0001	0.52 (0.38-0.72)	-0.71 (0.16)	<.0001	0.49 (0.36-0.68)
Personal safety issue (Ref = No issue)	-0.85 (0.13)	<.0001	0.43 (0.33-0.55)	-0.87 (0.13)	<.0001	0.42 (0.32-0.55)
Access to home issue (Ref = No issue)	-0.09 (0.02)	<.0001	0.91 (0.87-0.95)	-0.12 (0.02)	<.0001	0.89 (0.85-0.93)
Access to rooms in home issue (Ref = No issue)	-0.03 (0.02)	0.12	0.97 (0.93-1.01)	-0.06 (0.02)	0.008	0.94 (0.90-0.98)
Any home environment issues (Ref = None)	-0.15 (0.02)	<.0001	0.86 (0.83-0.89)	-0.15 (0.02)	<.0001	0.86 (0.83-0.89)
Economic trade-offs made (Ref = No)	-0.08 (0.06)	0.18	0.92 (0.82-1.04)	-0.32 (0.06)	<.0001	0.72 (0.64-0.81)
Need						
Cognition						

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Alzheimer's (Ref = No)	-1.18 (0.05)	<.0001	0.31 (0.28-0.34)	-1.16 (0.05)	<.0001	0.31 (0.29-0.34)
Dementia other than Alzheimer's disease (Ref = No)	-0.99 (0.03)	<.0001	0.37 (0.35-0.39)	-0.89 (0.03)	<.0001	0.41 (0.39-0.44)
CPS ≥3(Ref = 0,1,2)	-0.91 (0.03)	<.0001	0.40 (0.38-0.43)	-0.88 (0.03)	<.0001	0.41 (0.39-0.44)
Short-term memory problem (Ref = Ok)	-0.63 (0.01)	<.0001	0.53 (0.52-0.55)	-0.55 (0.02)	<.0001	0.58 (0.56-0.59)
Procedural memory problem (Ref = Ok)	-0.76 (0.02)	<.0001	0.47 (0.45-0.49)	-0.71 (0.02)	<.0001	0.49 (0.47-0.51)
Cognitive skills for daily decision-making (Ref = Independent)						
Modified independence	-0.39 (0.02)	<.0001	0.68 (0.65-0.70)	-0.31 (0.02)	<.0001	0.73 (0.71-0.76)
Minimally impaired	-0.80 (0.02)	<.0001	0.45 (0.43-0.47)	-0.72 (0.02)	<.0001	0.49 (0.46-0.51)
Moderately impaired	-1.11 (0.04)	<.0001	0.33 (0.30-0.35)	-1.05 (0.04)	<.0001	0.35 (0.32-0.38)
Severely impaired	-1.26 (0.07)	<.0001	0.29 (0.25-0.33)	-1.21 (0.07)	<.0001	0.30 (0.26-0.34)
Worsening of decision-making (Ref = No)	-0.44 (0.02)	<.0001	0.65 (0.62-0.67)	-0.37 (0.02)	<.0001	0.69 (0.67-0.72)
Sudden or new onset/change in mental function over last 7 days (Ref = No)	-0.07 (0.05)	0.10	0.93 (0.85-1.02)	-0.05 (0.05)	0.30	0.95 (0.87-1.04)
Agitated or disoriented in last 90 days (Ref = No)	-0.34 (0.04)	<.0001	0.71 (0.66-0.77)	-0.30 (0.04)	<.0001	0.74 (0.69-0.79)
Communication/Hearing/Vision Patterns						
Communication decline (Ref = No)	-0.36 (0.02)	<.0001	0.70 (0.66-0.73)	-0.32 (0.03)	<.0001	0.73 (0.69-0.76)
Vision decline (Ref = No)	0.11 (0.03)	<.0001	1.12 (1.07-1.18)	0.19 (0.03)	<.0001	1.21 (1.14-1.27)
Mood and Behaviour Patterns, Mental Health						
Any psychiatric diagnosis (Ref = 0)	-0.01 (0.02)	0.49	0.99 (0.95-1.03)	-0.10 (0.02)	<.0001	0.90 (0.86-0.94)
DRS ≥3 (Ref = 0,1,2)	0.17 (0.02)	<.0001	1.18 (1.14-1.22)	0.10 (0.02)	<.0001	1.11 (1.07-1.15)
Mood decline (Ref = No)	0.28 (0.02)	<.0001	1.33 (1.28-1.37)	0.25 (0.02)	<.0001	1.29 (1.25-1.33)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
Wandering problem (Ref = No)						
Exhibited on 1-2 of last 3 days	-1.00 (0.08)	<.0001	0.37 (0.31-0.43)	-1.00 (0.08)	<.0001	0.37 (0.31-0.44)
Exhibited on each of last 3 days	-0.98 (0.15)	<.0001	0.37 (0.28-0.50)	-1.02 (0.15)	<.0001	0.36 (0.27-0.49)
Verbally abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	-0.65 (0.06)	<.0001	0.52 (0.46-0.58)	-0.70 (0.06)	<.0001	0.50 (0.44-0.56)
Exhibited on each of last 3 days	-0.47 (0.09)	<.0001	0.63 (0.53-0.74)	-0.48 (0.09)	<.0001	0.62 (0.52-0.74)
Physically abusive behavioural symptoms (Ref = None)						
Exhibited on 1-2 of last 3 days	-0.70 (0.14)	<.0001	0.50 (0.38-0.65)	-0.70 (0.14)	<.0001	0.50 (0.38-0.66)
Exhibited on each of last 3 days	-0.35 (0.19)	0.07	0.71 (0.49-1.03)	-0.35 (0.19)	0.07	0.71 (0.49-1.03)
Socially inappropriate/disruptive behaviours (Ref = None)						
Exhibited on 1-2 of last 3 days	-0.91 (0.11)	<.0001	0.40 (0.32-0.50)	-0.89 (0.11)	<.0001	0.41 (0.33-0.51)
Exhibited on each of last 3 days	-0.73 (0.14)	<.0001	0.48 (0.37-0.64)	-0.69 (0.14)	<.0001	0.50 (0.38-0.66)
Resists care (Ref = No)						
Exhibited on 1-2 of last 3 days	-0.74 (0.05)	<.0001	0.48 (0.43-0.53)	-0.69 (0.05)	<.0001	0.50 (0.45-0.56)
Exhibited on each of last 3 days	-0.83 (0.07)	<.0001	0.44 (0.38-0.50)	-0.75 (0.07)	<.0001	0.47 (0.41-0.54)
Changes in behaviour symptoms (Ref = No)						
Lonely (Ref = No)	-0.21 (0.02)	<.0001	0.81 (0.78-0.85)	-0.17 (0.02)	<.0001	0.84 (0.81-0.88)
Delusions (Ref = No)	-0.66 (0.07)	<.0001	0.52 (0.45-0.59)	-0.63 (0.07)	<.0001	0.53 (0.46-0.61)
Hallucinations (Ref = No)	-0.59 (0.06)	<.0001	0.55 (0.50-0.62)	-0.58 (0.06)	<.0001	0.56 (0.50-0.62)
Physical Functioning						
ADLH $\geq$3 (Ref = 0,1,2)	-0.11 (0.02)	<.0001	0.90 (0.86-0.94)	-0.15 (0.02)	<.0001	0.86 (0.82-0.91)

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted *p*-value	Adjusted Odds Ratio (95% CI)
IADL-C ≥3 (Ref = 0,1,2)	-0.07 (0.02)	<.0001	0.93 (0.90-0.96)	-0.06 (0.02)	0.001	0.95 (0.92-0.98)
ADL decline (Ref = No)	0.20 (0.02)	<.0001	1.22 (1.19-1.26)	0.24 (0.02)	<.0001	1.27 (1.23-1.31)
Functional improvement potential - client perspective (Ref = No)	0.38 (0.02)	<.0001	1.47 (1.42-1.51)	0.34 (0.02)	<.0001	1.41 (1.36-1.45)
Functional improvement potential - caregiver perspective (Ref = No)	0.31 (0.02)	<.0001	1.37 (1.32-1.42)	0.30 (0.02)	<.0001	1.35 (1.30-1.40)
Good prospects of recovery (Ref = No)	0.33 (0.02)	<.0001	1.39 (1.33-1.44)	0.31 (0.02)	<.0001	1.36 (1.30-1.41)
Continence						
Worsening of bladder incontinence (Ref = No)	-0.06 (0.02)	0.007	0.94 (0.91-0.98)	0.00 (0.02)	0.99	1.00 (0.96-1.04)
Disease Diagnoses						
Number of diagnoses - collapsed (Ref = 0)						
1	0.28 (0.07)	<.0001	1.32 (1.16-1.50)	0.33 (0.07)	<.0001	1.39 (1.22-1.59)
2	0.18 (0.06)	0.006	1.19 (1.05-1.36)	0.31 (0.07)	<.0001	1.37 (1.20-1.55)
3	0.18 (0.06)	0.006	1.20 (1.05-1.36)	0.36 (0.07)	<.0001	1.44 (1.26-1.63)
4	0.23 (0.06)	0.0003	1.26 (1.11-1.43)	0.45 (0.07)	<.0001	1.57 (1.38-1.79)
5	0.27 (0.07)	<.0001	1.31 (1.15-1.49)	0.52 (0.07)	<.0001	1.68 (1.47-1.91)
≥6	0.44 (0.07)	<.0001	1.56 (1.37-1.77)	0.71 (0.07)	<.0001	2.04 (1.79-2.33)
Cerebrovascular accident (stroke) (Ref = No)	-0.18 (0.02)	<.0001	0.84 (0.80-0.87)	-0.21 (0.02)	<.0001	0.81 (0.78-0.85)
Congestive heart failure (Ref = No)	0.43 (0.02)	<.0001	1.53 (1.47-1.59)	0.53 (0.02)	<.0001	1.70 (1.63-1.77)
Coronary artery disease (Ref = No)	0.19 (0.02)	<.0001	1.21 (1.17-1.25)	0.24 (0.02)	<.0001	1.27 (1.23-1.31)
Hypertension (Ref = No)	-0.04 (0.01)	0.005	0.96 (0.93-0.99)	0.03 (0.01)	0.02	1.04 (1.01-1.07)
Irregularly irregular pulse (Ref = No)	0.39 (0.02)	<.0001	1.48 (1.42-1.54)	0.54 (0.02)	<.0001	1.71 (1.64-1.78)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Peripheral vascular disease (Ref = No)	0.24 (0.03)	<.0001	1.27 (1.20-1.34)	0.25 (0.03)	<.0001	1.28 (1.21-1.36)
Head trauma (Ref = No)	-0.28 (0.08)	0.0009	0.76 (0.64-0.89)	-0.37 (0.08)	<.0001	0.69 (0.58-0.81)
Hemiplegia/hemiparesis (Ref = No)	-0.29 (0.08)	<.0001	0.75 (0.64-0.87)	-0.49 (0.08)	<.0001	0.62 (0.53-0.71)
Multiple sclerosis (Ref = No)	-0.58 (0.14)	<.0001	0.56 (0.43-0.74)	-0.90 (0.14)	<.0001	0.41 (0.31-0.53)
Parkinsonism (Ref = No)	-0.41 (0.04)	<.0001	0.66 (0.61-0.72)	-0.58 (0.04)	<.0001	0.56 (0.51-0.61)
Arthritis (Ref = No)	-0.22 (0.01)	<.0001	0.80 (0.78-0.82)	-0.07 (0.01)	<.0001	0.94 (0.91-0.96)
Hip fracture (Ref = No)	-0.34 (0.04)	<.0001	0.71 (0.65-0.78)	-0.21 (0.04)	<.0001	0.81 (0.74-0.89)
Other fractures (Ref = No)	-0.08 (0.03)	0.003	0.92 (0.88-0.97)	-0.02 (0.03)	0.57	0.99 (0.94-1.04)
Osteoporosis (Ref = No)	-0.21 (0.02)	<.0001	0.81 (0.78-0.84)	-0.04 (0.02)	0.0815	0.97 (0.93-1.00)
Cataract (Ref = No)	0.04 (0.02)	0.06	1.04 (1.00-1.09)	0.11 (0.02)	<.0001	1.11 (1.07-1.16)
Glaucoma (Ref = No)	-0.03 (0.03)	0.35	0.97 (0.92-1.03)	0.13 (0.03)	<.0001	1.14 (1.08-1.21)
HIV infection (Ref = No)	0.88 (0.21)	<.0001	2.41 (1.60-3.64)	0.56 (0.21)	0.009	1.75 (1.15-2.66)
Pneumonia (Ref = No)	0.22 (0.04)	<.0001	1.25 (1.17-1.34)	0.27 (0.04)	<.0001	1.31 (1.22-1.41)
Tuberculosis (Ref = No)	-0.09 (0.23)	0.69	0.91 (0.58-1.44)	-0.11 (0.23)	0.63	0.89 (0.56-1.41)
Urinary tract infection (Ref = No)	0.10 (0.03)	0.002	1.10 (1.04-1.17)	0.25 (0.03)	<.0001	1.28 (1.21-1.36)
Cancer (Ref = No)	1.16 (0.02)	<.0001	3.18 (3.09-3.28)	1.10 (0.02)	<.0001	3.00 (2.91-3.10)
Diabetes (Ref = No)	0.21 (0.02)	<.0001	1.23 (1.19-1.27)	0.07 (0.02)	<.0001	1.07 (1.04-1.11)
Emphysema/COPD/asthma (Ref = No)	0.12 (0.02)	<.0001	1.13 (1.09-1.17)	0.11 (0.02)	<.0001	1.11 (1.07-1.15)
Renal failure (Ref = No)	0.39 (0.02)	<.0001	1.48 (1.41-1.55)	0.33 (0.03)	<.0001	1.39 (1.33-1.47)
Thyroid disease (hyper or hypo) (Ref = No)	-0.03 (0.02)	0.11	0.97 (0.93-1.01)	0.12 (0.02)	<.0001	1.13 (1.08-1.17)
Health Conditions						

Variable	Unadjusted Estimate (Standard Error)	Unadjusted *p*-value	Unadjusted Odds Ratio (95% CI)	Adjusted for LHIN, age, sex Estimate (Standard Error)	Adjusted for LHIN, age, sex *p*-value	Adjusted for LHIN, age, sex Odds Ratio (95% CI)
Pain Scale (Ref = 0)						
1	-0.01 (0.03)	0.66	0.99 (0.94-1.04)	0.03 (0.03)	0.25	1.03 (0.98-1.09)
2	0.22 (0.02)	<.0001	1.24 (1.20-1.29)	0.25 (0.02)	<.0001	1.28 (1.24-1.32)
3	0.47 (0.02)	<.0001	1.60 (1.54-1.67)	0.45 (0.02)	<.0001	1.56 (1.50-1.63)
Falls - collapsed (Ref = 0)						
1	-0.20 (0.02)	<.0001	0.82 (0.79-0.85)	-0.13 (0.02)	<.0001	0.88 (0.85-0.91)
2	-0.22 (0.03)	<.0001	0.81 (0.77-0.85)	-0.16 (0.03)	<.0001	0.85 (0.81-0.89)
3	-0.20 (0.02)	<.0001	0.82 (0.78-0.86)	-0.23 (0.03)	<.0001	0.79 (0.75-0.83)
Unsteady gait (Ref = No)	-0.10 (0.01)	<.0001	0.91 (0.88-0.93)	-0.03 (0.02)	0.05	0.97 (0.94-1.00)
Poor self-reported health (Ref = No)	0.49 (0.02)	<.0001	1.64 (1.59-1.69)	0.39 (0.02)	<.0001	1.48 (1.43-1.53)
Unstable conditions (Ref = No)	-0.24 (0.01)	<.0001	0.79 (0.77-0.81)	-0.22 (0.01)	<.0001	0.81 (0.78-0.83)
Flare-up of recurrent or chronic condition (Ref = No)	0.32 (0.02)	<.0001	1.38 (1.33-1.44)	0.28 (0.02)	<.0001	1.32 (1.27-1.37)
Treatments changed in last 30 days (Ref = No)	0.51 (0.02)	<.0001	1.67 (1.62-1.72)	0.54 (0.02)	<.0001	1.72 (1.67-1.77)
Elder Abuse						
Abuse CAP (Ref = 0)						
1	-0.48 (0.20)	0.02	0.62 (0.42-0.93)	-0.63 (0.21)	0.002	0.53 (0.36-0.80)
2	-0.47 (0.09)	<.0001	0.63 (0.53-0.74)	-0.55 (0.09)	<.0001	0.57 (0.48-0.68)
Fearful of family/caregiver (Ref = No)	-0.14 (0.13)	0.31	0.87 (0.67-1.13)	-0.16 (0.13)	0.24	0.85 (0.66-1.11)
Unusually poor hygiene (Ref = No)	-0.74 (0.12)	<.0001	0.48 (0.38-0.60)	-0.90 (0.12)	<.0001	0.41 (0.32-0.51)
Unexplained injuries (Ref = No)	-0.35 (0.47)	0.46	0.71 (0.28-1.77)	-0.47 (0.47)	0.31	0.62 (0.25-1.57)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
Neglected, abused, or mistreated (Ref = No)	-0.39 (0.17)	0.02	0.68 (0.48-0.95)	-0.39 (0.17)	0.02	0.67 (0.48-0.95)
Physically restrained (Ref = No)	-0.16 (0.17)	0.36	0.86 (0.61-1.20)	-0.13 (0.17)	0.47	0.88 (0.63-1.24)
Service Utilization						
Overall change in care needs (Ref = Improved)						
No change	-0.20 (0.03)	<.0001	0.82 (0.76-0.88)	-0.16 (0.04)	<.0001	0.85 (0.79-0.91)
Deteriorated	0.11 (0.03)	0.001	1.12 (1.05-1.19)	0.18 (0.03)	<.0001	1.20 (1.13-1.28)
Medications						
≥9 medications (Ref = No)	0.45 (0.01)	<.0001	1.56 (1.52-1.61)	0.47 (0.01)	<.0001	1.60 (1.55-1.64)
Other Scales						
CHESS ≥3 (Ref = 0,1,2)	0.37 (0.02)	<.0001	1.45 (1.40-1.49)	0.43 (0.02)	<.0001	1.53 (1.48-1.58)
MAPLe ≥3 (Ref = 1,2)	-0.36 (0.02)	<.0001	0.70 (0.68-0.72)	-0.33 (0.02)	<.0001	0.72 (0.70-0.74)
AUA (Ref = 1)						
2	0.33 (0.07)	<.0001	1.39 (1.22-1.58)	0.20 (0.07)	0.002	1.23 (1.08-1.40)
3	0.24 (0.04)	<.0001	1.27 (1.18-1.36)	0.19 (0.04)	<.0001	1.21 (1.13-1.30)
4	-0.36 (0.02)	<.0001	0.70 (0.66-0.73)	-0.26 (0.02)	<.0001	0.77 (0.74-0.81)
5	-0.49 (0.03)	<.0001	0.61 (0.58-0.65)	-0.41 (0.03)	<.0001	0.66 (0.63-0.70)
6	-0.33 (0.02)	<.0001	0.72 (0.69-0.75)	-0.28 (0.02)	<.0001	0.76 (0.72-0.79)
DIVERT (Ref = 1)						
2	0.39 (0.04)	<.0001	1.48 (1.38-1.59)	0.43 (0.04)	<.0001	1.55 (1.44-1.66)
3	0.67 (0.04)	<.0001	1.95 (1.82-2.10)	0.70 (0.04)	<.0001	2.02 (1.88-2.17)
4	0.95 (0.04)	<.0001	2.58 (2.40-2.76)	0.95 (0.04)	<.0001	2.58 (2.41-2.77)

	Unadjusted			Adjusted for LHIN, age, sex		
Variable	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**	**Estimate (Standard Error)**	***p*-value**	**Odds Ratio (95% CI)**
5	1.20 (0.04)	<.0001	3.33 (3.10-3.58)	1.26 (0.04)	<.0001	3.53 (3.28-3.79)
6	1.41 (0.04)	<.0001	4.09 (3.79-4.41)	1.46 (0.04)	<.0001	4.29 (3.97-4.63)