Rehabilitation, Recovery, and Adverse Events Following Discharge from Ontario Complex Continuing Care Hospitals

by

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Author's Declaration

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

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

Abstract

Purpose: The purpose of this dissertation was to characterize rehabilitative care in Ontario Complex Continuing Care hospitals and to examine the association of patient, structure, and process factors on functional outcomes and health state transitions.

Methods: First, a retrospective cross-sectional study of patients admitted to Ontario Complex Continuing Care hospitals between March 31st, 2011 and March 31st, 2016 (n = 100,778) was conducted to characterize rehabilitative care service utilization in this health service setting. The MDS 2.0 comprehensive health assessment that is completed at admission to this post-acute care service setting was used as the primary source of patient health status and service utilization data. A series of zero-inflated negative binomial regression models were fit to study the association of patient, facility and system-level factors on physical, occupational, and speech-language pathology therapy receipt and intensity.

Second, a retrospective study of patients admitted to Ontario Complex Continuing Care hospitals between January 1st, 2010 and March 31st, 2015 (n = 30,924) who were subsequently re-assessed with an interRAI assessment in either a Complex Continuing Care hospital, residential long-term care facility, or home care service setting was completed. This study aimed to describe patterns of functional gain following rehabilitation in Complex Continuing Care. The MDS 2.0 assessment that is completed at admission to Complex Continuing Care was used as the baseline measure of physical function, and was compared to measures collected with the next available MDS 2.0 or RAI-HC assessment completed in hospital, long-term care, or community care. A series of multivariate linear regression models were fit to study the association of patient, process, facility, and system-level factors on functional gain following rehabilitative care.

Third, a retrospective study of patients admitted to Ontario Complex Care hospitals between January 1st, 2010 and March 31st, 2015 (n = 76,132) that were either discharged from hospital or re-assessed with an interRAI assessment was performed to study factors associated with health transitions immediately following rehabilitative care in Complex Continuing Care hospital. The MDS 2.0 assessment that is completed at admission to Complex Continuing Care was used the

primary source of patent health information and was used to stratify the sample into three baseline functional states. A multistate transition model was fit to study the association of patient, process, facility and system-level factors on health transitions at follow-up. Possible transition states included functional improvement and decline, discharge to community care, discharge to residential long-term care, discharge to acute care, and death.

Finally, a Markov chain multistate transition model was fit for a sample of Ontario Complex Continuing Care patients that were discharged to community care between January 1st, 2010 and January 1st, 2014 and assessed with a RAI-HC assessment within 105 days of discharge (transitions = 12,824). This analysis aimed to describe the effect of hospital-based rehabilitation therapy intensity on health state transitions after community discharge. Patients were classified into two initial states using functional measures from the RAI-HC assessment. Possible transition states of interest included functional improvement and decline, hospital admission, residential long-term care facility admission, death, and discontinuation of home care services.

Results: Overall, 79% of Ontario Complex Continuing Care patients received physical therapy, 69% received occupational therapy, and 16% received speech-language pathology therapy. The mean therapy intensity was 103 (SD = 92) minutes per week for physical therapy, 75 (SD = 87) minutes per week for occupational therapy, and 11 (SD = 37) minutes per week for speech-language pathology therapy. Patient-level factors including age, diagnosis group, baseline functional and cognitive status, medical instability, and rehabilitation potential were predictive of both receipt and intensity of therapy across each provider type. However, these associations were stronger for the receipt-component of the model, suggesting that after determining eligibility for rehabilitation, providers allocate therapy time based on other factors. After adjusting for patient characteristics, facility size, facility rurality, and region were significant factors across the models. This indicates that there are likely inter-facility and inter-region differences for rehabilitation service utilization.

On average, Complex Continuing Care patients improved by 3.24 points ($Cohen's\ d = 0.36$) on the ADL-Long Form Scale between admission and follow-up. Statistically significant functional gain was observed for most activities of daily living; however, patients that were discharged to community care achieved greater gains than patients that were in hospital or residential long-term care at follow-up. Across baseline functional levels, the multivariate regression models explained between 19% and 23% of the variance in functional gain. Patient-level factors associated with functional outcomes included age, diagnosis group, cognitive status, and rehabilitation potential. Receipt of physical therapy was associated with functional gain; however, small amounts of additional physical therapy time were generally not associated with additional functional gain. Additionally, physical therapy time beyond 135 minutes per week did not result in additional gains in function. Receipt of occupational therapy resulted in gains in function for the least functionally impaired patients. However, more intensive occupational therapy was not associated with greater functional gains.

Within 105 days admission to a Complex Continuing Care hospital, 43% of patients were discharged to a community care setting, 11% were discharged to a long-term care facility, 8% were discharged to an acute care hospital, and 22% died. Among the 17% of patients that remained in Complex Continuing Care, 8% transitioned to a more impaired functional state and 16% transitioned to less impaired functional state. After adjusting for patient, facility, and system-level factors, patients that received more intensive physical therapy were generally more likely to be discharged to community care and hospital, and were less likely to die. Among patients that were not discharged, those that received more intensive physical therapy were generally more likely to transition to a less impaired functional state. Greater occupational therapy intensity was generally associated with greater odds of community discharge and lower odds of discharge to a residential long-term care facility.

Among patients that were discharged from Complex Continuing Care to home care, 13% of state transitions resulted in re-hospitalization, 5% resulted in residential long-term care admission, and 6% resulted in death. Among non-absorbing state transitions, 7% resulted in functional improvement and 6% resulted in functional decline. After adjusting for both patient and system-level factors, physical and occupational therapy intensity in Complex Continuing Care was not associated with greater odds of experiencing most health state transitions after discharge.

Conclusions: This dissertation represents the first comprehensive study of rehabilitation service patterns and outcomes for patients admitted to Ontario Complex Continuing Care hospitals. Through the use of national administrative health databases with near census-level coverage, this dissertation succeeds in answering research questions that span multiple health service settings along the continuum of care. The models that were developed in this dissertation lend support for the quality of rehabilitative care in Ontario Complex Continuing care hospitals; however, they suggest that there are opportunities to better allocate rehabilitation therapy for certain patient populations. Additionally, the results of this dissertation indicate that greater therapy intensity in Complex Continuing Care is associated with positive health state transitions; however, it is not protective over the long-term for patients that return to the community.

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Caitlin, this dissertation is the product of four of the most challenging and rewarding years of my life. Thank you for your companionship, love, and support. I could not imagine this journey

without you.

Dedication

This dissertation is dedicated to my father, Réjean Turcotte.

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List of Abbreviations

ABS Aggressive Behaviour Scale

ADL Activity of Daily Living

ADL-H Activities of Daily Living Hierarchy Scale

ADL-Long Activities of Daily Living Long Form Scale

ADL-Short Activities of Daily Living Short Form Scale

CAP Clinical Assessment Protocol

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

CPS Cognitive Performance Scale

DRS Depression Rating Scale

FIM-FRG Functional Independence Measure - Function Related Groups

IADL Instrumental Activities of Daily Living

ISE Index of Social Engagement

LTCF Long-term Care Facilities

PAC Post-acute Care

RCG Rehabilitation Client Group

RPG Rehabilitation Patient Groups

RUG-III Resource Utilization Groups Version III

RUG Resource Utilization Groups

AIC Akaike Information Criterion

BI Barthel Index

CCC Complex Continuing Care

CCRS Continuing Care Reporting System

CIHI Canadian Institute for Health Information

DAD Discharge Abstract Database

FIM Functional Independence Measure

HCRS Home Care Reporting System

IRF Inpatient Rehabilitation Facilities

LHIN Local Health Integration Network

LTC Long-term Care

LTLD Low Tolerance Long Duration

MDS 2.0 Minimum Data Set 2.0

MDS Minimum Data Set

MMSE Mini–Mental State Examination

NACRS National Ambulatory Care Reporting System

RAI-HC Minimum Data Set Home Care

RAI Resident Assessment Instrument

Chapter 1

Introduction

1.1 Rehabilitative Care

1.1.1 Conceptual Definitions

Several models and frameworks have been established to conceptualize "functioning" and "disability", including Nagi's Disablement Model and the World Health Organization's International Classification of Functioning, Disability, and Health. According to Nagi (1964), functioning can be described as individuals' ability or inability to perform the roles and tasks ascribed to them within their environment. From this perspective, inability may be the result of physical or mental limitations at birth, or may be the result of individual and environmental changes that occur over the life course (Nagi, 1964). The International Classification of Functioning, Disability, and Health extends this framework such that disability and function are the result of interactions between health conditions and contextual factors. In this framework, environmental and personal factors influence how disability is experienced by the individual (Stucki et al., 2007). Individuals may experience disability as a result of limitations at the levels of body function or structure, limitations in executing activities, or limitations in participating in life situations (World Health Organization, 2002).

Rehabilitation, as one of the four main health care strategies alongside prevention, curing, and support, is a health strategy that aims to restore and optimize physical function within the environment in which individuals are situated (Stucki et al., 2007; Stucki, 2005). This is achieved through biomedical procedures and the use of assistive devices to optimize a person's capacity, the removal of barriers so that a facilitating environment can be established, and the development of an individual's performance in interactions with the environment (Stucki et al., 2007). In addition to optimizing function, as secondary goals, rehabilitation also aims to support an individual's autonomy and quality of life (Stucki et al., 2007).

1.1.2 Physical and Rehabilitation Medicine

Rehabilitation strategies are the primary approach to care that is undertaken by health professionals practising in physical and rehabilitation medicine disciplines such as physical therapy and occupational therapy (Stucki et al., 2007). In the Canadian context, physical therapists are health professionals whose primary focus is to enhance or restore physical function through the use of physical and physiological therapeutic interventions and aids (Canadian Physiotherapy Association, 2012). Similarly, occupational therapists are health professionals that work to modify tasks and environments to enable individuals to complete activities of daily living. Finally, speech-language pathologists practice a form of rehabilitative medicine that is focused on the treatment of language impediments, swallowing problems, cognitive impairment, and hearing problems. In additional to individuals practising in physical and rehabilitation medicine disciplines, rehabilitation strategies may be used by other health care professionals such as physicians and nurses and may also be employed by other non-health professionals (e.g., family members, employers) (Stucki et al., 2007).

1.1.3 Post-acute Rehabilitative Care

Rehabilitative care is provided across a wide range of care settings including acute and post-acute care hospitals, nursing homes, community-based outpatient clinics, and in-home therapist visits (Stucki et al., 2007; Armstrong et al., 2015; McArthur et al., 2015). In Ontario, Canada, the setting where an individual receives rehabilitation is largely based on the level of nursing care and intensity of therapy that a patient requires. Patients requiring intensive rehabilitative care, frequent supervision by a rehabilitation physician, and support with activities of daily living are within the scope of inpatient rehabilitation facilities. As highlighted by the Rehabilitative Care Alliance's "Definitions Framework for Bedded Levels of Rehabilitative Care", patient goals such as recovery of function, avoidance of further loss of function, or slowing the rate of functional loss may be achieved in care settings offering less intensive rehabilitation therapy modalities (Rehabilitative Care Alliance, 2014). In addition to inpatient rehabilitation facilities, patients in Ontario requiring less intensive rehabilitation may be admitted to Complex Continuing Care (CCC) hospitals.

1.1.4 Rehabilitation in Complex Continuing Care Hospitals

CCC provides hospital-based nursing and rehabilitation services to individuals recovering from acute illness, or who have complex clinical needs requiring specialized medical care over an extended period (Complex Continuing Care and Rehabilitation Provincial Leadership Council of the Ontario Hospital Association, 2006). For most patients, CCC programs act as a transition point between acute care hospitals and home care or residential long-term care settings (Canadian Institute for Health Information, 2016a). However, nearly a third of patients die in CCC hospitals (Canadian Institute for Health Information, 2016a). A wide variety of programs including rehabilitative care, long-term complex medical care, psycho-geriatric care, palliative care, and respite care are offered in CCC beds (Teare et al., 2004). CCC is a care setting that is unique to Ontario, Canada, apart from two units in Manitoba. Programs similar to CCC in other health systems may be called post-acute, sub-acute, intermediate, or transitional care programs and may be offered in a variety settings such as skilled nursing facilities, nursing homes, community hospitals, and long-term acute care hospitals (Melis et al., 2004). In fiscal year 2017-2018, 28,522 patients received care in Ontario CCC hospitals (Canadian Institute for Health Information, 2018).

The role of CCC hospitals in Ontario has changed substantially over the past two decades. Prior to recommendations from the Health System Restructuring Committee's (HSRC) Long-term

Care Reform in 1998, chronic hospital beds were used for a variety of short and long-term care programs such as rehabilitation, palliative care, geriatric assessment, neurology, respirology, and psychiatry (Ontario Health Services Restructuring Commission, 1998). The HSRC established an integrated framework for LTC services, identifying CCC hospitals as just one of many care settings along the continuum of LTC services. This continuum was to extend to private residences, retirement homes, supportive housing, and nursing homes. Recognizing that the care setting where are an individual receives LTC services should be dependent on the desires of the patient, level of dependence, care requirements, and availability of formal and informal supports, CCC hospitals were to provide care to patients with complex or unstable chronic conditions requiring active medical management, frequent medical interventions, and technologically-based hospital care (Ontario Health Services Restructuring Commission, 1998). Broadly, it was recommended by the HSRC that patients classified into the Clinically Complex, Extensive Services, and Special Care categories of the Resource Utilization Groups III (RUG-III) case-mix system (Fries et al., 1994) be included within the scope of CCC hospitals, with all other categories best cared for in nursing homes (Hirdes et al., 2003b). Prior to these recommendations, the distribution of the RUG-III case-mix levels of patients in CCC hospitals was as follows: 19% Special Rehabilitation, 8% Extensive Services, 17% Special Care, 30% Clinically Complex, 4% Impaired Cognition, and 23% Reduced Physical Function (Canadian Institute for Health Information, 2004).

The rehabilitative care that is provided in CCC hospitals is often described as “Slow Stream” or “Low Tolerance Long Duration (LTLD)” therapy (Tourangeau et al., 2011). This rehabilitation modality is generally defined as the provision of five hours or less of therapy per week and is intended for patients that do not have the capacity to tolerate the intensity of rehabilitation that is typically provided in inpatient rehabilitation facilities (Tourangeau et al., 2011; GTA Rehab Network, 2004). For fiscal year 2015, 62% of CCC patients were classified into the Special Rehabilitation RUG-III category (Canadian Institute for Health Information, 2016a). This indicates that they receive a minimum of 45 minutes of rehabilitation therapy over three different days each week, and at least two nursing rehabilitation activities such as locomotion/mobility training or a range of motion program on six days each week .

1.1.5 Eligibility for Rehabilitation

In 1993, the "Chronic Care Role Study" recommended that the Ontario Ministry of Health develop a standard pre-application assessment process for admissions to CCC hospitals (Ontario Hospital Association and the Council of Chronic Hospitals of Ontario, 1993). Today, admission to a CCC hospital is based on an application and screening process, where the decision to admit a patient for rehabilitation is at the discretion of the admitting hospital. Driven by conflicting eligibility criteria for CCC and the development of sub-levels of CCC at regional and organizational levels, the role of CCC within the continuum of rehabilitative care in Ontario has come into question in recent years (Rehabilitative Care Alliance, 2013). The Rehabilitative Care Alliance, a task-group created by Ontario's 14 Local Health Integration Networks to address key system gaps and issues in rehabilitative care in Ontario, was given a mandate to develop standardized definitions for bedded levels of rehabilitative care in Ontario (Rehabilitative Care Alliance, 2014). Four levels of care across inpatient rehabilitation facilities, CCC hospitals, and convalescent care beds in nursing homes were established under the "Definitions Framework for Bedded Levels of Rehabilitative Care": Rehabilitation (low to high intensity), Activation/Restoration, Short Term Complex Medical Management, and Long Term Complex Management. These levels of rehabilitative care differ with respect to their goals of care, target population characteristics, levels of nursing care, and the intensity of daily rehabilitation provided to patients. The framework establishes a series of eligibility criteria for bedded rehabilitative care. Although largely subjective in nature, these eligibility criteria stipulate that patients eligible for rehabilitation have restorative potential; are medically stable; have goals that are specific, measurable, realistic, and timely; are able to participate and benefit in rehabilitative care; and have goals and care needs that may not be met in community care. Under this framework, restorative potential is established based on clinical assessment and should take premorbid level of function, diagnosis and comorbidities, and ability to participate in therapy into consideration.

Under this framework, patients receiving care and LTLD therapy provided in CCC hospitals would be classified under the Rehabilitation level of care. Patients qualifying for this level of care

are eligible to receive between 45 minutes and three hours of therapy per day from regulated health professionals. However, given that the "Definitions Framework for Bedded Levels of Rehabilitative Care" extends across the continuum of rehabilitative care, it is expected that patients receiving the greatest number of therapy minutes in this level of care would be those in inpatient rehabilitation facilities. Part of the funding allocation for patients qualifying for this level of care in CCC is based on the RUG-III case-mix classification system; however, it is suggested that an LTLD group would be added to the case-mix system currently used in inpatient rehabilitation facilities. This would allow all patients in this level of care to be assessed and classified using a common case-mix system across care settings. To support this transition, the Rehabilitative Care Alliance created a "Planning Considerations for Reclassification (PRC) of Rehab/CCC Beds Toolkit" to assist facility administrators and Local Health Integration Networks (LHINs) in determining if bed reclassification was appropriate for their organization (Rehabilitative Care Alliance, 2015). It is not clear how many CCC beds in Ontario have been reclassified to date. However, between April 2013 and 2016, the number of CCC beds among the 28 hospitals belonging to the GTA Rehab Network decreased by 163 beds. Simultaneously, the number of inpatient rehabilitation beds increased by 112 beds (GTA Rehab Network, 2016).

Recognizing that rehabilitation goals such as recovery of function, avoidance of further loss of function, or slowing the rate of functional loss may be achieved without intensive therapy by regulated rehabilitation professionals, a large proportion of non-LTLD patients in CCC hospitals may qualify for one of the other three levels of rehabilitative care defined by the "Definitions Framework for Bedded Levels of Rehabilitative Care." For example, patients that are medically stable but require skilled nursing and medical care may be eligible for "Short Term Complex Medical Management" or "Long Term Complex Management." These patients may engage in rehabilitation activities provided by regulated health professionals, presumably nursing staff, for up to an hour per day. Patients in the "Activation/Restoration" level of rehabilitative care may participate in 30-120 minutes of restorative activities delivered by "Non-regulated Activation/Recreational Staff" in an individual or group setting. Examples of restorative activities may include assistance with walking or self care, and participation in exercise programs or recreational activities. Although

CCC patients may qualify for this level of rehabilitative care, it is largely intended for patients in convalescent care beds within Long-term Care facilities.

1.2 Dissertation Rationale, Purpose, and Organization

There are a lack of peer-reviewed articles and grey literature reports that examine the provision of rehabilitation therapy in CCC hospitals. In part, this may have lead the Office of the Auditor General of Ontario to conclude in their "Rehabilitation Services at Hospitals" audit during the 2012/2013 fiscal year, that the "Ministry [of Health and Long-term Care] had limited information on the actual use of complex continuing care beds in hospitals," due to a lack of a system-wide information system that may be used for decision-making and system capacity planning (Auditor General of Ontario, 2013). Given the availability of longitudinal patient-level data for individuals receiving care in CCC hospitals dating back to 1996, when Ontario gained its first health information system that could be used for evidence-informed decision making (Hirdes et al., 2003b), there is an opportunity to describe the provision of rehabilitative care in CCC hospitals. In response, this dissertation will describe patterns of rehabilitation service provision in CCC hospitals for a range of different patient, facility, and system-level factors.

Unlike the Functional Independence Measure (FIM) assessment that is used in Ontario inpatient rehabilitation facilities, the MDS 2.0 assessment is not completed at discharge from CCC hospitals. Given that the average length of stay is approximately 30 days (Canadian Institute for Health Information, 2011) and that facilities are only required to re-assess patients at ninety-day intervals after completing the admission assessment, there is a lack information on patient outcomes following rehabilitation in CCC hospitals. This presents a challenge for evaluating the effectiveness of rehabilitation therapy in these facilities and precludes this study of patient characteristics and rehabilitation modalities that are associated with positive patient outcomes. Using comprehensive health assessments completed in residential long-term care and home care settings, there is an opportunity to link patient records across care settings in lieu of a discharge assessment. Using linked interRAI assessments, this dissertation will characterize trajectories of recovery and describe the patient, facility, and system-level factors that are associated with functional gain in CCC hospitals.

Recognizing that CCC hospitals are a transition-point along the rehabilitative continuum of care, beyond the provision of rehabilitation to facilitate recovery of function, a goal of rehabilitate care is to provide patients with the necessary knowledge and skills to effectively self-manage their conditions and avoid unplanned hospital readmissions and emergency department visits (Gassaway et al., 2017). The United States Medicare Payment Advisory Commission (MedPAC) estimates that hospital readmission following post-acute care result in a doubling of the episode care total cost (Middleton et al., 2016). This lends support for the United States Centers for Medicare and Medicaid Services' adoption of a 30-day all-cause unplanned acute care readmission quality measure following discharge from inpatient rehabilitation facilities (Fisher et al., 2016). In Ontario, rates of 30-day all-cause readmission to hospital for various patient conditions are part of the set of recommended priority quality improvement plan indicators established by Health Quality Ontario (Health Quality Ontario, 2015). These quality indicators are not specific to patients in post-acute rehabilitation facilities, providing an opportunity to study factors that are associated with unplanned readmission following discharge from a CCC facility. From the perspective of reducing hospital readmission rates, there are also questions about the relationship between rehabilitation intensity in hospital and adverse events in the community. Leveraging linked interRAI and Ontario administrative health databases, this dissertation will aim to identify patient, and facility level factors that are associated with multi-state transition to hospital readmission, residential long-term care admission, and mortality end-points following discharge from a CCC facility.

The purpose of this dissertation is to characterize rehabilitative care in Ontario CCC hospitals and to examine the association of patient, structure, and process factors with patterns of recovery and likelihood of experiencing adverse events following community discharge. Each proposed study within the overarching dissertation aims to address a distinct line of questioning surrounding the role of CCC hospitals along the rehabilitative continuum of care for restoring patient function, and maximizing long-term independence and survival after discharge. The knowledge that is generated through this dissertation is expected to contribute to the health systems research community's understanding of the trajectory of recovery for patients receiving LTLD rehabilitation and other less intensive forms of therapy in post-acute care settings. For Ontario health system planners and decision-makers, this dissertation represents an in-depth examination of a health service setting that has historically been understudied despite the accumulation of more than 20 years of standardized person-level health information.

The following studies are contained within this dissertation:

Chapter 2: Characterization of Rehabilitation Service Patterns in Ontario Complex Continuing Care Hospitals

Chapter 3: Predictors of Functional Outcomes Following Rehabilitation in Ontario Complex Continuing Care Hospitals

Chapter 4: Patient Outcomes Following Rehabilitation in Ontario Complex Continuing Care Hospitals

1.3 Literature Review Methods

Literature searches were conducted using the MEDLINE (PubMED), Scopus, Web of Science and Google Scholar journal indexes using appropriate Medical Subjects Headings (MeSH) and title/abstract keyword search terms. Results were restricted to English language articles. Secondary literature sources were obtained by reviewing citations made by the primary article and using journal indexes to retrieve relevant literature citing the primary article. Relevant articles were screened for inclusion based on the title and abstract, followed by a review of the article's content.

Chapter 2

Characterization of Rehabilitation Service Patterns in Ontario Complex Continuing Care Hospitals

2.1 Introduction

2.1.1 Rehabilitation in Ontario Complex Continuing Care Hospitals

To date, only rudimentary information is available about the intensity of rehabilitation provided to patients in Ontario Complex Continuing Care (CCC) hospitals. For fiscal year 2009, Hirdes et al. (2011) reported that 69% of CCC patients received at least one fifteen-minute session of physical therapy per week. The percentage receiving occupational and speech language pathology therapy was 58% and 15%, respectively. The Canadian Institute for Health Information's (2018) most recent "Quick Stats" report for fiscal year 2017–2018 indicates that the percentage receiving physical and occupational therapy has grown by 5–7%. Unfortunately, these statistics provide no indication of the frequency and duration of therapy sessions in CCC hospitals. To date, the best estimate of the average weekly therapy minutes among patients receiving therapy in Ontario CCC Facilities is 129 minutes/week (SD = 101 minutes/week) of physical therapy and 107 minutes/week (SD = 100 minutes/week) of occupational therapy (Wodchis et al., 2004). These figures date back to 1999 at a time when CCC hospitals were funded using a global budget payment system.

2.1.2 Rehabilitation in Other Post-acute Care Settings

Although CCC hospitals are unique to Ontario, and to some extent Manitoba, patients requiring complex medical care and Low Tolerance Long Duration (LTLD) rehabilitation therapy are likely to be represented in other post-acute service settings including skilled nursing facilities, long-term care facilities (i.e., nursing homes), and inpatient rehabilitation facilities. Therefore, in order to understand the patient, facility, and system-level factors that explain variation in rehabilitation service patterns, a broad review of the post-acute rehabilitation literature was undertaken.

Skilled Nursing Facilities

The literature detailing the intensity of rehabilitation therapy in skilled nursing facilities has focused mainly on individuals with orthopedic conditions such as total hip replacement and total knee replacement. Patients admitted to skilled nursing facilities in the United States following hip fracture averaged 0.7 (SD = 0.2) sessions of physical therapy per day with an average session length of 51.2 (SD = 11.7) minutes. Similarly, patients averaged 0.6 (SD = 0.2) sessions of occupational therapy per day with an average session length of 49.6 (SD = 10.6) minutes. Among a more physically impaired population admitted to skilled nursing facilities following hip replacement, patients averaged slightly more daily therapy at 54 minutes of physical therapy and 48 minutes of occupational therapy per day (DeJong et al., 2009). This study also reported a similar number of hours of daily physical therapy and occupational therapy for patients admitted following knee replacement. Functional status on admission, determined using the Functional Independence Measure (FIM) Motor and Cognitive sub-scales was comparable between patient groups (DeJong et al., 2009).

Tian et al. (2010) detailed the provision of therapy for patients admitted to United States skilled nursing facilities following either non-elective total hip or partial hip replacement following hip fracture, or elective hip replacement as a result of osteoarthritis or other degenerative condition. Patients admitted following non-elective surgery averaged 13.7 (SD = 7.9) hours of physical therapy and 11.7 (SD = 6.1) hours of occupational therapy over a mean length of stay of 20.7 (SD = 11.3) days (Tian et al., 2010). Those that were admitted following elective surgery received therapy of comparable intensity, albeit over a shorter mean length of stay of 13.3 (SD = 8.6) days.

To date, few studies have identified patient, facility, and system-level factors that are associated with provision of rehabilitation therapy in skilled nursing facilities. Chen et al. (2002) found that physical function, cognition, and impairment type were associated with rehabilitation intensity in a variety of different inpatient rehabilitation settings, including skilled nursing facilities. Generally, stroke-related impairment (vs. orthopedic), lower self-care performance, and greater cognitive performance at admission were associated with greater therapy intensity (Chen et al., 2002). Across patient groups, patient characteristics and facility characteristics explained only 10% of variance in therapy intensity, suggesting many factors that influence rehabilitation intensity are unknown (Chen et al., 2002). In a large study of Canadian nursing home residents that received at least one physical therapy treatment session over a one-week period, McArthur et al. (2015) found that patients that had recently experienced a decline or improvement in clinical status, identified themselves as having potential improvement, had any fracture, or a multiple sclerosis diagnosis had greater odds of receiving at least 150 minutes of therapy over 5 or more days. Residents with cognitive impairment or symptoms of depression were less likely to receive physical therapy at that intensity (McArthur et al., 2015).

At a system level, Wodchis et al. (2004) found that after adjusting for numerous factors (e.g., patient demographics, rehabilitation potential, functional and cognitive capacity), patients admitted to United States skilled nursing facilities funded using prospective payment systems, (as is now the case in Ontario CCC hospitals), received 27% fewer weekly occupational therapy minutes and 25% fewer weekly physical therapy minutes than patients admitted to facilities funded using a cost-based payment system. The configuration of the case-mix system used as the basis for prospective payment systems has also been shown to influence service provider behaviour with respect to provision of rehabilitation therapy. The Resource Utilization Groups Version III (RUG-III) case-mix system algorithm is structured such that additional therapy time that is provided in between Resource Utilization Groups (RUG) group thresholds leads to little additional facility revenue (Wodchis, 2004). As a result, the odds a patient will receive a level of care at the threshold necessary to qualify for a given RUG-III group is greater for facilities under prospective payment systems (Wodchis, 2004). This suggests that rehabilitation service providers may determine therapy intensity by case-mix system configuration as opposed to patient characteristics and demonstrated need.

Broader regional practice patterns may also influence provision of rehabilitation therapy. After adjusting for a wide variety of patient characteristics, residents in long-term care facilities in Newfoundland, Nova Scotia, and the Yukon were more likely to receive physical therapy compared to British Columbia, Manitoba, and Saskatchewan (McArthur et al., 2015). Interestingly, residents in Saskatchewan were mostly likely to receive at least 150 minutes of physical therapy over five or more days. Unfortunately, this study did not investigate the effect of provincial health insurance plans, hours of physical therapy available, and facility ownership to identify reasons for this disparity in provision of rehabilitation.

Inpatient Rehabilitation Facilities

The inpatient rehabilitation facility literature on intensity of rehabilitation therapy includes a greater number of studies on more diverse patient populations including stroke, traumatic brain injury, spinal cord injury, and orthopedic conditions such as knee and hip replacement. Patients admitted to inpatient rehabilitation facilities for total hip replacement received between 1.0 and 1.4 hours of physical therapy and occupational therapy per day (Munin et al., 2010; DeJong et al., 2009). Similarly, those admitted for total knee replacement averaged between 1.1 and 1.5 hours of physical therapy and occupational therapy per day (DeJong et al., 2009; DeJong et al., 2011).

Compared to patients with orthopedic conditions, patients admitted to inpatient rehabilitation facilities for therapy following stroke received fewer minutes of daily therapy from physical therapists and occupational therapists; however, they often received additional therapy time from speech language pathologists (DeJong et al., 2011). Most reports of stroke therapy estimated that patients received between 42 to 59 minutes of physical therapy per day (DeJong et al., 2011; Karges and Smallfied, 2009; Jette et al., 2005; Horn et al., 2010; Horn et al., 2005; Foley et al., 2012; De

Wit et al., 2005; Chen et al., 2002) and 36 to 54 minutes of occupational therapy per day (Foley et al., 2012; Karges and Smallfied, 2009; Horn et al., 2005; Chen et al., 2002). Compared to individuals with orthopedic conditions, these therapies were provided in shorter but more frequent sessions lasting between 30 and 38 minutes (Karges and Smallfied, 2009; Jette et al., 2005). The intensity of therapy delivered by speech language pathologists ranges from 1 to 41 minutes per day (Foley et al., 2012; Karges and Smallfied, 2009; Horn et al., 2005; De Wit et al., 2005; Bernhardt et al., 2007; Chen et al., 2002). This wide variation is likely attributable to sample differences in the percentage of patients with symptoms necessitating therapy from a speech language pathology therapist.

It is important to note that in many cases, reports of therapy time include activities such as assessment, consultation, and documentation. For example, as highlighted by Foley et al. (2012) in their study of an Ontario inpatient rehabilitation facility, one-third of therapist time was spent on assessment and consultation, leaving only 75 minutes of active therapy per day. This intensity of rehabilitation is below what is recommended in the Canadian Best Practice Guidelines. Legal requirements for administration on the part of the therapist limit provision of therapy in other health systems as well. For example, despite the capacity to deliver as much as 7 hours of physical therapy and 4 hours of occupational therapy per week in the United Kingdom, stroke patients received only 24 minutes of physical therapy and 7 minutes of occupational therapy (De Wit et al., 2005).

Few studies have attempted to explain variation in therapy time for patients admitted to inpatient rehabilitation facilities. In a study contrasting patients with moderate and severe stroke, Horn et al. (2005) found that patients with moderate stroke received a few more minutes of physical therapy per day than patients with severe stroke (43.5 ± 13.6 vs. 41.4 ± 13.9; $P = 0.033$). Group differences for occupational therapy time were not significant; however, patients with severe stroke received more therapy from a speech language pathologists (31.5 ± 15.2 vs. 25.6 ± 16.2; $P < 0.001$) (Horn et al., 2005).

2.2 Rationale and Objectives

As highlighted in the literature review, little is known about rehabilitation service patterns in Ontario CCC hospitals. The primary objective of this study is to characterize Ontario CCC rehabilitation service patterns by stratifying the reporting of therapy provision by patient factors such as diagnosis and level of function. In addition, this study will identify key patient, facility, and system-level factors that are associated with rehabilitation intensity in order to determine if variation in service provision is based on patient need.

2.2.1 Phase 1: Characterization of Rehabilitation Service Patterns in Ontario Complex Continuing Care Hospitals

This phase will describe patterns of rehabilitation service provision for patients in Ontario CCC hospitals. A focus will be placed on rehabilitation provided by physical therapists, occupational therapists, and speech language pathologists. In addition, rehabilitation activities performed by nursing staff such as training or skill practice in bed mobility, transfers, walking, or communication will be considered. Analyses will be stratified by major rehabilitation groups (e.g., orthopedic conditions, stroke, traumatic brain injury, spinal cord injury) in addition to level of physical and cognitive function at admission to CCC. This phase will aim to answer the following questions:

- What percentage of CCC patients, stratified by major rehabilitation group, and level of physical and cognitive function, receive therapy by rehabilitation professionals?
- How many minutes of rehabilitation therapy do CCC patients, stratified by major rehabilitation group, and level of physical and cognitive function, receive from rehabilitation professionals each week?

2.2.2 Phase 2: Factors Associated with Rehabilitation Intensity in Ontario Complex Continuing Hospitals

The aim of this final phase will be to develop a series of models to identify patient, facility, and system-level factors that are associated with total and provider-specific rehabilitation intensity in Ontario CCC hospitals.

This phase will aim to answer the following questions:

- What patient-level factors are associated with receipt of rehabilitation and provider-specific rehabilitation intensity?
- After accounting for patient characteristics, are there facility and system-level factors that are associated with receipt of rehabilitation and greater provider-specific rehabilitation intensity.

2.3 Methods

2.3.1 Data Source

A retrospective cross-sectional study of patients admitted to Ontario CCC hospitals was undertaken to characterize rehabilitation service patterns. This study used interRAI Resident Assessment Instrument (RAI) Minimum Data Set 2.0 (MDS 2.0) assessments contained in the Canadian Institute for Health Information (CIHI) Continuing Care Reporting System (CCRS) data repository. The CCRS includes MDS 2.0 assessments from residential long-term care and CCC sectors form 9 Canadian provinces and territories (Yukon, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Newfoundland, and Labrador) (Canadian Institute for Health Information, 2017). The MDS 2.0 is a comprehensive clinical assessment used in continuing care settings to evaluate patients across a broad range of health domains including physical functioning, cognition, mood and behaviour, social functioning, diseases and conditions, health service and medication utilization (Bernabei et al., 2008; Gray et al., 2009; Hirdes et al., 2011; Ikegami et al., 2002).

In Ontario, the MDS 2.0 admission assessment is completed within fourteen days of admission for all CCC patients with a length of stay of fourteen days or more. Among the 22,766 patients that were admitted to CCC hospitals during 2015/2016 fiscal year, 15.5% had a length of stay less than 14 days and were not assessed using the MDS 2.0 assessment (Canadian Institute for Health Information, 2016a). Patient re-assessments are completed every 90 after the admission assessment using either a full assessment or a quarterly assessment with a reduced number of items. Full assessments are repeated on a yearly basis for individuals whose length of stay extends beyond one year. The CCRS data repository represents all Ontario CCCs facility patients assessed using the MDS 2.0 instrument beginning July 1st, 1996 (Hirdes et al., 2003b).

The MDS 2.0 assessment has numerous evidence-informed applications including patient care planning, decision support, quality assessment, case-mix based funding, research, and policy development (Fries et al., 2007; Mor, 2005; Zimmerman et al., 1995; Morris et al., 1999; Hawes et al., 1992; Hirdes et al., 1999; Hirdes et al., 2003b). In addition to the individual items on the assessment, a series of validated clinical scales, such as the Cognitive Performance Scale (CPS) (Morris et al., 1994) may be derived from the assessment. These outcome scales provide users with summary measures of patient health status that can be used to measure clinical change over time or describe patient populations at an aggregate level.

Reliability

The first inter-rater reliability study of the MDS 1.0 assessment was completed with a sample of 123 nursing home residents from thirteen facilities across five states in the United States (Hawes et al., 1995). The assessment was divided into eighteen sections, and five sections achieved Spearman-Brown inter-class correlation coefficients greater than 0.7, indicating excellent reliability. An additional seven sections achieved average reliabilities of 0.6 to 0.69. The earliest international inter-rater reliability study of the MDS 1.0 assessment was conducted in nursing homes across seven English and non-English speaking countries including the United States, Denmark, Iceland, Italy, Japan, Sweden, and Switzerland (Sgadari et al., 1997). Across countries, 76% to 97% of items on the assessment achieved adequate inter-rater reliability ($\kappa \geq 0.4$) and 17% to 84% of items achieved excellent reliability ($\kappa \geq 0.75$). The MDS 2.0 assessment was modified to include many new and revised items, but retained 82 items from the MDS 1.0 assessment (Morris et al., 1997a). In a sample of 187 randomly selected nursing home residents from 21 nursing homes across seven states in the United States, nearly all the new MDS 2.0 items achieved adequate inter-rater reliability ($\kappa \geq 0.4$). In addition, revised items averaged an 18% kappa value increase due to changes in process instructions, item definitions, and examples (Morris et al., 1997a). The Activity of Daily Living (ADL) items achieved weighted κ ranging from 0.87 for personal hygiene to 0.94 for eating (Morris et al., 1999). A review by Poss et al. (2008), highlights additional studies that have investigated the reliability of interRAI assessments and their associated case-mix algorithms and quality indicators.

The most recent reliability study of the MDS 2.0 assessment was completed by Hirdes et al.

(2013) who measured the internal consistency of items used in the algorithms for several outcome scales using a sample of 466,767 assessments completed in Ontario CCC hospitals and a 900,995 assessments completed in Long-term Care (LTC) facilities. Cronbach's Alpha statistics for the items on the Activities of Daily Living Long Form Scale (ADL-Long) scale ranged by calendar quarter between 0.92 and 0.94, indicating excellent internal consistency. For the Depression Rating Scale (DRS) and the Aggressive Behaviour Scale (ABS) they ranged from 0.70–0.77 and 0.72–0.81, respectively. Finally, using a sample of patients from skilled nursing facilities in the United States, Jette et al. (2003) found that the internal consistency of 19 functional items (i.e., ADL, bowel and bladder continence, and select measures of cognition) on the MDS 2.0 assessment was excellent ($Cronbach's\ \alpha = 0.97$).

Validity of Items and Scales Related to Physical Function

The MDS 2.0 assesses ADL self-performance using a five-point scale based on the level of assistance that a patient requires to complete a given ADL. The following ADLs are assessed: bed mobility, transfer, walk in room, walk in corridor, locomotion on unit, locomotion off unit, dressing, eating, toilet use, and personal hygiene. Self-performance on these ADL is assessed using the following scaling: independent, supervision, limited assistance, extensive assistance, total dependence. An additional level on the scale is available to denote when ADL did not occur during the entire seven-day assessment period. Self-performance in bathing is also assessed; however, it uses a different scale. The level of assistance that is required to complete the activity is segmented based on whether the amount of physical help required to complete the task is limited to transferring or part of the bathing activity.

Jette et al. (2003) compared the functional items on four instruments used in post-acute (MDS, OASIS, FIM, PF-10) and found that the items on the MDS covered 89% of the range of an overall functional ability scale created using a Rasch partial credit model. Comparatively, the FIM assessment covered 61% of the range of functional abilities and overlapped completely with the range covered by the MDS 2.0 (Jette et al., 2003). Williams et al. (1997) created a cross-walk between the FIM and MDS 2.0 using items that were comparable across both assessments. Twelve FIM items with analogous MDS 2.0 counterparts were found. Mean differences between FIM and re-scaled "Pseudo-FIM" items based on the MDS 2.0 items were not significantly different for 8 items (eating, transferring, toileting, dressing, grooming, bladder control, memory, and problem solving). Sub-scales created using comparable MDS 2.0 items were strongly correlated with FIM sub-scales, achieving Spearman-Brown correlation coefficients of 0.81-0.82 (Williams et al., 1997).

The functional items on the interRAI Post-acute Care (PAC) assessment and the FIM motor sub-scale have been compared on the basis of internal responsiveness to functional change following rehabilitation in musculoskeletal and geriatric rehabilitation units (Glenny et al., 2010). Items from both the interRAI PAC and FIM instruments were able to detect functional change in both populations; however, the FIM motor sub-scale was more responsive when compared using effect size and standardized response mean statistics due to less between-subject variance (Glenny et al., 2010). In a follow-up study using Rasch analysis, Glenny et al. (2012) found that scales from both the FIM and interRAI PAC were unable to differentiate between patients with middle and higher ranges of physical functioning. The psychometric properties of the functional items on the interRAI PAC should not be equated to the MDS 2.0 because the interRAI PAC uses an expanded seven-point scale. However, given that the range of these scales is equivalent, ceiling-effect limitations are also likely to affect the functional items on the MDS 2.0 assessment.

There are three scales that can be used to measure function using the ADL items on the MDS 2.0 assessment. The ADL-Long scale is an additive scale of the dressing, personal hygiene, toilet use, locomotion on unit, transfer, bed mobility, and eating ADLs. The range of this scale is from 0-28, with greater scores indicating more impairment of self-sufficiency in ADL performance (Morris et al., 1999). The Activities of Daily Living Short Form Scale (ADL-Short) scale is also an additive scale; however, it uses only four ADL items to represent a range of early, middle, and late loss ADLs. The range of this scale is from 0-16. Again, greater ADL-Short form scores indicate more impairment of self-sufficiency in ADL performance (Morris et al., 1999). Finally, the Activities of Daily Living Hierarchy Scale (ADL-H) takes early, middle, and late loss activities of daily living into account to create a hierarchical measure of functional performance (Morris et al., 1999). For the purposes of measuring change in patient function over time, the ADL-Long and ADL-Short form scales are more likely to detect minor shifts in function given their additive nature. Indeed, 23% of nursing home residents are expected to have decline detected by the ADL-Long form scale over a 3-month period, compared to 10.5% when measured using the ADL-H Scale (Morris et al., 1999).

Measures of Rehabilitation Intensity

Rehabilitation intensity by provider type (i.e., speech language pathology therapy, occupational therapy, and physical therapy) may be determined using the MDS 2.0. The assessment captures the number of days in the previous seven days where therapy was administered for 15 minutes or more. In addition, the total number of minutes of therapy provided in the previous week, by provider type, are collected. The reliability of the rehabilitation intensity measures on the MDS 2.0 assessment has not yet been studied; however, preliminary analysis of 1,510 patients from the Canadian Staff Time and Resource Intensity Verification (CAN-STRIVE) project has been completed by the author of this dissertation. Therapist staff time measurements that were collected proximate to the usual MDS 2.0 assessment did not differ substantially. Additionally, there was moderate agreement between RUG-III Special Rehabilitation group classification at the time of the usual MDS 2.0 and the staff time measurement. These results are presented in Appendix A.3.

In addition to the continuous measures of rehabilitation intensity by provider that are collected on the MDS 2.0 assessment, the Resource Utilization Groups Version III (RUG-III) case-mix system may also be used to categorize patients into discrete levels of rehabilitation intensity (Fries et al., 1994). The RUG-III case-mix system classifies patients into 44 mutually exclusive groups based on information collected using the MDS 2.0. Given the hierarchical configuration of the case-mix system, all patients that receive at least 45 minutes of therapy per week and 2+ nursing rehabilitation activities qualify for the "Special Rehabilitation" RUG-III category. Patients that qualify for this category are then sub-divided into case-mix groups based on the intensity of rehabilitation they receive. This provides a convenient way to categorize patients into six groups based on the intensity of rehabilitation they receive (Table 2.1).

Beyond therapy provided by specialized therapy staff, the assessment features a "pick-list" of rehabilitation or restorative techniques and practices that may be delivered by nursing staff. The assessment captures the number of days in the previous week where nursing rehabilitation was provided to the patient for at least 15 minutes. The activities in this list include: range of motion (passive and active), splint or brace assistance, and training or skill practice in bed mobility, transfer, walking, dressing or grooming, eating or swallowing, amputation or prosthesis care, and communication. The current version of the RUG-III algorithm used in Ontario CCC hospitals requires that patients receive each nursing rehabilitation activity on six or more days during the assessment period to qualify for the "Low Intensity" RUG-III Special Rehabilitation sub-category. However, when constructing binary variables for receipt of nursing rehabilitation in this dissertation, a five day threshold was used to conform with the algorithm described in the RUG-III derivation study (Fries et al., 1994).

Table 2.1: Rehabilitation Intensity Categories Based on the RUG-III Case-mix System Special Rehabilitation Sub-categories

Special Rehabilitation Sub-category	Eligibility
Low intensity	45+ minutes of rehabilitation per week, with 3+ days per week of therapy, and 2+ types of nursing rehabilitation
Medium intensity	150+ minutes of therapy per week, with 5+ days per week of one type of therapy
High intensity	325+ minutes of therapy per week, with 5+ days per week of one type of therapy
Very high intensity	500+ minutes of therapy per week, with 5+ days per week of one type of therapy
Ultra high intensity	720+ minutes of therapy per week from at least 2 disciplines, with 5+ days per week of one type of therapy, and 3+ per week of the second therapy
Did not qualify for Special Rehabilitation category	All other patients

Independent Variables

Patient, facility, and system-level factors that may be associated with rehabilitation service patterns were selected as independent variables based on information obtained through a review of the academic literature. With some exceptions, MDS 2.0 items that were selected as independent variables were used in the analyses without rescaling. Therefore, only variables that were constructed or collapsed are discussed in this section.

Patient Demographics Sex (AA2) was reported as a binary item called 'Female', where female sex patients were denoted by a value of one. Approximate age at assessment measured in years was reported by calculating the difference between the 'Assessment Reference Date' (A3) and 'Birth Date' (AA3a). Age was collapsed into a five level ordinal variable (0-64, 65-74, 75-84, 85-94, 95+) and reported in years.

Diagnostic Conditions Diagnostic condition groups that were selected as independent variables were identified by selecting the most commonly represented Rehabilitation Client Groups (RCGs) from the Rehabilitation Patient Groups (RPG) case-mix system in a sample of 157,027 patients in Ontario inpatient rehabilitation beds reporting to the National Rehabilitation Reporting System maintained by CIHI. To the best extent possible, items from the MDS 2.0 diseases "pick-list" were used to create an RCG crosswalk. Due to its broad nature, the "Other Disabilities" RCG could not be created using MDS 2.0 disease "pick-list" items. In lieu of the "Other Disabilities" RCG, the "Neoplasms" and "Other Medically Complex Conditions" sub-groups were created as the conditions associated with these RCGs were prevalent in the Ontario CCC sample used in this study. MDS 2.0 items used to create each group are presented in Table 2.2.

Rehabilitation Potential A four-level "Rehabilitation potential" variable was created by combining the items "Resident believes self to be capable of increased independence in at least some ADLs" (G8a) and "Direct care staff believe resident is capable of increased independence in at least

Table 2.2: Rehabilitation Patient Groups Impairment Category Crosswalk Using MDS 2.0 Items

Impairment Category	MDS 2.0 Items
Stroke	Cerebrovascular accident (i1u), Transient ischemic attack (i1dd)
Traumatic brain injury (brain dysfunction)	Traumatic brain injury (i1ee)
Neurological conditions	Multiple sclerosis (i1y), Parkinson's (i1aa), Cerebral palsy (i1t), Amyotrophic lateral sclerosis (i1q), Huntington's disease (i1x), Seizure disorder (i1cc)
Spinal cord injury (spinal cord dysfunction)	Paraplegia (i1z), Quadriplegia (i1bb)
Arthritis	Arthritis (i1l)
Orthopedic	Hip fracture (i1m), Pathological bone fracture (i1p), Hip fracture in last 180 days (j4c), Other fracture in last 180 days
Amputation	Missing limb (e.g., amputation) (i1n)
Cardiac disorders	Arteriosclerotic heart disease (i1d), Cardiac dysrhythmia (i1e), Congestive heart failure (if), Other cardiovascular disease (i1k)
Pulmonary disorders	Asthma (i1jj), Emphysema/Chronic obstructive pulmonary disorder (i1kk)
Neoplasms	Cancer (i1rr)
Other Medically Complex Conditions	Renal failure (i1u), Liver failure (i1t)

some ADLs" (G8b). This subjective rehabilitation potential item has the following response options: "Neither Patient or Provider", "Only Patient", "Only Provider", "Both Patient and Provider."

Facility and System-level Variables In addition to patient-level information, the CCRS data repository includes select facility-level information. A binary facility area item was used to differentiate between facilities located in urban and rural areas. A facility size variable was used to classify facilities based on their designated number of CCC beds. The following thresholds are used: "Small" (1-25 beds), "Medium" (25-100 beds), "Large" (101+ beds). A facility area income variable which classifies facilities into five groups based on the dissemination area that the facility is located in was also used. This variable uses the Statistics Canada Quintile of Annual Income Per Person Equivalent methodology. Facilities that could not be classified were grouped into a

"Not Assigned" category. Finally, a region item which classifies facilities by Ontario's fourteen Local Health Integration Networks (LHINs) was used. A map of Ontario's LHINs is presented in Figure 2.1.

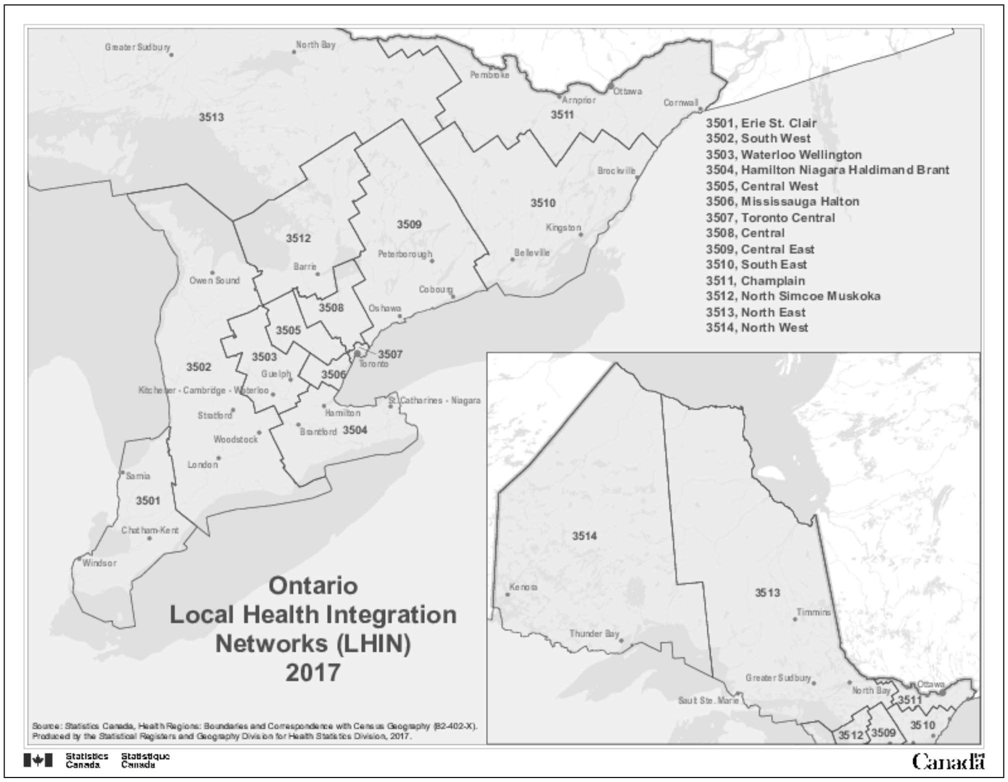


Figure 2.1: Map of Ontario's Local Health Integration Networks

2.3.2 Phase 1: Characterization of Rehabilitation Service Patterns in Ontario Complex Continuing Care Hospitals

Study Design and Sample

This study was a retrospective cross-sectional study of patients admitted to Ontario CCC hospitals between March 31st, 2011 and March 31st, 2016. Given that CCC is a transitional care setting, it is possible that patients may be admitted to higher or lower levels of care multiple times for a short period before returning to a CCC facility for the remainder of their care. Therefore, the unit of analysis for this study were "episodes of care." An episode of care was defined as the period a patient receives care in a CCC facility without a temporary discharge of more than fourteen days. Patients that were re-admitted to a CCC facility more than fourteen days after the previous CCC discharge date were issued a new episode of care identifier if an MDS 2.0 “Full Assessment” was completed within fourteen days of re-entry. Episodes of care where this condition was not met were removed from the sample. Patients that were comatose on admission to the CCC facility were also removed from the sample. Finally, episodes of care where an improbable therapy intensity was recorded on the MDS 2.0 assessment for either physical therapy, occupational therapy, or speech-language pathology therapy were removed from the sample. These thresholds were selected by identifying episodes of care at the 99.99th percentile for each therapy type. A total of 32 outlier cases were removed. A final sample of 100,778 episodes of care, representing 90,861 unique patients, were used for this phase of the study. Patients with more than one episode of care represented 9.2% of the sample (Table 2.3).

Table 2.3: Composition of Sample by Number of Episodes of Care Contributed Per Patient

Number of Episodes of Care	Percentage of Sample
1	90.79%
2	7.92%
3	1.02%
4	0.21%
5+	0.06%

Analytic Strategy

Mean rehabilitation intensity per week was reported for each therapy provider type (physical therapy, occupational therapy, and speech-language pathology therapy). This analysis was repeated to stratify patients by patient, facility, and system-level factors that were identified in the literature as sources of variation for rehabilitation therapy intensity. Independent variables that were examined included demographic factors, diagnoses, health conditions, functional performance measures, cognition, communication, change in health status, rehabilitation potential, and level of engagement. In addition to individual items on the MDS 2.0 assessment, several outcome measures including the ADL-H Scale, CPS, Pain Scale, DRS and Changes in Health, End-Stage Disease, Signs, and Symptoms Scale (CHESS) were used as variables for stratification. Although other commonly used measures of medical complexity, such as the Charlson Comorbidity Index, can be computed using data elements from the MDS 2.0 assessment, CHESS was used to measure medical instability in this study because it is a signs and symptoms-based measure that is independent of diagnosis and functional status (Hirdes et al., 2003a; Hirdes et al., 2014). Additionally, several variants of the Frailty Index, can be computed using MDS 2.0 assessment. Although CHESS is not a direct measure of frailty, it performs comparably with frailty indices when predicting death, hospitalization, and move to long-term care (Hogan et al., 2012). CHESS was used in favour of a frailty index in this study because it was developed using a sample of Ontario CCC patients.

In addition to patient-level factors, a few facility and system-level factors were examined. These factors were facility size, facility area density (i.e., rural or urban area), facility area income quintile, and health region (i.e., LHIN). Given that therapy intensity in this sample does not follow a normal distribution, non-parametric Kruskal-Wallis H test for comparisons of means between levels of stratification variables were performed. All patients in the sample, including patients that did not receive any therapy during the assessment period, were included when calculating mean therapy intensity by provider type.

The percentage of patients that received any rehabilitation (15+ minutes), 45+ minutes over 3+ days, 150+ minutes over 5+ days, and 325+ minutes per week over 5+ days was reported for the patient, facility, and system-level factors discussed previously. These thresholds were selected as they correspond to therapy intensity cut-points from the RUG-III case-mix system algorithm. Chi-square tests were used to ascertain differences in frequency response by group stratification variables. All analyses were performed using SAS® 9.4 (SAS Institute, Inc., Cary, NC).

2.3.3 Phase 2: Factors Associated with Rehabilitation Intensity in Ontario Complex Continuing Hospitals

Study Design and Sample

Using the cross-sectional sample of 100,788 episodes of care for patients admitted to Ontario CCC hospitals between March 31st, 2011 and March 31st, 2016 from Phase 1, this second phase of the study sought to understand the patient, facility, and system-level factors that are associated with provider-specific rehabilitation at admission to a CCC hospital in Ontario. Additionally, given that not all patients in Ontario CCC hospitals receive rehabilitation therapy, this phase of the study also sought to understand the patient, facility, and system-level factors that are associated with provision of any amount of rehabilitation by each provider type. To achieve these objectives, a series of zero-inflated negative binomial regression models were fit.

Analytic Strategy

Zero-inflated negative binomial regression models belong to the family of generalized linear models and are used to model outcomes that follow an overdispersed Poisson distribution with an abundance of zero values (Slymen et al., 2006; Atkins and Gallop, 2007). These distributions assume that zero values occur as a result of two distinct processes: random and structural zeros (He et al., 2014). Random zeros occur as a result of normal sampling variability. For example, when modelling therapy intensity as a dependent variable, random zeros occur in situations where patients are not provided rehabilitation therapy as a result of their health status, but could otherwise access therapy. Structural zeros occur when a sub-group of the sample may only produce a zero value. For example, regardless of health status, patients that are admitted to CCC facilities that do not offer rehabilitation therapy will always produce zero values. Distinguishing between random and structural zeros is important because despite a common outcome, these patients may differ in both health status and demographic characteristics (He et al., 2014).

Zero-inflated negative binomial regression models are mixture models composed of a logistic regression component to predict zero cases and a negative binomial regression component to predict counts among non-zero cases (Atkins and Gallop, 2007). This means that a separate set of parameter estimates for each component of the model are computed. The parameter estimates for the logistic regression component are on the logit scale and can be exponentiated to obtain the odds of being a certain zero case (Atkins and Gallop, 2007). The parameter estimates for the negative binomial component of the model can be interpreted as the difference in the log of the expected counts for a single unit change in the independent variable. For example, a parameter estimate of -0.5 for a binary independent variable can be interpreted as a decrease in the expected log count of the dependent variable by 0.5 units. These parameter estimates can also be exponentiated to obtain a rate ratio for the relative change in the dependent count variable given a single unit change in the independent variable. It is important to note that the independent variables used in the two components can differ (Atkins and Gallop, 2007).

Model specification was performed in a stepwise manner, with all patient-level effects entered into the model before the facility and system-level effects. Candidate variables for each model were selected based on the magnitude of the effects in the univariate analyses performed in Phase 1. Specifically, candidate variables to be included in the negative binomial regression component of the model were selected based on the analyses comparing mean differences in the count of therapy minutes. Candidate variables for the logistic regression component of the model were selected based on the percentage of patients that received at least 15+ minutes of therapy, as this threshold identifies non-zero cases. Candidate variables were entered into each component of the model if the Chi-square value for the likelihood ratio test had a *P-value* less than 0.05 and reduced the overall model Akaike Information Criterion (AIC) statistic over the nested model that previously fit in the stepwise process.

The zero-inflated negative binomial regression model was fit using the `SAS GENMOD` procedure with the `ZEROMODEL` statement. The `ZEROMODEL` statement does not allow the user to specify the event category for the binary response model, meaning that the logit component of the model can only model the absence of therapy as the event of interest. The odds ratio estimates were presented as inverse odds ratios for easier interpretation of results, as most were less than 1.00. The inversion allows for result statements without the use of double negatives. For example, “stroke patients were more likely to receive physical therapy” instead of “stroke patients were less likely to not receive physical therapy.” All analyses were performed using SAS® 9.4 (SAS Institute, Inc., Cary, NC).

2.4 Results

2.4.1 Sample Clinical Characteristics

The clinical characteristics of the sample used in Phase 1 and 2 of this study are presented in Appendix A.1. Nearly two-thirds of the sample were aged 75 and older, and had a support person that was positive towards discharge. Nearly half of the sample had a cardiac condition, and approximately one-quarter of the sample had arthritis, cancer, an orthopedic condition, or had sustained a stroke. Half of the sample had an unsteady gait, and a quarter of patients experienced shortness of breath. Stage two or greater pressure ulcers were prevalent in the sample. Nearly two-thirds of the sample required at least extensive assistance to complete some basic ADLs, and one-third had moderate or worse cognitive impairment and medical instability. Approximately three-quarters of sample experienced pain, and 21% showed signs of depression. In the last 90 days, two-thirds of the sample had experienced a deterioration in their ADL function, and one-third had experienced a deterioration in their cognitive status. Based on subjective appraisal from either the care provider or the patient, half of the sample had some rehabilitation potential.

2.4.2 Phase 1: Characterization of Rehabilitation Service Patterns in Ontario Complex Continuing Care Hospitals

Therapy Intensity Distributions

The distribution of weekly physical therapy minutes for the sample of Ontario CCC patients is presented in Figure 2.2. The median physical therapy intensity that was provided was 90 minutes, with an interquartile range extending from 30 to 155 minutes. Twenty-percent of the sample did not receive any physical therapy on their MDS 2.0 admission assessment. The distribution of weekly occupational therapy minutes was similar to the distribution for physical therapy minutes, except the median value was 50 minutes and the interquartile range extended from 0 to 120 minutes. Thirty-percent of the sample did not receive any occupational therapy (Figure 2.3). Given that 84% of the sample did not receive speech-language pathology therapy, a zero-truncated distribution of speech-language pathology therapy minutes is presented in Figure 2.4. Among patients that received speech-language pathology therapy, the median intensity was 45 minutes with an interquartile range of 30 to 90 minutes.

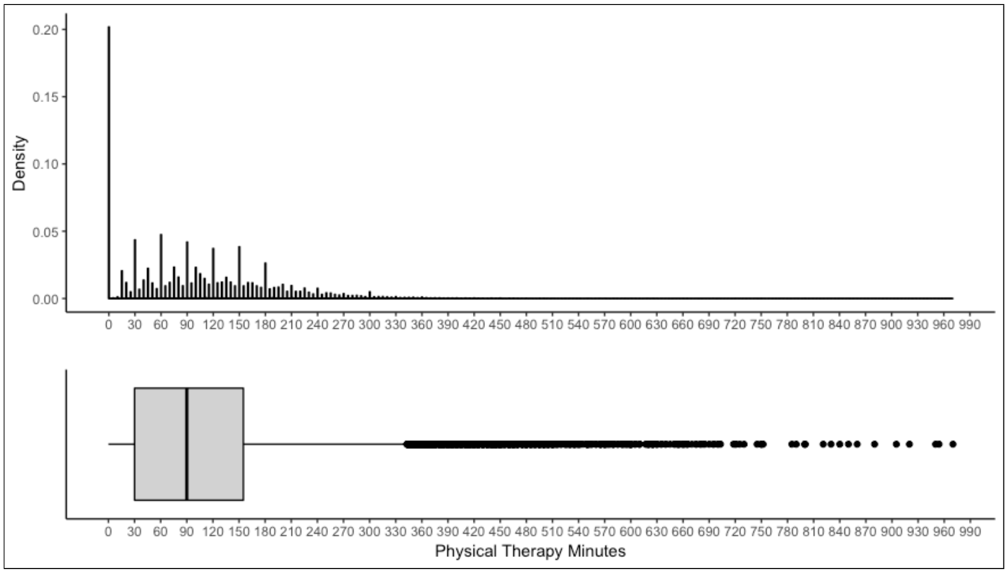


Figure 2.2: Physical Therapy Intensity Distribution, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

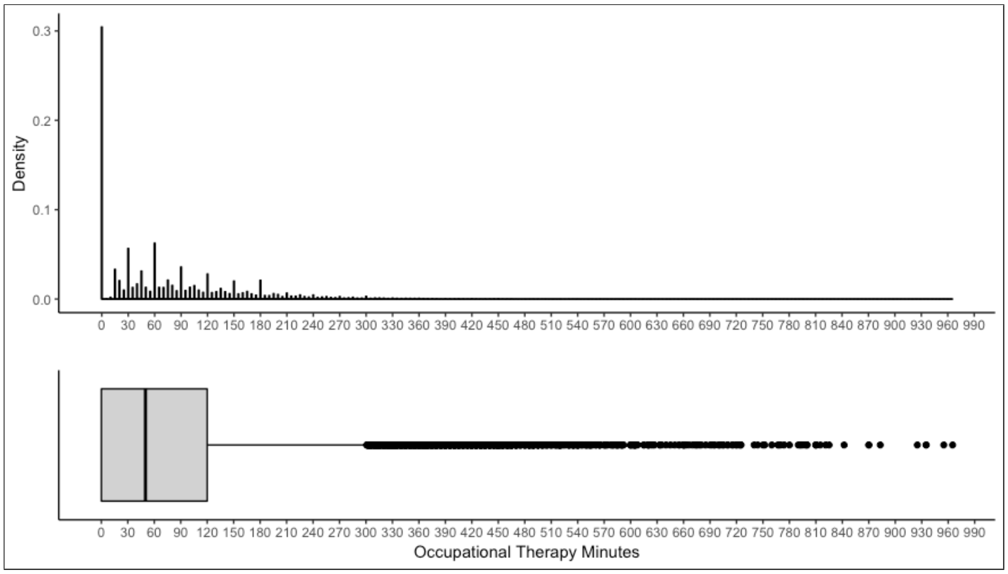


Figure 2.3: Occupational Therapy Intensity Distribution, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

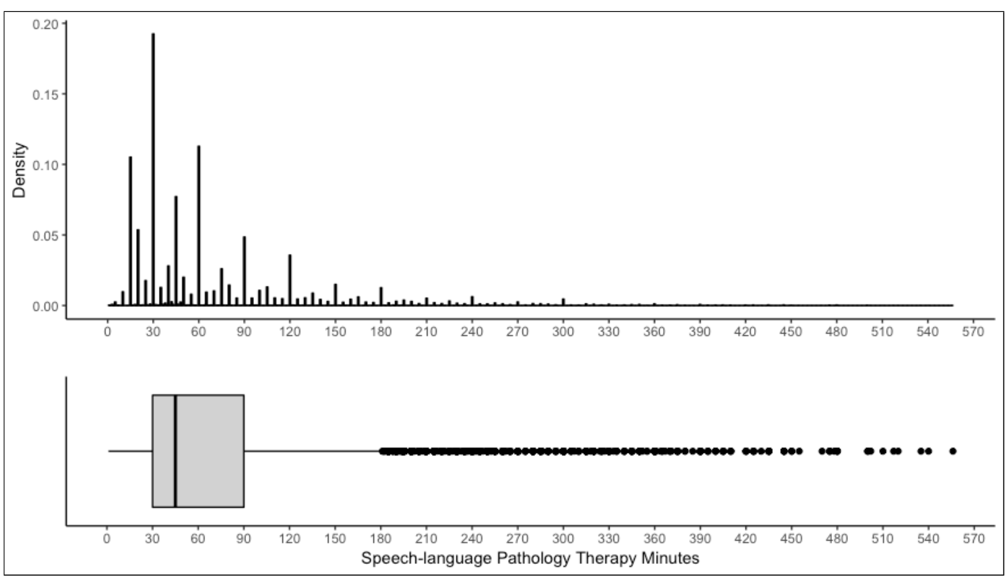


Figure 2.4: Zero-truncated Speech-language Pathology Therapy Intensity Distribution, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Mean Rehabilitation Intensity

Overall, patients in the sample received an average of 103.4 (SD = 92.3) minutes of physical therapy, 74.5 (SD = 86.7) minutes of occupational therapy, and 11.1 (SD = 37.2) minutes of speech-language pathology therapy per week. Patients aged 65-74 and 75-84 years old received the most physical therapy minutes per week, while those aged 95+ received the fewest minutes of physical therapy. There was a negative relationship between age and occupational therapy intensity, wherein patients aged 0-64 received the most minutes per week and patients aged 95+ received the fewest minutes. A similar trend was observed for age and speech-language pathology therapy. Female patients received similar amounts of physical and occupational therapy each week compared to patients that were not female; however, female patients received fewer minutes of speech-language pathology therapy each week. Finally, patients with a support person that was positive towards discharge received approximately 50% more physical and occupational therapy time each week. This was also true for speech-language pathology therapy, except the relative difference was only 10% (Table 2.4).

Table 2.4: Mean Weekly Therapy Intensity by Rehabilitation Provider and Patient Demographics, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Overall		103.4 (92.3)	74.5 (86.7)	11.1 (37.2)
Age	0-64	98.7 (98.5)	79.9 (97.4)	16.3 (48.7)
	65-74	105.2 (96.3)	76.6 (90.0)	11.9 (39.4)
	75-84	106.6 (92.2)	75.2 (85.3)	10.1 (34.8)
	85-94	102.7 (87.7)	71.5 (81.5)	9.4 (32.0)
	95+	91.5 (82.7)	62.1 (75.9)	9.7 (30.3)
	Test Statistic[1]	232.5	99.9	138.3
	P-value	<.0001	<.0001	<.0001
Female	No	101.4 (94.8)	74.4 (89.3)	13.7 (41.7)
	Yes	104.8 (90.4)	74.6 (84.7)	9.2 (33.2)
	Test Statistic[1]	98.1	20.8	498.1
	P-value	<.0001	<.0001	<.0001
Support Person Present	No	57.6 (72.4)	44.9 (69.2)	10.4 (31.7)
	Yes	128.0 (92.5)	90.4 (90.9)	11.6 (39.8)
	Test Statistic[1]	16783.2	9195.6	128.8
	P-value	<.0001	<.0001	<.0001

[1] Kruskal-Wallis H Test

Among the conditions that were studied, only patients that were admitted with cancer, and spinal cord injury received less physical therapy than those patients without the condition. There was no difference for patients with other medically complex conditions. Otherwise, patients with the health conditions that were studied received more physical therapy than those without the condition (Table 2.5). Only cancer patients received less occupational therapy than patients without cancer. There was no difference for patients with pulmonary condition and spinal cord injury. Patients with all other conditions that were studied received more occupational than those without the condition (Table 2.5). Patients with amputation, arthritis, pulmonary conditions, and orthopedic conditions received less speech-language pathology therapy than patients without the condition. Conversely, patients with cardiac conditions, neurological conditions, spinal cord injury, stroke, and traumatic brain injury received more speech-language pathology therapy each week. There was no difference in speech-language pathology therapy intensity for patients with other medically complex conditions (Table 2.5).

Patients with aphasia receive significantly more occupational therapy and speech-language pathology therapy minutes per week compared to patients without aphasia. Those experiencing hallucinations or delusions received significantly less physical and occupational therapy than patients without the condition. The difference in means for the intensity of speech-language pathology therapy was negligible. Patients with a stage two or greater pressure ulcer received slightly less therapy from all providers. This was also true for patients experiencing shortness of breath; however, the magnitude of the difference was substantially greater. Those that had an unsteady gait when walking received more physical and occupational therapy minutes each week than those without gait problems. Patients with a fluctuating health status as a result of conditions or diseases that made their cognitive, ADL, mood, or behaviour patterns unstable received less therapy from physical and occupational therapists; however, they received more therapy from speech-language pathology therapists. Finally, patients experiencing an acute episode or a flare-up of a recurrent or chronic problem received more physical and speech-language pathology therapy. There was no difference in the intensity of occupational therapy provided for these patients (Table 2.6).

When stratified by ADL-H Scale score, a curvilinear relationship between level of dependence and intensity of physical therapy and occupational therapy was observed. There was a positive linear relationship between level of dependence in activities of daily living and speech-language pathology therapy intensity, with the most dependent patients receiving the most therapy each week (Table 2.7).

There was a negative linear relationship between level of cognitive impairment (CPS score), and weekly physical therapy intensity. Patients with a CPS score of zero received an average of 121.95 (SD = 94.27) minutes of therapy per week, while those with a CPS score of six received an average of 42.69 (SD = 66.33) minutes of therapy per week. When stratified by CPS score, occupational therapy intensity follows a similar curvilinear pattern as the ADL-H Scale. Patients with a CPS score of two received the most intensive occupational therapy per week. Finally, there was a curvilinear relationship between speech-language pathology therapy intensity and CPS score. Patients with a CPS score of four received the most intensive speech-language pathology therapy (Table 2.7).

When stratified by CHESS, therapy intensity minutes by all three providers follows a curvilinear pattern. Patients with CHESS scores of one received the most physical and occupational therapy minutes each week, respectively averaging 125.44 (SD = 93.69) and 90.08 (SD = 94.05) minutes per week. Patients with CHESS scores of two to four received the most intensive speech-language pathology therapy (Table 2.7).

Patients with Pain Scale scores of zero and two received the most physical and occupational therapy each week. These scores correspond to patients experiencing no pain, and daily pain that was not severe. Patients that experienced daily and severe pain received the least amount of therapy from these providers. With respect to speech-language pathology therapy, as Pain Scale scores increased, patients received less intense therapy. Finally, patients DRS scores of three or greater, indicating a potential mood disorder, received less therapy from all providers (Table 2.7).

Table 2.8 presents mean weekly therapy intensity by rehabilitation provider and level of dependence in the completion of the following activities of daily living: bed mobility, transfer, locomotion on unit, eating, toilet use, and bathing. For all ADLs, there was a curvilinear relationship between level of dependence, and physical and occupational therapy intensity. Except for bathing, which uses a different scale, patients that required limited assistance to complete the ADL received the most therapy per week. Patients that were totally dependent received approximately half as much therapy per week as patients that required limited assistance. Except for toilet use and bathing, when the ADL activity itself did not occur during the entire seven day assessment period, patients received very little therapy relative to those that were totally dependent. For bathing and toilet use, patients where the ADL did not occur received comparable amounts of physical and occupational therapy as patients that were totally dependent for the completion of the activity. Generally, a similar curvilinear association occurred for speech-language pathology therapy intensity; however, it was patients that were totally dependent for the ADL that received the most therapy.

In line with the trend observed for CPS, patients with deficits in short-term memory, decision-making skills, expression, speech clarity, and comprehension received less physical and occupational therapy minutes as severity increased. Conversely, patients with deficits in these areas received significantly more intensive speech-language pathology therapy (Table 2.9). A similar trend was observed for items related to feeding. Patients with chewing and swallowing problems, need for a mechanically altered diet, and feeding tube received less intensive physical and occupational therapy. However, patients with these problems received approximately three-times more speech-language pathology therapy minutes per week (Table 2.10).

Patients whose ADL function had improved in the past 90 days received the most intensive physical and occupational therapy. Patients whose ADL function had deteriorated received more physical and occupational therapy minutes than those with no change in ADL function in the past 90 days. In the case of speech-language pathology therapy, patients whose ADL function had recently deteriorated received the most therapy minutes per week. Those who had not experienced a change in cognitive status in the past 90 days received the most intensive physical and occupational therapy, followed by patients whose cognitive status had recently improved. Patients who cognitive status had deteriorated in the last 90 days received substantially more speech-language pathology therapy minutes than patients whose status had improved or was unchanged. Change in communication or hearing followed a similar trend; however, both patients who had improved and declined in this domain received more therapy than patients where there was no recent change. Patients who had experienced a recent improvement in their care needs such that they required fewer supports or a less restrictive level of care received substantially more physical and occupational therapy compared to patients that had not changed or had deteriorated. Finally, a subjective appraisal of rehabilitation potential from the care provider and patient's perspective differentiated the level of physical and occupational therapy that patients received. In situations where both the patient and the provider believed that the patient is capable of increased independence in at least some ADLs, the amount of therapy provided was nearly twice as much compared to situations where neither the patient nor the provider believed the patient had rehabilitation potential (Table 2.11).

Level of social engagement, as measured by the Index of Social Engagement (ISE), was generally associated with increased physical and occupational therapy intensity. There was relatively little difference in the intensity of speech-language pathology therapy across levels of social engagement. Patients that spent more time involved in activities, when awake and not receiving treatment or ADL care, received more intensive physical and occupational therapy. Conversely, patients that spent more time involved in activities received less speech-language pathology therapy per week (Table 2.12).

When stratified by facility size, there were negligible differences in the mean intensity of physical therapy provision; however, as facility size decreased, patients received progressively less occupational and speech-language pathology therapy minutes per week. For all therapy providers, patients that were admitted to facilities located in rural areas received significantly less therapy than patients admitted to facilities located in urban areas. The magnitude of this effect was greatest for speech-language pathology therapy, followed by occupational therapy. When stratified by facility area income quintiles, patients that were admitted to facilities located in the least affluent dissemination areas (1st quintile), received the least physical and occupational therapy. Across therapy providers, facilities located in the 4th quintile received the most therapy minutes. Note that 63 patients were admitted to facilities that were not classified into a facility area income quintile. Finally, there was significant variation in the mean intensity of therapy provided by all providers across Ontario's fourteen LHINs. For example, patients admitted to facilities located in the Hamilton Niagara Haldimand Brant LHIN received the most intensive physical and occupational therapy. Those that were admitted to facilities located in Toronto Central LHIN received the most intensive speech-language pathology therapy. Patients admitted to Erie St. Clair LHIN received the least intensive physical therapy, while patients admitted to North Simcoe Muskoka LHIN received the least occupational therapy minutes. Lastly, patients admitted to North East LHIN received the fewest speech-language pathology minutes (Table 2.13).

Table 2.5: Mean Weekly Therapy Intensity by Rehabilitation Provider and Diagnosis Group, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Condition		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Amputation	Present	114.35 (94.51)	85.50 (85.43)	6.83 (28.35)
	Absent	103.10 (92.23)	74.27 (86.73)	11.25 (37.39)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	1.33×10^8	1.36×10^8	1.16×10^8
Arthritis	Present	118.67 (93.06)	81.04 (86.15)	8.56 (31.45)
	Absent	97.44 (91.31)	72.02 (86.80)	12.15 (39.16)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	1.57×10^9	1.50×10^9	1.38×10^9
Cardiac Conditions	Present	111.69 (92.57)	79.56 (87.32)	12.32 (39.43)
	Absent	96.39 (91.49)	70.33 (85.98)	10.16 (35.19)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	2.46×10^9	2.41×10^9	2.34×10^9
Cancer	Present	85.28 (87.41)	70.19 (89.16)	10.42 (31.95)
	Absent	104.19 (92.43)	74.74 (86.60)	11.18 (37.42)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	1.94×10^8	2.09×10^8	2.26×10^8
Other Medically Complex Conditions	Present	101.66 (89.32)	75.44 (83.91)	10.74 (35.05)
	Absent	103.74 (92.93)	74.35 (87.31)	11.23 (37.65)
	P-value	0.1739	<.0001	0.4546
	Test Statistic[1]	9.02×10^8	9.21×10^8	9.05×10^8
Neurological Conditions	Present	107.51 (93.64)	81.35 (93.14)	15.73 (44.17)
	Absent	102.92 (92.14)	73.80 (85.96)	10.65 (36.33)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	5.11×10^8	5.16×10^8	5.27×10^8
Orthopedic Conditions	Present	127.70 (88.58)	83.67 (82.53)	6.15 (24.89)
	Absent	95.61 (92.11)	71.63 (87.81)	12.74 (40.22)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	1.45×10^9	1.35×10^9	1.16×10^9
Pulmonary Conditions	Present	104.93 (89.38)	72.60 (82.75)	9.81 (34.57)
	Absent	102.98 (93.01)	75.03 (87.68)	11.48 (37.83)
	P-value	<.0001	0.1817	<.0001
	Test Statistic[1]	1.04×10^9	1.02×10^9	1.01×10^9
Spinal Cord Injury	Present	84.42 (91.45)	76.71 (93.96)	15.83 (41.77)
	Absent	103.67 (92.28)	74.51 (86.59)	11.07 (37.12)
	P-value	<.0001	0.6836	<.0001
	Test Statistic[1]	6.89×10^7	8.07×10^7	8.61×10^7
Stroke	Present	115.24 (97.68)	88.53 (96.41)	25.02 (58.08)
	Absent	100.51 (90.72)	71.17 (83.86)	7.80 (29.09)
	P-value	<.0001	<.0001	<.0001
	Test Statistic[1]	1.06×10^9	1.08×10^9	1.11×10^9
Traumatic Brain Injury	Present	112.50 (104.20)	93.46 (102.52)	32.85 (68.54)
	Absent	103.22 (92.09)	74.24 (86.41)	10.80 (36.39)
	P-value	0.0088	<.0001	<.0001
	Test Statistic[1]	8.20×10^7	8.74×10^7	9.27×10^7

[1] Wilcoxon signed-rank test

Table 2.6: Mean Weekly Therapy Intensity by Therapy Provider and Patient Health Condition, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Aphasia	No	103.2 (91.4)	73.3 (84.2)	9.6 (33.8)
	Yes	107.8 (110.6)	102.2 (127.0)	44.2 (73.4)
	Test Statistic[1]	3.1	150.5	3416.3
	P-value	0.0764	<.0001	<.0001
Hallucinations/Delusions	No	105.7 (92.6)	75.7 (86.6)	11.1 (37.5)
	Yes	72.2 (81.9)	58.9 (87.3)	11.2 (33.0)
	Test Statistic[1]	1071.2	446.0	29.0
	P-value	<.0001	<.0001	<.0001
Stage 2+ Pressure Ulcer	No	105.3 (92.7)	75.0 (86.6)	11.2 (37.6)
	Yes	95.1 (89.9)	72.6 (87.3)	10.9 (35.6)
	Test Statistic[1]	215.6	17.2	12.5
	P-value	<.0001	<.0001	0.0004
Shortness of Breath	No	110.3 (93.7)	80.0 (90.1)	11.7 (39.6)
	Yes	82.7 (84.8)	58.2 (73.5)	9.5 (28.9)
	Test Statistic[1]	1987.2	1249.9	21.0
	P-value	<.0001	<.0001	<.0001
Unsteady Gait	No	91.4 (89.6)	68.5 (83.5)	11.7 (38.9)
	Yes	114.9 (93.3)	80.4 (89.3)	10.6 (35.5)
	Test Statistic[1]	2026.7	687.8	11.4
	P-value	<.0001	<.0001	0.0007
Fluctuating Health Status	No	110.5 (92.6)	80.9 (89.3)	9.6 (34.8)
	Yes	96.9 (91.5)	68.8 (83.9)	12.6 (39.2)
	Test Statistic[1]	704.3	577.8	307.2
	P-value	<.0001	<.0001	<.0001
Acute Episode of Chronic Disease	No	100.9 (90.5)	75.8 (89.3)	10.6 (36.8)
	Yes	107.2 (94.9)	72.5 (82.6)	12.0 (37.8)
	Test Statistic[1]	77.5	2.1	101.9
	P-value	<.0001	0.1426	<.0001

[1] Kruskal-Wallis H Test

Table 2.7: Mean Weekly Therapy Intensity by Therapy Provider and Outcome Measure Summary Scale, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
ADL-Hierarchy Scale	0	96.8 (94.7)	63.0 (83.2)	6.0 (30.6)
	1	118.5 (96.6)	76.7 (86.4)	5.7 (27.9)
	2	130.3 (90.6)	93.0 (92.3)	9.8 (38.4)
	3	127.2 (94.1)	87.8 (91.2)	9.9 (36.2)
	4	120.6 (90.9)	85.9 (84.4)	12.5 (38.4)
	5	84.2 (85.4)	63.8 (81.8)	11.9 (37.6)
	6	43.0 (66.4)	38.6 (70.0)	16.3 (39.1)
	Test Statistic[1]	11985.8	5915.0	1852.5
	P-value	<.0001	<.0001	<.0001
Cognitive Performance Scale	0	122.0 (94.3)	80.0 (86.2)	5.5 (25.7)
	1	113.0 (91.8)	80.4 (85.8)	8.5 (32.1)
	2	110.8 (91.4)	85.8 (90.5)	13.7 (43.5)
	3	92.1 (88.1)	68.4 (83.5)	13.2 (40.2)
	4	80.1 (89.9)	67.2 (95.1)	25.6 (56.4)
	5	80.0 (86.4)	59.0 (83.5)	14.4 (39.6)
	6	42.7 (66.3)	39.5 (72.6)	16.6 (38.9)
	Test Statistic[1]	6249.8	2799.2	2948.8
	P-value	<.0001	<.0001	<.0001
CHESS	0	108.5 (92.1)	74.4 (87.0)	8.7 (33.7)
	1	125.3 (93.7)	90.1 (94.1)	8.8 (33.9)
	2	120.9 (93.2)	87.5 (89.9)	14.0 (44.0)
	3	103.6 (88.6)	74.6 (83.4)	12.1 (37.6)
	4	70.6 (79.8)	53.1 (72.0)	13.2 (37.6)
	5	28.8 (50.8)	25.5 (50.8)	9.1 (26.6)
	Test Statistic[1]	11958.6	6751.1	606.1
	P-value	<.0001	<.0001	<.0001
Pain Scale	0	109.9 (96.5)	78.8 (91.0)	14.9 (45.0)
	1	97.7 (90.1)	68.7 (81.6)	10.4 (34.2)
	2	106.3 (90.6)	78.3 (88.1)	9.5 (34.2)
	3	88.2 (90.4)	64.5 (81.5)	8.0 (28.8)
	Test Statistic[1]	563.0	361.0	385.0
	P-value	<.0001	<.0001	<.0001
Depression Rating Scale	0-2	107.1 (93.2)	77.1 (88.1)	11.5 (38.6)
	3+	89.1 (87.2)	64.8 (80.6)	9.8 (31.4)
	Test Statistic[1]	699.9	325.7	1.3
	P-value	<.0001	<.0001	0.2528

[1] Kruskal-Wallis H Test

Table 2.8: Mean Weekly Therapy Intensity by Therapy Provider and Level of ADL Dependence, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Bed Mobility	Independent	104.0 (89.2)	71.3 (83.4)	7.7 (34.1)
	Supervision	124.0 (94.4)	84.9 (88.9)	7.1 (31.1)
	Limited Assistance	127.4 (90.6)	95.3 (93.5)	11.5 (40.3)
	Extensive Assistance	106.3 (92.9)	75.0 (85.6)	12.6 (38.7)
	Total Dependence	60.1 (80.3)	46.7 (72.8)	13.2 (35.3)
	Did Not Occur	24.1 (48.0)	24.5 (53.3)	7.2 (26.2)
	Test Statistic[1]	8554.9	4973.2	1470.8
	P-value	<.0001	<.0001	<.0001
Transfer	Independent	92.9 (90.7)	65.5 (83.1)	6.8 (31.7)
	Supervision	118.8 (91.7)	78.9 (85.5)	6.4 (29.1)
	Limited Assistance	126.7 (91.1)	93.4 (92.1)	10.3 (38.1)
	Extensive Assistance	114.8 (92.1)	79.2 (86.1)	11.5 (37.7)
	Total Dependence	76.7 (85.7)	59.7 (81.9)	15.8 (41.3)
	Did Not Occur	19.9 (40.5)	18.6 (41.3)	7.1 (24.5)
	Test Statistic[1]	10409.6	5809.2	1908.2
	P-value	<.0001	<.0001	<.0001
Locomotion on Unit	Independent	114.4 (96.5)	80.6 (94.5)	9.0 (37.1)
	Supervision	121.6 (92.5)	80.8 (84.7)	6.9 (29.8)
	Limited Assistance	131.8 (91.4)	93.0 (91.0)	11.3 (39.4)
	Extensive Assistance	120.7 (90.1)	85.8 (83.9)	12.8 (39.3)
	Total Dependence	89.8 (86.0)	70.4 (85.5)	14.7 (40.9)
	Did Not Occur	37.6 (61.9)	28.1 (53.5)	7.6 (26.0)
	Test Statistic[1]	13337.8	7774.3	1400.3
	P-value	<.0001	<.0001	<.0001
Eating	Independent	104.0 (89.2)	71.3 (83.4)	7.7 (34.1)
	Supervision	124.0 (94.4)	84.9 (88.9)	7.1 (31.1)
	Limited Assistance	127.4 (90.6)	95.3 (93.5)	11.5 (40.3)
	Extensive Assistance	106.3 (92.9)	75.0 (85.6)	12.6 (38.7)
	Total Dependence	60.1 (80.3)	46.7 (72.8)	13.2 (35.3)
	Did Not Occur	24.1 (48.0)	24.5 (53.3)	7.2 (26.2)
	Test Statistic[1]	8554.9	4973.2	1470.8
	P-value	<.0001	<.0001	<.0001
Toilet Use	Independent	97.7 (92.3)	65.9 (84.0)	6.9 (33.1)
	Supervision	118.5 (92.8)	79.1 (84.4)	6.0 (27.9)
	Limited Assistance	126.1 (90.2)	91.9 (91.0)	10.1 (38.2)
	Extensive Assistance	115.8 (92.8)	82.0 (87.1)	11.0 (37.1)
	Total Dependence	74.4 (85.1)	56.7 (80.4)	14.1 (38.9)
	Did Not Occur	73.1 (105.7)	64.3 (125.1)	15.2 (41.0)
	Test Statistic[1]	7091.6	3930.5	1596.5
	P-value	<.0001	<.0001	<.0001
Bathing	Independent	92.1 (92.0)	62.7 (79.4)	7.6 (35.2)
	Supervision	108.3 (92.0)	73.5 (79.0)	6.2 (29.8)
	Transfer Help	119.6 (90.4)	85.8 (82.5)	8.8 (34.8)
	Bathing Help	126.1 (92.3)	90.6 (91.9)	11.1 (40.3)
	Total Dependence	78.0 (85.8)	57.9 (80.4)	12.5 (35.3)
	Did Not Occur	80.3 (88.3)	51.1 (75.1)	9.8 (34.8)
	Test Statistic[1]	7821.8	4679.7	1160.8
	P-value	<.0001	<.0001	<.0001

[1] Kruskal-Wallis H Test

Table 2.9: Mean Weekly Therapy Intensity by Therapy Provider for Items Related to Cognition, Comprehension and Expression, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Short-term Memory Problem	No	115.0 (93.0)	77.0 (83.5)	7.6 (30.2)
	Yes	92.7 (90.4)	72.3 (89.5)	14.4 (42.4)
	Test Statistic[1]	1854.7	341.5	1330.9
	P-value	<.0001	<.0001	<.0001
Decision-making Skills	Independent	121.3 (94.2)	82.5 (88.7)	7.1 (30.3)
	Modified Independence	111.3 (91.7)	81.8 (86.6)	11.6 (39.2)
	Moderately Impaired	89.2 (87.7)	67.0 (84.6)	14.1 (41.4)
	Severally Impaired	64.2 (80.7)	50.8 (79.7)	15.3 (39.3)
	Test Statistic[1]	5509.8	2589.3	1658.0
	P-value	<.0001	<.0001	<.0001
Expression	Understood	114.0 (92.8)	78.7 (86.2)	7.5 (30.1)
	Usually Understood	91.2 (87.4)	71.3 (85.1)	15.8 (45.0)
	Sometimes Understood	76.2 (88.1)	62.6 (88.9)	23.2 (52.5)
	Rarely or Never Understood	52.7 (79.3)	50.6 (91.2)	19.1 (44.8)
	Test Statistic[1]	4287.5	1330.3	3312.6
	P-value	<.0001	<.0001	<.0001
Speech Clarity	Understood	108.6 (92.0)	76.9 (86.1)	8.3 (31.5)
	Usually Understood	81.1 (91.2)	64.8 (90.7)	24.6 (54.8)
	Sometimes Understood	59.4 (78.0)	53.0 (78.8)	29.5 (59.3)
	Test Statistic[1]	2409.6	824.8	4056.8
	P-value	<.0001	<.0001	<.0001
Comprehension	Understands	114.0 (93.6)	78.6 (86.5)	8.1 (32.0)
	Usually Understands	96.1 (87.9)	73.1 (85.1)	14.2 (42.2)
	Sometimes Understands	80.2 (87.6)	64.9 (89.4)	18.8 (47.2)
	Rarely or Never Understands	49.0 (75.3)	47.1 (84.6)	15.7 (37.3)
	Test Statistic[1]	3685.7	1139.5	2097.0
	P-value	<.0001	<.0001	<.0001

[1] Kruskal-Wallis H Test

Table 2.10: Mean Weekly Therapy Intensity by Therapy Provider and Variables Related to Feeding, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Chewing Problem	No	107.0 (92.9)	75.5 (86.8)	8.6 (33.9)
	Yes	87.6 (87.9)	70.6 (86.1)	22.2 (47.5)
	Test Statistic[1]	810.9	77.5	4963.5
	P-value	<.0001	<.0001	<.0001
Swallowing Problem	No	110.6 (92.8)	77.9 (87.6)	6.6 (29.6)
	Yes	78.0 (85.7)	62.7 (82.6)	27.2 (53.3)
	Test Statistic[1]	2780.3	804.8	11183.6
	P-value	<.0001	<.0001	<.0001
Feeding Tube	No	104.4 (92.5)	74.8 (86.7)	10.2 (35.2)
	Yes	80.2 (83.4)	69.3 (86.8)	33.1 (65.0)
	Test Statistic[1]	326.9	23.6	1755.1
	P-value	<.0001	<.0001	<.0001
Mechanically Altered Diet	No	107.7 (92.7)	76.2 (87.0)	7.2 (30.9)
	Yes	89.7 (89.6)	69.3 (85.5)	23.8 (50.3)
	Test Statistic[1]	879.6	169.9	8012.9
	P-value	<.0001	<.0001	<.0001

[1] Kruskal-Wallis H Test

Table 2.11: Mean Weekly Therapy Intensity by Therapy Provider and Variables Related to Rehabilitation Potential, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Change in ADL Function	No Change	92.8 (88.4)	66.9 (86.1)	9.6 (32.8)
	Improved	130.2 (84.4)	92.5 (76.6)	7.6 (30.3)
	Deteriorated	103.8 (94.2)	75.0 (88.0)	12.4 (39.8)
	Test Statistic[1]	1649.5	1471.4	214.9
	P-value	<.0001	<.0001	<.0001
Change in Cognitive Status	No Change	114.9 (93.5)	81.7 (89.3)	9.1 (33.6)
	Improved	108.1 (89.6)	78.8 (79.3)	10.4 (33.7)
	Deteriorated	80.4 (85.6)	60.3 (79.9)	15.2 (43.3)
	Test Statistic[1]	3840.5	2036.6	893.2
	P-value	<.0001	<.0001	<.0001
Change in Communication or Hearing	No Change	109.8 (92.8)	77.8 (87.4)	8.6 (31.6)
	Improved	104.6 (86.6)	84.7 (88.5)	18.8 (49.1)
	Deteriorated	75.2 (85.0)	59.6 (81.7)	22.0 (53.6)
	Test Statistic[1]	2763.8	1146.2	2269.5
	P-value	<.0001	<.0001	<.0001
Overall Change in Care Needs	No Change	94.8 (87.9)	68.3 (85.8)	10.2 (34.1)
	Improved	129.2 (85.8)	92.2 (79.3)	7.8 (30.7)
	Deteriorated	101.6 (94.1)	73.4 (87.9)	12.1 (39.2)
	Test Statistic[1]	1647.4	1507.3	183.3
	P-value	<.0001	<.0001	<.0001
Rehabilitation Potential	Neither Patient or Provider	73.9 (83.7)	53.8 (75.7)	10.5 (33.3)
	Only Patient	105.7 (85.0)	74.7 (82.7)	8.7 (33.0)
	Only Provider	117.5 (87.2)	78.9 (84.7)	10.2 (33.4)
	Both Patient and Provider	143.7 (91.3)	104.9 (94.2)	12.9 (43.9)
	Test Statistic[1]	14677.1	9602.1	94.7
	P-value	<.0001	<.0001	<.0001

[1] Kruskal-Wallis H Test

Table 2.12: Mean Weekly Therapy Intensity by Therapy Provider and Variables Related to Social Engagement, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Index of Social Engagement	0	70.6 (86.2)	48.7 (74.4)	12.1 (33.5)
	1	70.7 (77.3)	55.3 (73.5)	11.2 (33.7)
	2	97.2 (86.3)	68.6 (82.1)	12.1 (37.3)
	3	110.4 (87.2)	80.4 (89.5)	11.3 (37.2)
	4	121.5 (92.2)	92.8 (94.6)	11.5 (39.3)
	5	118.7 (89.5)	84.0 (82.8)	8.2 (33.4)
	6	138.8 (100.6)	93.7 (93.6)	10.6 (42.7)
	Test Statistic[1]	8934.2	4825.6	731.6
	P-value	<.0001	<.0001	<.0001
Time Involved in Activities	Most	123.0 (104.9)	87.8 (95.6)	9.7 (36.4)
	Some	117.8 (88.3)	81.1 (84.4)	11.2 (37.8)
	Little	92.9 (86.0)	69.5 (86.1)	11.7 (36.8)
	None	53.1 (70.2)	44.9 (68.8)	12.1 (37.7)
	Test Statistic[1]	7341.8	3221.1	193.2
	P-value	<.0001	<.0001	<.0001

[1] Kruskal-Wallis H Test

Table 2.13: Mean Weekly Therapy Intensity by Therapy Provider, and Facility and System-level Variables, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Physical Therapy Minutes (SD)	Occupational Therapy Minutes (SD)	SLP Therapy Minutes (SD)
Facility Size	Large	100.6 (92.1)	90.0 (97.1)	14.6 (44.1)
	Medium	106.3 (93.8)	69.9 (79.6)	10.1 (34.4)
	Small	103.9 (89.7)	50.4 (67.6)	5.7 (22.7)
	Test Statistic[1]	99.7	3348.1	1144.4
	P-value	<.0001	<.0001	<.0001
Facility Location	Urban Area	104.5 (92.5)	77.4 (87.4)	11.7 (38.1)
	Rural Area	86.7 (88.3)	32.8 (62.2)	2.7 (18.1)
	Test Statistic[1]	272.2	2824.9	713.1
	P-value	<.0001	<.0001	<.0001
Facility Area Income Quintile	1st Quintile	88.2 (84.3)	58.8 (78.1)	7.2 (24.3)
	2nd Quintile	104.1 (104.1)	76.2 (99.2)	12.0 (39.8)
	3rd Quintile	102.2 (91.9)	67.1 (71.9)	8.0 (26.3)
	4th Quintile	117.7 (92.5)	101.7 (99.5)	22.3 (57.9)
	5th Quintile	102.5 (80.8)	67.6 (73.8)	5.8 (21.6)
	Not Assigned	70.8 (115.8)	87.5 (126.7)	29.6 (53.3)
	Test Statistic[1]	1156.8	2392.7	1698.1
	P-value	<.0001	<.0001	<.0001
LHIN	Central	102.2 (91.8)	90.2 (93.6)	7.8 (30.2)
	Central East	74.8 (69.7)	49.0 (54.2)	4.2 (18.5)
	Central West	119.4 (114.2)	60.3 (73.9)	8.5 (33.6)
	Champlain	70.2 (63.6)	36.4 (56.1)	3.8 (17.7)
	Erie St. Clair	63.4 (68.4)	47.1 (63.8)	5.1 (21.3)
	HNHB*	140.5 (100.5)	102.8 (105.2)	15.9 (43.1)
	Mississauga Halton	118.2 (97.3)	79.8 (76.8)	6.3 (22.2)
	North East	110.4 (91.7)	35.9 (58.4)	3.6 (23.2)
	North Simcoe Muskoka	122.1 (139.2)	30.9 (61.3)	8.9 (39.1)
	North West	121.5 (86.5)	102.6 (86.9)	7.0 (26.0)
	South East	115.2 (92.9)	61.7 (75.0)	5.8 (31.6)
	South West	77.5 (86.4)	43.6 (59.5)	5.8 (23.9)
	Toronto Central	99.1 (88.1)	95.2 (95.0)	21.3 (52.9)
	Waterloo Wellington	72.2 (56.5)	50.5 (49.4)	5.3 (19.8)
	Test Statistic[1]	7425.5	10516.7	4930.2
	P-value	<.0001	<.0001	<.0001

* Hamilton Niagara Haldimand Brant
1 Kruskal-Wallis H Test

Percentage of Patients Receiving Rehabilitation

The percentage of patients receiving therapy at various intensity thresholds used in the RUG-III case-mix system algorithm are presented in Table 2.14. The majority of CCC patients received at least 15 minutes of physical therapy and occupational therapy; however, only 15.53% of patients received speech-language pathology therapy at this intensity threshold. At all therapy intensity thresholds, physical therapy is most frequently provided.

Table 2.14: Percentage of Patients Receiving Therapy at RUG-III Therapy Intensity Thresholds, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	79.49	59.31	20.3	2.15
Occupational Therapy	69.17	36.66	9.14	1.41
SLP Therapy	15.53	3.62	0.55	0.13

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days

Generally, except for patients with spinal cord injury and other medically complex conditions, patients with each of the conditions that were examined were more likely to receive physical therapy at each intensity threshold (Table 2.15). This was also the case for the provision of occupational therapy, except that patients with pulmonary conditions were also likely to receive occupational therapy at most thresholds (Table 2.16). A greater percentage of patients with cardiac conditions, neurological conditions, spinal cord injury, stroke, and traumatic brain injury received speech-language pathology therapy at the 15+ minute threshold. Conversely, fewer patients with amputation, arthritis, orthopedic conditions, and pulmonary conditions received speech-language pathology therapy at this threshold. This trend was generally true at all other therapy intensity thresholds, with a few exceptions. For example, for patients with cardiac conditions and neurological conditions, there was no difference in the percentage of patients with and without the condition that received speech-language pathology therapy at the 150+ and 325+ minute thresholds. In the case of spinal cord injury, there was no difference in the percentage of patients with the condition that received speech-language pathology therapy at the 45+ minute, 150+ minute, and 325+ minute thresholds (Table 2.17).

When stratified by the ADL-H Scale, patients with scores of two were most likely to receive physical therapy and occupational therapy at nearly all therapy intensity thresholds. For physical therapy and occupational therapy intensity threshold, there is a curvilinear relationship with ADL-H Scale score, such that patients with a score of six are least likely to receive therapy at a given threshold (Table 2.18). For speech-language pathology therapy, there is a positive linear relationship between ADL-H Scale score and the percentage of patients receiving therapy at a given therapy intensity, except for patients receiving 325+ minutes of therapy over 5 or more days (Table 2.18). When stratified by CPS score, there is a negative linear relationship between severity of cognitive impairment and the percentage of patients that received physical therapy each intensity threshold (Table 2.19). At most therapy intensity thresholds, a greater percentage of patients with CPS scores of zero to two received occupational therapy than those with CPS scores of three or greater (Table 2.19). Finally, patients with a CPS score of four were most likely to receive speech-language pathology therapy at all therapy intensity thresholds (Table 2.19).

Table 2.15: Percentage of Patients Receiving Physical Therapy at RUG-III Therapy Intensity Thresholds by Condition, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Condition		15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Amputation	No	79.3	59.2	20.2	2.1
	Yes	86.1	62.4	22.7	3.0
	Test Statistic[4]	68.0	9.9	8.9	9.3
	P-value	<.0001	0.0017	0.0029	0.0023
Arthritis	No	77.1	55.9	18.7	2.0
	Yes	85.6	68.0	24.5	2.6
	Test Statistic[4]	883.5	1212.6	429.4	41.1
	P-value	<.0001	<.0001	<.0001	<.0001
Cardiac Conditions	No	76.4	55.5	18.7	1.9
	Yes	83.2	63.8	22.2	2.4
	Test Statistic[4]	706.6	721.2	200.2	25.5
	P-value	<.0001	<.0001	<.0001	<.0001
Neurological Conditions	No	79.3	59.1	20.2	2.1
	Yes	81.3	61.2	21.3	2.2
	Test Statistic[4]	22.5	15.8	7.3	0.1
	P-value	<.0001	<.0001	0.0071	0.7329
Orthopedic Conditions	No	75.9	54.4	18.1	2.0
	Yes	90.7	74.5	27.0	2.7
	Test Statistic[4]	2469.7	3095.0	901.5	43.9
	P-value	<.0001	<.0001	<.0001	<.0001
Other Medically Complex Conditions	No	79.4	59.4	20.6	2.2
	Yes	79.9	58.7	18.8	1.9
	Test Statistic[4]	2.5	3.5	28.9	4.5
	P-value	0.1163	0.0607	<.0001	0.0347
Pulmonary Conditions	No	79.1	58.9	20.2	2.2
	Yes	81.2	61.0	20.7	1.8
	Test Statistic[4]	45.2	29.8	2.6	13.7
	P-value	<.0001	<.0001	0.1036	0.0002
Spinal Cord Injury	No	79.5	59.6	20.4	2.1
	Yes	75.7	43.7	11.6	2.1
	Test Statistic[4]	14.3	164.2	76.3	0.0
	P-value	0.0002	<.0001	<.0001	0.8512
Stroke	No	78.2	58.1	19.9	1.9
	Yes	84.6	64.4	21.9	3.2
	Test Statistic[4]	397.1	262.2	39.1	140.8
	P-value	<.0001	<.0001	<.0001	<.0001
Traumatic Brain Injury	No	79.4	59.3	20.3	2.1
	Yes	82.2	60.0	19.4	3.4
	Test Statistic[4]	7.0	0.4	0.8	12.9
	P-value	0.0083	0.5516	0.3623	0.0003

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table 2.16: Percentage of Patients Receiving Occupational Therapy at RUG-III Therapy Intensity Thresholds by Condition, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Condition		15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Amputation	No	69.0	36.5	9.1	1.4
	Yes	76.5	42.9	10.2	1.5
	Test Statistic[4]	63.5	42.6	3.5	0.2
	P-value	<.0001	<.0001	0.0629	0.6373
Arthritis	No	67.6	35.0	8.7	1.4
	Yes	73.3	41.0	10.2	1.4
	Test Statistic[4]	314.6	322.9	58.6	0.0
	P-value	<.0001	<.0001	<.0001	0.9013
Cardiac Conditions	No	66.8	34.3	8.4	1.3
	Yes	72.0	39.5	10.0	1.5
	Test Statistic[4]	324.7	294.0	74.3	3.5
	P-value	<.0001	<.0001	<.0001	0.0631
Neurological Conditions	No	69.0	36.3	8.9	1.3
	Yes	70.7	39.7	10.8	1.9
	Test Statistic[4]	11.7	43.9	38.8	20.2
	P-value	0.0006	<.0001	<.0001	<.0001
Orthopedic Conditions	No	66.6	34.4	8.6	1.4
	Yes	77.1	43.6	10.9	1.2
	Test Statistic[4]	950.7	673.5	115.2	5.4
	P-value	<.0001	<.0001	<.0001	0.0204
Other Medically Complex Conditions	No	68.9	36.5	9.2	1.5
	Yes	70.2	37.5	8.9	1.1
	Test Statistic[4]	11.2	7.1	1.1	16.4
	P-value	0.0008	0.0077	0.2892	<.0001
Pulmonary Conditions	No	69.1	36.9	9.2	1.5
	Yes	69.3	35.7	8.7	1.2
	Test Statistic[4]	0.3	9.2	4.8	11.3
	P-value	0.5971	0.0025	0.0284	0.0008
Spinal Cord Injury	No	69.1	36.7	9.1	1.4
	Yes	71.3	33.9	8.2	2.3
	Test Statistic[4]	3.5	5.4	1.8	8.7
	P-value	0.0629	0.0198	0.1778	0.0032
Stroke	No	67.7	35.1	8.6	1.2
	Yes	75.2	43.1	11.3	2.3
	Test Statistic[4]	411.8	434.8	142.2	147.1
	P-value	<.0001	<.0001	<.0001	<.0001
Traumatic Brain Injury	No	69.1	36.6	9.1	1.4
	Yes	75.7	42.8	12.9	3.0
	Test Statistic[4]	32.1	26.2	26.9	29.4
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table 2.17: Percentage of Patients Receiving Speech-language Pathology Therapy at RUG-III Therapy Intensity Thresholds by Condition, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Condition		15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Amputation	No	15.7	3.7	0.5	0.1
	Yes	9.8	1.6	0.3	0.1
	Test Statistic[4]	61.9	28.3	3.0	0.3
	P-value	<.0001	<.0001	0.0812	0.5614
Arthritis	No	16.6	4.0	0.6	0.1
	Yes	12.7	2.6	0.3	0.1
	Test Statistic[4]	228.1	114.4	31.2	6.2
	P-value	<.0001	<.0001	<.0001	0.0128
Cardiac Conditions	No	14.6	3.2	0.5	0.1
	Yes	16.6	4.1	0.6	0.1
	Test Statistic[4]	78.5	47.7	3.7	1.1
	P-value	<.0001	<.0001	0.0547	0.2879
Neurological Conditions	No	14.9	3.4	0.5	0.1
	Yes	21.1	5.2	0.7	0.2
	Test Statistic[4]	262.0	79.9	3.3	3.3
	P-value	<.0001	<.0001	0.0686	0.0710
Orthopedic Conditions	No	17.2	4.2	0.6	0.2
	Yes	10.3	1.8	0.2	0.0
	Test Statistic[4]	658.4	319.5	69.0	25.0
	P-value	<.0001	<.0001	<.0001	<.0001
Other Medically Complex Conditions	No	15.6	3.7	0.6	0.1
	Yes	15.3	3.3	0.4	0.1
	Test Statistic[4]	0.6	5.0	9.4	2.0
	P-value	0.4402	0.0247	0.0022	0.1601
Pulmonary Conditions	No	15.8	3.7	0.6	0.1
	Yes	14.3	3.1	0.4	0.1
	Test Statistic[4]	27.3	21.1	12.1	0.1
	P-value	<.0001	<.0001	0.0005	0.7009
Spinal Cord Injury	No	15.4	3.6	0.5	0.1
	Yes	23.0	3.9	0.3	0.1
	Test Statistic[4]	68.9	0.4	2.5	0.5
	P-value	<.0001	0.5425	0.1123	0.4950
Stroke	No	12.6	2.2	0.2	0.1
	Yes	27.7	9.5	1.8	0.4
	Test Statistic[4]	2754.2	2396.7	684.7	141.1
	P-value	<.0001	<.0001	<.0001	<.0001
Traumatic Brain Injury	No	15.3	3.5	0.5	0.1
	Yes	31.4	12.1	1.6	0.5
	Test Statistic[4]	307.6	330.6	32.8	19.7
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table 2.18: Percentage of Patients Receiving Therapy at RUG-III Therapy Intensity Thresholds by ADL-Hierarchy Scale Score, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	ADL-H Scale	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0	73.6	55.9	22.0	1.8
	1	84.2	66.6	28.7	3.1
	2	90.2	74.8	28.4	3.0
	3	89.3	72.0	26.5	3.3
	4	87.6	68.4	22.9	2.4
	5	73.1	49.4	14.4	1.3
	6	51.5	24.7	4.4	0.6
	Test Statistic[4]	8874.8	10078.2	3795.9	422.6
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0	60.3	32.0	7.5	1.2
	1	71.3	38.1	10.7	1.8
	2	78.9	45.2	13.1	2.3
	3	76.6	42.8	11.0	1.7
	4	77.1	43.9	10.0	1.2
	5	63.8	31.1	7.3	1.0
	6	46.4	18.3	2.8	0.7
	Test Statistic[4]	4856.6	3166.0	1094.6	231.7
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0	6.7	1.9	0.5	0.0
	1	7.6	1.8	0.4	0.1
	2	11.3	3.2	0.6	0.2
	3	13.2	3.2	0.6	0.1
	4	17.2	4.3	0.5	0.1
	5	17.2	3.8	0.5	0.1
	6	26.9	5.2	0.6	0.1
	Test Statistic[4]	1953.9	196.3	5.6	9.3
	P-value	<.0001	<.0001	0.4641	0.1592

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table 2.19: Percentage of Patients Receiving Therapy at RUG-III Therapy Intensity Thresholds by Cognitive Performance Scale Score, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	CPS	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0	85.8	69.0	27.1	2.9
	1	84.4	64.8	22.8	2.4
	2	82.6	62.8	21.7	2.2
	3	76.5	54.4	16.3	1.6
	4	71.8	45.1	11.6	1.7
	5	70.0	46.9	12.6	1.3
	6	50.1	25.6	4.1	0.6
	Test Statistic[4]	4548.2	4985.3	2441.1	199.4
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0	73.0	39.5	10.6	1.6
	1	73.5	40.5	9.8	1.3
	2	73.5	41.7	11.3	1.7
	3	66.5	33.7	7.7	1.2
	4	62.0	31.4	6.9	1.8
	5	61.5	28.0	6.1	1.0
	6	46.1	19.0	3.2	0.9
	Test Statistic[4]	2221.5	1481.5	576.1	52.4
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0	8.4	1.5	0.3	0.1
	1	12.5	2.6	0.4	0.1
	2	17.3	4.3	0.7	0.2
	3	18.4	4.4	0.6	0.1
	4	30.9	9.9	1.3	0.2
	5	20.0	5.2	0.7	0.1
	6	26.8	5.2	0.6	0.1
	Test Statistic[4]	2871.1	1117.0	114.3	29.9
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

2.4.3 Phase 2: Factors Associated with Rehabilitation Intensity in Ontario Complex Continuing Hospitals

Factors Associated with Provision of Physical Therapy

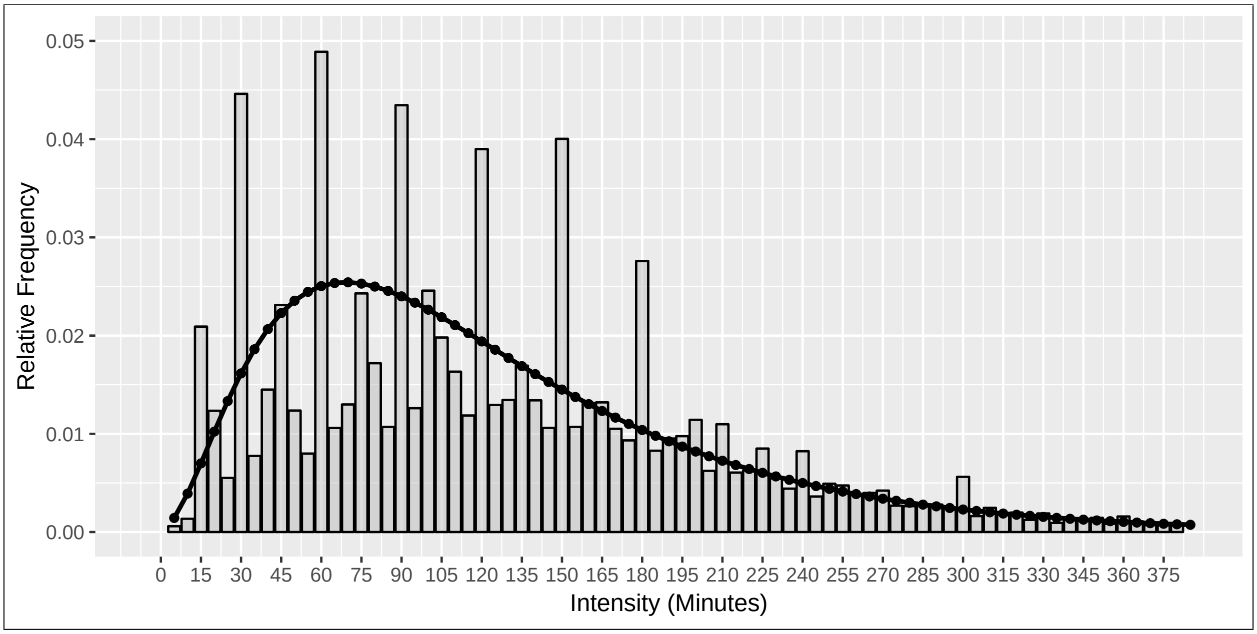
Model fit statistics for the zero-inflated negative binomial regression model for weekly physical therapy intensity are presented in (Table 2.20). Compared to a null model, which includes only intercept and dispersion parameters, the addition of both patient and facility-level characteristics lead to a reduction in both AIC and BIC statistics. Additionally, the C-statistics for the logit component of the models were both above 0.8, indicating good fit when predicting receipt of no physical therapy during the assessment period. Figure 2.5 illustrates the observed and model predicted physical therapy intensity distributions.

Table 2.20: Goodness of Fit Statistics for the Zero-inflated Negative Binomial Regression Model for Weekly Physical Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Model Description	AIC	BIC	Pearson Chi-Square	Deviance	C-Statistic (Logit Component Only)
Null Model	1020267.7903	1020296.3521	99741.2272	1020261.7901	-
Patient Characteristics	981566.4749	982566.1458	103134.1677	981356.4749	0.835
Facility Characteristics	1007804.9495	1008214.3386	98805.1172	1007718.9495	0.638
Patient and Facility Characteristics	967698.7400	969098.2793	101559.3327	967404.7400	0.858

Parameter estimates for the zero-inflated negative binomial regression model for weekly physical therapy intensity are divided between Table 2.21 and Table 2.22. The logit model component of the regression model, which predicts receipt of no physical therapy minutes during the assessment period, is presented first (Table 2.21). The inverse of the odds ratio estimates are presented to simplify the interpretation of the effect. Patient-level factors associated with greater odds of physical therapy provision included arthritis, pulmonary conditions, neurological conditions, orthopedic conditions, stroke, traumatic brain injury, and need for tracheostomy care. Patients with a cancer diagnosis, hallucinations or delusions, CHESS scores of three or greater, CPS scores greater than one, need for IV medications, and need for oxygen therapy were less likely to receive physical

Figure 2.5: Zero-truncated and Binned Observed and Predicted Distributions for Physical Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788



Observed frequency represented with bars, predicted frequency represented with line.

therapy than patients without these characteristics. Patients that were 65 to 94 years of age were more likely to receive physical therapy than patients aged 0 to 64 years. Patients with ADL-H Scale scores greater than zero more likely to receive physical therapy. This effect followed a curvilinear pattern whereby patients with ADL-H Scale scores of two to four were most likely to receive physical therapy. In addition to level of functional performance at time of assessment, improvement or deterioration in ADL function in the previous 90 days was associated with greater odds of receiving physical therapy. Patients with daily pain that was not severe (Pain Scale = 2) were more likely to receive physical therapy compared to patients without pain. However, there was no difference among patients with less than severe or daily severe pain. Compared to patients with an ISE score of zero, patients with scores of two or greater had greater odds of receiving physical therapy. Patients that were experiencing an acute episode or a flare-up of a recurrent or chronic problem were more likely to receive any physical therapy. Patients with rehabilitation potential, as determined by a subjective appraisal from the care provider or the patient, had greater odds receiving physical therapy. This effect was greatest when both the patient and the provider believed the patient had rehabilitation potential. Patients with a support person that was positive towards discharge were more likely to receive physical therapy. Patients that were involved in activities for two-thirds of the time or less were more likely to receive physical therapy than patients involved in activities most of the time. However, patients that did not spend any time involved in activities were less likely to receive physical therapy (Table 2.21).

With respect to facility-level effects, patients that were admitted to medium-sized facilities were less likely to receive physical therapy compared to patients in small-sized facilities. However, there was no difference between large and small-sized facilities. Compared to CCC facilities located in urban areas, patients admitted to facilities located in rural areas were less likely to receive physical therapy. Compared to patients admitted to facilities located in areas that were classified into the lowest area income quintile, patients admitted to facilities in the second to fifth area income quintile were more likely to receive physical therapy. Finally, after adjusting for patient and facility-level factors, geographic region was significantly associated with likelihood of not receiving physical therapy. Compared to Toronto Central LHIN, patients receiving care in the Hamilton Niagara Haldimand Brant, Mississauga Halton, and North West LHINs were more likely to receive physical therapy. Apart from Central, North Simcoe Muskoka, and South East LHINs where there was no difference in odds compared to Toronto Central LHIN, patients that were admitted to all other LHINs were less likely to receive physical therapy (Table 2.21).

Table 2.21: Binomial with Logit Link Zero-inflation Model Parameter Estimates Predicting Receipt of No Physical Therapy, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Intercept	0.91	0.08	142.13	<.0001	
Age (Ref = 0-64)					
65-74	-0.19	0.03	34.14	<.0001	1.21 (1.13-1.29)
75-84	-0.19	0.03	40.54	<.0001	1.21 (1.14-1.28)
85-94	-0.12	0.03	14.82	0.0001	1.13 (1.06-1.20)
95+	-0.04	0.06	0.40	0.5286	1.04 (0.93-1.16)
Arthritis (Ref = Absent)					
Present	-0.15	0.02	38.03	<.0001	1.16 (1.10-1.21)
Pulmonary Conditions (Ref = Absent)					
Present	-0.17	0.02	72.25	<.0001	1.19 (1.14-1.24)

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Table 2.21 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Neurological Conditions (Ref = Absent)					
Present	-0.14	0.03	17.61	<.0001	1.15 (1.08-1.23)
Orthopedic Conditions (Ref = Absent)					
Present	-0.56	0.03	397.79	<.0001	1.75 (1.65-1.84)
Stroke (Ref = Absent)					
Present	-0.31	0.03	138.33	<.0001	1.36 (1.29-1.43)
Traumatic Brain Injury (Ref = Absent)					
Present	-0.20	0.08	6.71	0.0096	1.23 (1.05-1.43)
Cancer (Ref = Absent)					
Present	0.59	0.02	700.05	<.0001	0.55 (0.53-0.58)
Hallucinations or Delusions (Ref = Absent)					
Present	0.11	0.03	10.20	0.0014	0.90 (0.84-0.96)
Unsteady Gait (Ref = Absent)					
Present	-0.39	0.02	362.85	<.0001	1.48 (1.42-1.54)
CHESS (Ref = 0)					
1	-0.13	0.03	15.01	0.0001	1.14 (1.07-1.22)
2	-0.16	0.03	22.52	<.0001	1.18 (1.10-1.26)
3	0.03	0.04	0.58	0.4445	0.97 (0.90-1.05)
4	0.36	0.04	80.92	<.0001	0.70 (0.65-0.75)
5	0.82	0.05	330.22	<.0001	0.44 (0.40-0.48)
ADL Hierarchy Scale (Ref = 0)					
1	-0.41	0.06	46.80	<.0001	1.50 (1.34-1.69)
2	-0.89	0.05	310.78	<.0001	2.43 (2.20-2.68)
3	-0.96	0.05	352.56	<.0001	2.62 (2.37-2.89)
4	-1.06	0.05	394.96	<.0001	2.89 (2.60-3.21)
5	-0.65	0.05	184.71	<.0001	1.92 (1.74-2.10)
6	-0.43	0.06	57.98	<.0001	1.54 (1.38-1.72)
Cognitive Performance Scale (Ref = 0)					
1	0.03	0.03	1.01	0.3159	0.97 (0.91-1.03)
2	0.14	0.03	18.54	<.0001	0.87 (0.81-0.93)
3	0.26	0.03	65.23	<.0001	0.77 (0.72-0.82)
4	0.16	0.05	10.40	0.0013	0.85 (0.78-0.94)
5	0.37	0.04	74.94	<.0001	0.69 (0.64-0.75)
6	0.40	0.05	60.23	<.0001	0.67 (0.61-0.74)
Pain Scale (Ref = 0)					
1	0.03	0.03	1.03	0.3101	0.97 (0.93-1.02)
2	-0.16	0.03	37.72	<.0001	1.18 (1.12-1.24)
3	-0.03	0.04	0.42	0.5172	1.03 (0.95-1.11)
Index of Social Engagement (Ref = 0)					
1	0.06	0.03	3.27	0.0703	0.95 (0.89-1.00)
2	-0.08	0.04	4.73	0.0296	1.08 (1.01-1.16)
3	-0.15	0.04	16.16	<.0001	1.16 (1.08-1.25)
4	-0.30	0.04	60.96	<.0001	1.35 (1.25-1.46)
5	-0.14	0.05	8.99	0.0027	1.15 (1.05-1.26)
6	-0.36	0.04	65.34	<.0001	1.43 (1.31-1.56)
Acute Episode of Chronic Condition (Ref = No)					
Yes	-0.17	0.02	63.95	<.0001	1.19 (1.14-1.24)
Rehabilitation Potential (Ref = Neither Patient or Provider)					
Both Patient and Provider	-0.90	0.03	830.91	<.0001	2.45 (2.30-2.60)
Only Patient	-0.36	0.04	79.35	<.0001	1.44 (1.33-1.56)

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Table 2.21 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Only Provider	-0.62	0.04	246.30	<.0001	1.86 (1.72-2.01)
Support Person Present (Ref = No)					
Yes	-1.08	0.02	2267.89	<.0001	2.93 (2.81-3.07)
Time Involved in Activities (Ref = Most)					
Some	-0.39	0.03	176.05	<.0001	1.47 (1.39-1.56)
Little	-0.22	0.03	53.16	<.0001	1.24 (1.17-1.31)
None	0.36	0.03	104.19	<.0001	0.70 (0.65-0.75)
IV Medication (Ref = Not Provided)					
Provided	0.36	0.03	203.84	<.0001	0.70 (0.66-0.73)
Tracheostomy Care (Ref = Not Provided)					
Provided	-0.33	0.07	25.39	<.0001	1.39 (1.23-1.59)
Oxygen Therapy (Ref = Not Provided)					
Provided	0.14	0.02	33.50	<.0001	0.87 (0.83-0.91)
Facility Size (Ref = Small)					
Large	-0.06	0.04	2.71	0.0998	1.06 (0.99-1.14)
Medium	0.10	0.03	8.69	0.0032	0.91 (0.85-0.97)
Urban Area (Ref = Urban)					
Rural	0.29	0.05	37.17	<.0001	0.75 (0.68-0.82)
Facility Area Income Quintile (Ref = 1st Quintile)					
2nd Quintile	-0.73	0.04	395.36	<.0001	2.07 (1.93-2.22)
3rd Quintile	-0.44	0.03	179.04	<.0001	1.55 (1.45-1.65)
4th Quintile	-0.41	0.04	129.44	<.0001	1.51 (1.41-1.62)
5th Quintile	-0.68	0.04	317.13	<.0001	1.97 (1.83-2.12)
Not Assigned	0.69	0.28	5.93	0.0149	0.50 (0.29-0.87)
LHIN (Ref = Toronto Central)					
Central	0.09	0.06	2.50	0.1137	0.92 (0.82-1.02)
Central East	0.24	0.04	29.30	<.0001	0.79 (0.72-0.86)
Central West	1.91	0.07	709.50	<.0001	0.15 (0.13-0.17)
Champlain	0.25	0.05	31.12	<.0001	0.78 (0.71-0.85)
Erie St. Clair	0.18	0.05	14.59	0.0001	0.84 (0.77-0.92)
Hamilton Niagara Haldimand Brant	-1.07	0.04	711.46	<.0001	2.92 (2.70-3.15)
Mississauga Halton	-0.23	0.05	20.71	<.0001	1.26 (1.14-1.38)
North East	0.74	0.05	212.30	<.0001	0.48 (0.43-0.53)
North Simcoe Muskoka	0.09	0.08	1.31	0.2522	0.92 (0.79-1.06)
North West	-0.55	0.06	94.46	<.0001	1.73 (1.55-1.93)
South East	0.01	0.06	0.05	0.8320	0.99 (0.89-1.10)
South West	1.07	0.04	605.50	<.0001	0.34 (0.31-0.37)
Waterloo Wellington	0.22	0.05	18.78	<.0001	0.80 (0.72-0.88)

The negative binomial model component of the regression model, which predicts physical therapy intensity as a count of minutes per week among patients that are not certain zeros, is presented next (Table 2.22). All effects that are described are for patients that received physical therapy during the assessment period. Patents that were aged 65-74 years old received physical therapy at the same rate as the 0-64 years old reference. However, patients that were 75-84, 85-94, and 95+ years old received physical therapy at a lower rate. Patients that were female, had a cancer diagnosis, experienced hallucinations or delusions, shortness of breath, had a DRS scale score of three or greater, were provided with IV medications, or required tracheostomy care, oxygen therapy, or suctioning, received physical therapy at a lower rate. Greater medical instability, as measured by CHESS, was associated with a lower rate of physical therapy provision. This effect followed a negative linear pattern such that as CHESS scores increased, patients received physical therapy at a lower rate. Patients with cognitive impairment, as measured by CPS, also received physical therapy at a lower rate; however, this rate did not vary substantially by severity of cognitive impairment. The effect of pain followed a similar trend. Patients with Pain Scale scores greater than zero, indicating that the patient is experiencing some pain, received physical therapy at a lower rate, but there was little difference by level of frequency or severity of pain. Patients that spent less time involved in activities received physical therapy at lower rate. This effect was weak for patients that spent some or little time involved in activities; however, compared to patients that spent most of the time (more than two-thirds) of the time involved in activities, patients that spent no time involved in activities received 15% less therapy per week. Patients with arthritis, pulmonary conditions, neurological conditions, orthopedic conditions, stroke, traumatic brain injury, unsteady gait, or a need for tracheostomy care received physical therapy at a higher rate. Compared to patients that were independent in all four ADLs in the ADL-H Scale, patients that required limited (ADL-H = 2) to maximal assistance (ADL-H = 4) received physical therapy at a slightly higher rate. However, patients that were either dependent or totally dependent received physical therapy at a lower rate. Compared to patients whose functional performance had not changed in the previous 90 days, patients whose ADL function had improved or deteriorated received physical therapy at higher rate. Rehabilitation potential, from the perspective of the patient or the provider was associated with higher rate of physical therapy provision. This effect was strongest when both the patient and provider believed the patient had rehabilitation potential. Finally, presence of a support person that is positive towards discharge was associated with a higher rate of physical therapy provision.

Compared to patients that were admitted to small CCC facilities, patients that were admitted to medium-sized facilities received physical therapy at 4% higher rate. There was no difference for large-sized facilities. Compared to patients admitted to facilities located in the lowest area income quintile, patients in all other facilities received physical therapy at a higher rate. Finally, region was significantly associated with rate of physical therapy provision. Compared to patients that received care in facilities located in the Toronto Central LHIN, those that were admitted to facilities in the Central, Champlain, Erie St. Clair, South West, and Waterloo Wellington LHINs received physical therapy at a lower rate. Patients that were admitted to facilities in all other LHINs received physical therapy at higher rate than in Toronto Central LHIN (Table 2.22).

Table 2.22: Negative Binomial with Log Link Count Model Parameter Estimates for Physical Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Estimate	Standard Error	χ^2	P-Value	Rate Ratio (95% CI)
Intercept	4.33	0.02	51311.40	<.0001	
Age (Ref = 0-64)					
65-74	0.01	0.01	1.22	0.2687	1.01 (0.99-1.02)
75-84	-0.02	0.01	6.17	0.0130	0.98 (0.97-1.00)
85-94	-0.05	0.01	46.59	<.0001	0.95 (0.94-0.97)
95+	-0.11	0.01	78.23	<.0001	0.89 (0.87-0.92)
Female (Ref = No)					
Yes	-0.03	0.00	33.77	<.0001	0.98 (0.97-0.98)
Arthritis (Ref = Absent)					
Present	0.04	0.00	65.91	<.0001	1.04 (1.03-1.05)
Pulmonary Conditions (Ref = Absent)					
Present	0.03	0.00	57.06	<.0001	1.03 (1.02-1.04)
Neurological Conditions (Ref = Absent)					
Present	0.03	0.01	15.54	<.0001	1.03 (1.01-1.04)
Orthopedic Conditions (Ref = Absent)					
Present	0.06	0.00	157.30	<.0001	1.06 (1.05-1.07)
Stroke (Ref = Absent)					
Present	0.06	0.01	115.04	<.0001	1.06 (1.05-1.07)
Traumatic Brain Injury (Ref = Absent)					
Present	0.10	0.02	34.39	<.0001	1.10 (1.07-1.14)
Cancer (Ref = Absent)					
Present	-0.10	0.01	377.94	<.0001	0.90 (0.89-0.91)
Hallucinations or Delusions (Ref = Absent)					
Present	-0.06	0.01	42.56	<.0001	0.94 (0.93-0.96)
Unsteady Gait (Ref = Absent)					
Present	0.07	0.00	262.73	<.0001	1.07 (1.07-1.08)
CHESS (Ref = 0)					
1	0.01	0.01	3.97	0.0463	1.01 (1.00-1.03)
2	0.01	0.01	1.31	0.2530	1.01 (0.99-1.02)
3	-0.03	0.01	11.60	0.0007	0.97 (0.96-0.99)
4	-0.10	0.01	111.36	<.0001	0.90 (0.89-0.92)
5	-0.26	0.01	373.94	<.0001	0.77 (0.75-0.79)
ADL Hierarchy Scale (Ref = 0)					
1	0.02	0.01	2.44	0.1179	1.02 (0.99-1.05)

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Table 2.22 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Incidence Rate Ratio (95% CI)
2	0.07	0.01	37.95	<.0001	1.08 (1.05-1.10)
3	0.10	0.01	63.29	<.0001	1.10 (1.07-1.13)
4	0.09	0.01	49.28	<.0001	1.09 (1.06-1.12)
5	0.03	0.01	5.50	0.0190	1.03 (1.00-1.05)
6	-0.09	0.02	30.67	<.0001	0.92 (0.89-0.95)
Cognitive Performance Scale (Ref = 0)					
1	-0.02	0.01	9.64	0.0019	0.98 (0.97-0.99)
2	-0.01	0.01	2.90	0.0883	0.99 (0.98-1.00)
3	-0.05	0.01	43.07	<.0001	0.95 (0.94-0.97)
4	-0.05	0.01	19.14	<.0001	0.95 (0.93-0.97)
5	-0.04	0.01	15.53	<.0001	0.96 (0.94-0.98)
6	-0.05	0.02	10.95	0.0009	0.95 (0.92-0.98)
Depression Rating Scale (Ref = 0-2)					
3+	-0.04	0.01	57.44	<.0001	0.96 (0.95-0.97)
Pain Scale (Ref = 0)					
1	-0.05	0.01	74.94	<.0001	0.95 (0.94-0.96)
2	-0.04	0.01	40.42	<.0001	0.96 (0.95-0.98)
3	-0.08	0.01	63.14	<.0001	0.93 (0.91-0.94)
Index of Social Engagement (Ref = 0)					
1	-0.07	0.01	57.88	<.0001	0.94 (0.92-0.95)
2	-0.01	0.01	1.47	0.2249	0.99 (0.97-1.01)
3	-0.01	0.01	1.38	0.2395	0.99 (0.97-1.01)
4	0.02	0.01	6.67	0.0098	1.02 (1.01-1.04)
5	0.00	0.01	0.07	0.7880	1.00 (0.98-1.02)
6	0.09	0.01	83.06	<.0001	1.09 (1.07-1.11)
Rehabilitation Potential (Ref = Neither Patient or Provider)					
Both Patient and Provider	0.16	0.01	808.67	<.0001	1.17 (1.16-1.18)
Only Patient	0.05	0.01	38.60	<.0001	1.06 (1.04-1.07)
Only Provider	0.11	0.01	241.80	<.0001	1.12 (1.10-1.14)
Support Person Present (Ref = No)					
Yes	0.21	0.01	1531.12	<.0001	1.23 (1.22-1.25)
Time Involved in Activities (Ref = Most)					
Some	-0.04	0.01	57.68	<.0001	0.96 (0.95-0.97)
Little	-0.05	0.01	61.55	<.0001	0.95 (0.94-0.96)
None	-0.14	0.01	219.93	<.0001	0.87 (0.86-0.89)
IV Medication (Ref = Not Provided)					
Provided	-0.08	0.01	162.56	<.0001	0.92 (0.91-0.93)
Tracheostomy Care (Ref = Not Provided)					
Provided	0.15	0.02	41.96	<.0001	1.16 (1.11-1.21)
Oxygen Therapy (Ref = Not Provided)					
Provided	-0.08	0.01	172.49	<.0001	0.92 (0.91-0.93)
Suctioning (Ref = Not Provided)					
Provided	-0.14	0.02	66.34	<.0001	0.87 (0.84-0.90)
Facility Size (Ref = Small)					
Large	0.01	0.01	0.92	0.3382	1.01 (0.99-1.02)
Medium	0.04	0.01	26.44	<.0001	1.04 (1.02-1.05)
Facility Area Income Quintile (Ref = 1st Quintile)					
2nd Quintile	0.26	0.01	1147.77	<.0001	1.30 (1.28-1.32)
3rd Quintile	0.15	0.01	356.23	<.0001	1.16 (1.14-1.17)

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Table 2.22 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Incidence Rate Ratio (95% CI)
4th Quintile	0.29	0.01	1218.98	<.0001	1.34 (1.32-1.36)
5th Quintile	0.26	0.01	801.10	<.0001	1.30 (1.28-1.32)
Not Assigned	0.80	0.11	50.89	<.0001	2.22 (1.78-2.76)
LHIN (Ref = Toronto Central)					
Central	0.17	0.01	146.66	<.0001	1.19 (1.16-1.22)
Central East	-0.08	0.01	47.53	<.0001	0.93 (0.91-0.95)
Central West	0.19	0.02	105.81	<.0001	1.21 (1.17-1.26)
Champlain	-0.22	0.01	402.35	<.0001	0.81 (0.79-0.82)
Erie St. Clair	-0.20	0.01	298.24	<.0001	0.82 (0.80-0.84)
Hamilton Niagara Haldimand Brant	0.33	0.01	1659.06	<.0001	1.38 (1.36-1.41)
Mississauga Halton	0.24	0.01	506.46	<.0001	1.27 (1.25-1.30)
North East	0.25	0.01	336.68	<.0001	1.29 (1.25-1.32)
North Simcoe Muskoka	0.20	0.02	133.62	<.0001	1.22 (1.18-1.26)
North West	0.32	0.01	737.07	<.0001	1.38 (1.34-1.41)
South East	0.24	0.01	356.86	<.0001	1.27 (1.24-1.31)
South West	-0.11	0.01	108.15	<.0001	0.89 (0.87-0.91)
Waterloo Wellington	-0.27	0.01	496.90	<.0001	0.76 (0.75-0.78)
Dispersion	0.33	0.00			

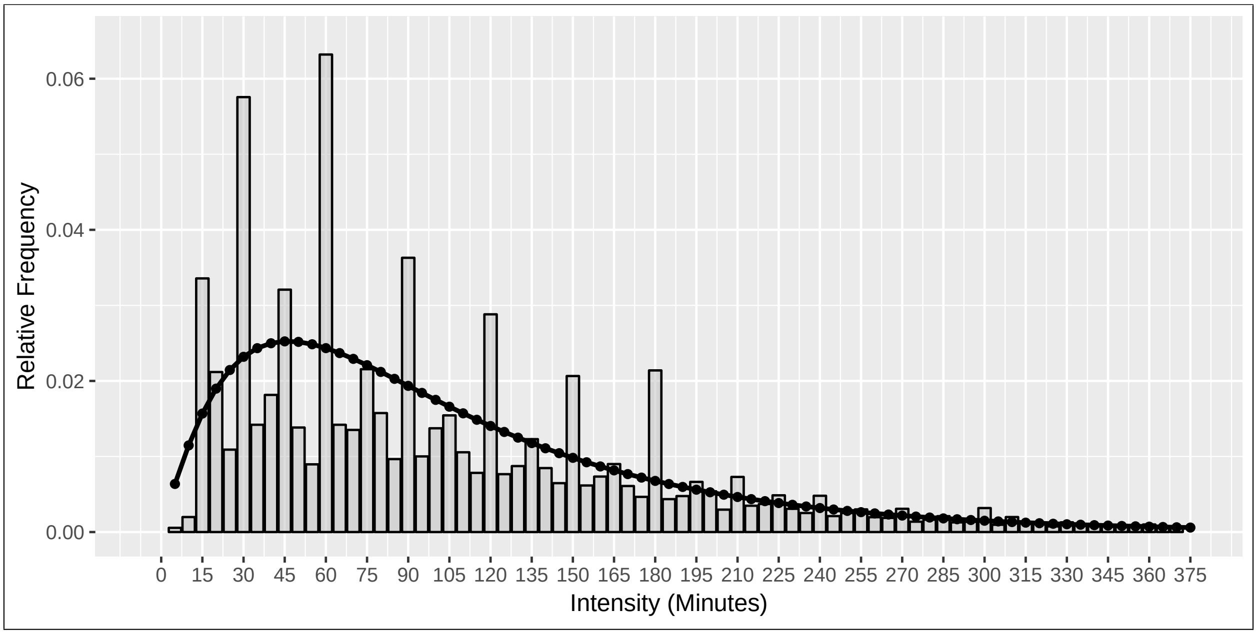
Factors Associated with Provision of Occupational Therapy

Model fit statistics for the zero-inflated negative binomial regression model for weekly occupational therapy intensity are presented in (Table 2.23). Compared to a null model, the addition of both patient and facility-level characteristics lead to a reduction in both AIC and BIC statistics. The C-statistic for the logit component of the model containing only patient characteristics was 0.73, indicating good model fit. The addition of facility and system-level characteristics improved the C-statistic to 0.81, which indicates strong fit. Figure 2.6 illustrates the observed and model predicted occupational therapy intensity distributions.

Table 2.23: Goodness of Fit Statistics for the Zero-inflated Negative Binomial Regression Model for Weekly Occupational Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Model Description	AIC	BIC	Pearson Chi-Square	Deviance	C-Statistic (Logit Component Only)
Null Model	907735.9602	907764.5222	109527.3809	907729.9602	-
Patient Characteristics	885914.6633	886895.2929	110785.7997	885708.6633	0.730
Facility Characteristics	888366.8272	888795.2576	109601.2129	888276.8272	0.696
Patient and Facility Characteristics	865304.6093	866685.1073	111287.6112	865014.6093	0.806

Figure 2.6: Zero-truncated and Binned Observed and Predicted Distributions for Occupational Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788



Observed frequency represented with bars, predicted frequency represented with line.

Parameter estimates for the zero-inflated negative binomial regression model for weekly occupational therapy intensity are presented in Table 2.24 and Table 2.25. With minor exceptions, this model shares a common set of covariates with the regression model predicting weekly physical therapy intensity presented in Tables 2.21 and 2.22. For this reason, only effects that differ in significance, direction or by a substantial magnitude are discussed. The logit model component of the regression model predicting provision of no occupational therapy during assessment period is presented in Table 2.24. Again, the inverse of the effect odds ratio is discussed to facilitate interpretation. Patients aged 85-94 and 95+ were less likely to receive occupational therapy compared patients aged 0-64. However, this effect was not significant for patients aged 65-74 and 75-84. Spinal cord injury was significantly associated with a greater likelihood receiving occupational therapy. Compared to patients with a CHESS score of zero, patients with scores of one and two were more likely to receive occupational therapy. However, patients with CHESS scores of four and five were less likely to receive occupational therapy. Patients with CPS scores of one and two were more likely than patients with a CPS of zero to receive occupational therapy. Patients with CPS scores of four and six were less likely to receive any occupational therapy. This effect was not significant at all other levels. Patients that were likely to have a mood disorder (DRS 3+) had lower odds of receiving any occupational therapy. Patients with pain that occurred less than daily were less likely than patients with no pain to receive any occupational therapy. Conversely, patients with daily pain were more likely to receive occupational therapy. Compared to patients that spent most of the time involved in actives, patients that spent little time involved in activities were more likely to receive occupational therapy. However, patients that spent no time involved in activities were less likely to receive any occupational therapy.

With respect to facility and system-level effects, patients that received care in both large and medium-sized facilities were more likely to receive occupational therapy compared to patients in small facilities. The effect of facility area density (rurality) was much stronger in the occupational therapy model. The odds of receiving occupational therapy in a facility located in an urban setting was 2.7 as large compared to a facility located in rural setting. Finally, compared to the Toronto Central LHIN, only patients admitted to facilities located in the Hamilton Niagara Haldimand Brant and North West LHINs were more likely to receive occupational therapy. Patients admitted to facilities in all other LHINs were less likely to receive any occupational therapy (Table 2.24) .

Table 2.24: Binomial with Logit Link Zero-inflation Model Parameter Estimates Predicting Receipt of No Occupational Therapy, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Intercept	1.12	0.07	275.65	<.0001	
Age (Ref = 0-64)					
65-74	-0.05	0.03	2.65	0.1035	1.05 (0.99-1.11)
75-84	0.00	0.03	0.01	0.9215	1.00 (0.95-1.05)
85-94	0.11	0.03	17.57	<.0001	0.89 (0.85-0.94)
95+	0.28	0.05	37.09	<.0001	0.75 (0.69-0.82)
Amputation (Ref = Absent)					
Present	-0.23	0.06	17.22	<.0001	1.26 (1.13-1.41)
Arthritis (Ref = Absent)					
Present	-0.12	0.02	37.14	<.0001	1.12 (1.08-1.17)
Pulmonary Conditions (Ref = Absent)					
Present	-0.13	0.02	53.68	<.0001	1.13 (1.10-1.17)
Orthopedic Conditions (Ref = Absent)					
Present	-0.18	0.02	79.46	<.0001	1.20 (1.15-1.25)

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Table 2.24 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Other Medically Complex Conditions (Ref = Absent)					
Present	-0.09	0.02	19.35	<.0001	1.10 (1.05-1.15)
Spinal Cord Injury (Ref = Absent)					
Present	-0.28	0.07	17.91	<.0001	1.32 (1.16-1.50)
Stroke (Ref = Absent)					
Present	-0.29	0.02	173.74	<.0001	1.34 (1.28-1.40)
Traumatic Brain Injury (Ref = Absent)					
Present	-0.30	0.07	19.07	<.0001	1.35 (1.18-1.54)
Cancer (Ref = Absent)					
Present	0.41	0.02	429.97	<.0001	0.67 (0.64-0.69)
Unsteady Gait (Ref = Absent)					
Present	-0.18	0.02	112.71	<.0001	1.20 (1.16-1.24)
Aphasia (Ref = Absent)					
Present	-0.22	0.04	25.97	<.0001	1.24 (1.14-1.35)
CHESS (Ref = 0)					
1	-0.07	0.03	6.87	0.0088	1.07 (1.02-1.13)
2	-0.14	0.03	27.27	<.0001	1.16 (1.09-1.22)
3	-0.08	0.03	6.32	0.0119	1.08 (1.02-1.15)
4	0.18	0.03	27.64	<.0001	0.84 (0.78-0.89)
5	0.58	0.04	210.19	<.0001	0.56 (0.52-0.60)
ADL Hierarchy Scale (Ref = 0)					
1	-0.32	0.05	38.01	<.0001	1.37 (1.24-1.52)
2	-0.67	0.04	240.32	<.0001	1.95 (1.79-2.12)
3	-0.63	0.04	206.93	<.0001	1.88 (1.72-2.05)
4	-0.85	0.05	344.29	<.0001	2.33 (2.13-2.55)
5	-0.47	0.04	123.83	<.0001	1.60 (1.47-1.74)
6	-0.22	0.05	17.64	<.0001	1.24 (1.12-1.37)
Cognitive Performance Scale (Ref = 0)					
1	-0.05	0.03	4.06	0.0440	1.05 (1.00-1.11)
2	-0.10	0.03	13.80	0.0002	1.10 (1.05-1.16)
3	-0.02	0.03	0.69	0.4065	1.02 (0.97-1.08)
4	0.12	0.04	7.33	0.0068	0.89 (0.82-0.97)
5	0.04	0.04	1.23	0.2669	0.96 (0.89-1.03)
6	0.11	0.05	5.86	0.0155	0.89 (0.81-0.98)
Depression Rating Scale (Ref = 0-2)					
3+	0.13	0.02	41.73	<.0001	0.88 (0.84-0.91)
Pain Scale (Ref = 0)					
1	0.11	0.02	27.13	<.0001	0.89 (0.86-0.93)
2	-0.11	0.02	25.10	<.0001	1.12 (1.07-1.17)
3	-0.10	0.04	8.13	0.0043	1.11 (1.03-1.19)
Index of Social Engagement (Ref = 0)					
1	0.08	0.03	7.67	0.0056	0.93 (0.88-0.98)
2	0.06	0.03	3.70	0.0545	0.94 (0.88-1.00)
3	0.03	0.03	0.61	0.4333	0.97 (0.91-1.04)
4	-0.07	0.03	4.02	0.0449	1.07 (1.00-1.14)
5	-0.15	0.04	14.30	0.0002	1.16 (1.07-1.25)
6	-0.30	0.04	66.70	<.0001	1.34 (1.25-1.44)
Rehabilitation Potential (Ref = Neither Patient or Provider)					
Both Patient and Provider	-0.64	0.02	801.22	<.0001	1.90 (1.82-1.99)

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Table 2.24 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Only Patient	-0.26	0.03	58.77	<.0001	1.29 (1.21-1.38)
Only Provider	-0.46	0.03	234.24	<.0001	1.58 (1.49-1.68)
Support Person Present (Ref = No)					
Yes	-0.76	0.02	1540.52	<.0001	2.14 (2.06-2.22)
Time Involved in Activities (Ref = Most)					
Some	-0.03	0.02	2.11	0.1461	1.03 (0.99-1.08)
Little	-0.07	0.02	8.38	0.0038	1.07 (1.02-1.13)
None	0.33	0.03	114.25	<.0001	0.72 (0.68-0.76)
IV Medication (Ref = Not Provided)					
Provided	0.27	0.02	143.74	<.0001	0.77 (0.73-0.80)
Tracheostomy Care (Ref = Not Provided)					
Provided	-0.19	0.06	9.40	0.0022	1.21 (1.07-1.37)
Oxygen Therapy (Ref = Not Provided)					
Provided	0.11	0.02	27.23	<.0001	0.89 (0.86-0.93)
Facility Size (Ref = Small)					
Large	-0.76	0.03	634.13	<.0001	2.13 (2.01-2.26)
Medium	-0.40	0.03	208.42	<.0001	1.49 (1.41-1.57)
Urban Area (Ref = Urban)					
Rural	0.98	0.04	643.44	<.0001	0.37 (0.35-0.40)
Facility Area Income Quintile (Ref = 1st Quintile)					
2nd Quintile	-0.87	0.03	823.16	<.0001	2.39 (2.25-2.53)
3rd Quintile	-0.62	0.03	511.17	<.0001	1.85 (1.76-1.96)
4th Quintile	-0.52	0.03	287.38	<.0001	1.69 (1.59-1.79)
5th Quintile	-1.17	0.03	1308.07	<.0001	3.21 (3.01-3.42)
Not Assigned	-0.94	0.31	9.39	0.0022	2.56 (1.40-4.68)
LHIN (Ref = Toronto Central)					
Central	0.60	0.05	152.11	<.0001	0.55 (0.50-0.60)
Central East	0.36	0.04	86.42	<.0001	0.70 (0.65-0.75)
Central West	1.60	0.06	691.48	<.0001	0.20 (0.18-0.23)
Champlain	0.98	0.04	678.77	<.0001	0.37 (0.35-0.40)
Erie St. Clair	0.70	0.04	316.29	<.0001	0.50 (0.46-0.54)
Hamilton Niagara Haldimand Brant	-0.56	0.03	301.60	<.0001	1.76 (1.65-1.87)
Mississauga Halton	0.32	0.04	60.50	<.0001	0.73 (0.67-0.79)
North East	1.31	0.04	846.89	<.0001	0.27 (0.25-0.29)
North Simcoe Muskoka	1.89	0.06	973.93	<.0001	0.15 (0.13-0.17)
North West	-0.39	0.05	63.53	<.0001	1.48 (1.34-1.63)
South East	0.39	0.05	70.45	<.0001	0.68 (0.62-0.74)
South West	1.04	0.04	759.08	<.0001	0.35 (0.33-0.38)
Waterloo Wellington	0.86	0.04	394.22	<.0001	0.42 (0.39-0.46)

The negative binomial model component of the regression model predicting occupational therapy intensity as a count of minutes per week among patients that received more than 15 minutes of week of occupational therapy during the assessment period is presented in Table 2.25. In this model, patients with orthopedic conditions received occupational therapy at a slightly lower rate than patients without orthopedic conditions. Unlike the physical therapy model, only patients with CHESS scores of three or greater received occupational therapy a lower rate than patients with a CHESS score of zero. Compared to patients with ADL-H Scale scores of zero, patients with scores from two to four received occupational therapy at a higher rate. Patients with an ADL-H Scale of six received occupational therapy at a lower rate. This effect was not significant at the other levels. With respect to change in ADL function, only patients that deteriorated in the past 90 days received occupational at a higher rate. Cognitive impairment was associated with a slight increase in the rate in the occupational therapy provision for all CPS scores, except five.

Patients that were admitted to large and medium-sized facilities received occupational therapy at a significantly higher rate compared to patients admitted small-sized facilities. Except for patients admitted to facilities located in areas classified into the third facility area quintile, occupational therapy was provided at a higher rate to patients admitted to facilities that were not located in the first area income quintile. Compared to Toronto Central LHIN, patients admitted to facilities in the Central, Hamilton Niagara Haldimand Brant, Mississauga Halton, and North West LHINs received occupational therapy at higher rate. Outside of Central West LHIN where there was no difference, patients admitted to all other LHINs were provided occupational therapy at a lower rate than in Toronto Central LHIN (Table 2.25).

Table 2.25: Negative Binomial with Log Link Count Model Parameter Estimates for Occupational Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Estimate	Standard Error	χ^2	P-Value	Rate Ratio (95% CI)
Intercept	4.24	0.02	29650.80	<.0001	
Age (Ref = 0-64)					
65-74	-0.04	0.01	23.46	<.0001	0.96 (0.94-0.97)
75-84	-0.08	0.01	80.07	<.0001	0.93 (0.91-0.94)
85-94	-0.11	0.01	156.45	<.0001	0.90 (0.88-0.91)
95+	-0.17	0.02	117.65	<.0001	0.84 (0.82-0.87)
Arthritis (Ref = Absent)					
Present	0.02	0.01	16.41	<.0001	1.02 (1.01-1.04)
Pulmonary Conditions (Ref = Absent)					
Present	0.02	0.01	18.87	<.0001	1.02 (1.01-1.03)
Neurological Conditions (Ref = Absent)					
Present	0.04	0.01	25.08	<.0001	1.04 (1.03-1.06)
Stroke (Ref = Absent)					
Present	0.06	0.01	95.48	<.0001	1.07 (1.05-1.08)
Traumatic Brain Injury (Ref = Absent)					
Present	0.10	0.02	26.06	<.0001	1.11 (1.07-1.15)

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Table 2.25 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Rate Ratio (95% CI)
Cancer (Ref = Absent)					
Present	-0.10	0.01	230.23	<.0001	0.90 (0.89-0.92)
Aphasia (Ref = Absent)					
Present	0.21	0.01	233.89	<.0001	1.23 (1.20-1.26)
CHESS (Ref = 0)					
1	0.05	0.01	35.83	<.0001	1.05 (1.03-1.07)
2	0.04	0.01	27.47	<.0001	1.05 (1.03-1.06)
3	0.02	0.01	5.55	0.0185	1.02 (1.00-1.04)
4	-0.04	0.01	13.74	0.0002	0.96 (0.94-0.98)
5	-0.20	0.02	150.40	<.0001	0.82 (0.79-0.85)
ADL Hierarchy Scale (Ref = 0)					
1	-0.02	0.02	1.23	0.2668	0.98 (0.95-1.02)
2	0.05	0.02	9.24	0.0024	1.05 (1.02-1.08)
3	0.06	0.02	13.75	0.0002	1.06 (1.03-1.09)
4	0.06	0.02	13.22	0.0003	1.06 (1.03-1.09)
5	0.02	0.02	2.22	0.1362	1.02 (0.99-1.05)
6	-0.06	0.02	7.80	0.0052	0.95 (0.91-0.98)
Cognitive Performance Scale (Ref = 0)					
1	0.03	0.01	14.80	0.0001	1.03 (1.01-1.05)
2	0.08	0.01	97.61	<.0001	1.08 (1.07-1.10)
3	0.05	0.01	34.42	<.0001	1.05 (1.03-1.07)
4	0.05	0.01	12.00	0.0005	1.05 (1.02-1.08)
5	0.01	0.01	0.68	0.4103	1.01 (0.99-1.04)
6	0.05	0.02	8.08	0.0045	1.06 (1.02-1.10)
Pain Scale (Ref = 0)					
1	-0.06	0.01	84.00	<.0001	0.94 (0.93-0.95)
2	-0.02	0.01	5.65	0.0175	0.98 (0.97-1.00)
3	-0.07	0.01	35.29	<.0001	0.93 (0.91-0.95)
Index of Social Engagement (Ref = 0)					
1	0.04	0.01	15.73	<.0001	1.04 (1.02-1.06)
2	0.07	0.01	40.09	<.0001	1.07 (1.05-1.10)
3	0.10	0.01	81.25	<.0001	1.11 (1.08-1.13)
4	0.17	0.01	222.52	<.0001	1.18 (1.16-1.21)
5	0.14	0.01	115.91	<.0001	1.15 (1.12-1.18)
6	0.22	0.01	356.35	<.0001	1.25 (1.22-1.28)
Rehabilitation Potential (Ref = Neither Patient or Provider)					
Both Patient and Provider	0.11	0.01	271.62	<.0001	1.12 (1.10-1.13)
Only Patient	0.06	0.01	31.79	<.0001	1.06 (1.04-1.09)
Only Provider	0.08	0.01	75.31	<.0001	1.08 (1.06-1.10)
Support Person Present (Ref = No)					
Yes	0.17	0.01	601.56	<.0001	1.18 (1.16-1.20)
Time Involved in Activities (Ref = Most)					
Some	-0.05	0.01	39.78	<.0001	0.96 (0.94-0.97)
Little	-0.03	0.01	13.61	0.0002	0.97 (0.96-0.99)
None	-0.08	0.01	47.83	<.0001	0.93 (0.91-0.95)
IV Medication (Ref = Not Provided)					
Provided	-0.08	0.01	91.34	<.0001	0.93 (0.91-0.94)
Tracheostomy Care (Ref = Not Provided)					
Provided	0.16	0.03	35.61	<.0001	1.18 (1.12-1.24)
Oxygen Therapy (Ref = Not Provided)					

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Table 2.25 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Rate Ratio (95% CI)
Provided	-0.08	0.01	120.34	<.0001	0.92 (0.90-0.93)
Suctioning (Ref = Not Provided)					
Provided	-0.16	0.02	62.46	<.0001	0.85 (0.82-0.89)
Facility Size (Ref = Small)					
Large	0.15	0.01	181.13	<.0001	1.16 (1.13-1.18)
Medium	0.02	0.01	3.95	0.0468	1.02 (1.00-1.04)
Facility Area Income Quintile (Ref = 1st Quintile)					
2nd Quintile	0.20	0.01	385.85	<.0001	1.22 (1.20-1.24)
3rd Quintile	-0.04	0.01	17.76	<.0001	0.96 (0.94-0.98)
4th Quintile	0.23	0.01	410.08	<.0001	1.25 (1.23-1.28)
5th Quintile	0.09	0.01	52.09	<.0001	1.10 (1.07-1.13)
Not Assigned	0.80	0.12	42.82	<.0001	2.22 (1.75-2.82)
LHIN (Ref = Toronto Central)					
Central	0.33	0.02	349.85	<.0001	1.40 (1.35-1.44)
Central East	-0.23	0.01	287.78	<.0001	0.80 (0.78-0.82)
Central West	0.00	0.02	0.01	0.9376	1.00 (0.96-1.05)
Champlain	-0.52	0.01	1311.45	<.0001	0.59 (0.58-0.61)
Erie St. Clair	-0.17	0.01	137.26	<.0001	0.84 (0.82-0.87)
Hamilton Niagara Haldimand Brant	0.16	0.01	269.88	<.0001	1.18 (1.15-1.20)
Mississauga Halton	0.13	0.01	88.04	<.0001	1.14 (1.11-1.17)
North East	-0.18	0.02	107.87	<.0001	0.83 (0.80-0.86)
North Simcoe Muskoka	-0.26	0.03	82.52	<.0001	0.77 (0.73-0.82)
North West	0.26	0.01	331.74	<.0001	1.30 (1.26-1.33)
South East	-0.12	0.02	59.21	<.0001	0.88 (0.86-0.91)
South West	-0.33	0.01	570.65	<.0001	0.72 (0.70-0.74)
Waterloo Wellington	-0.42	0.02	684.07	<.0001	0.66 (0.64-0.68)
Dispersion	0.45	0.00			

Factors Associated with Provision of Speech-language Pathology Therapy

Model fit statistics for the zero-inflated negative binomial regression model for weekly physical therapy intensity are presented in (Table 2.26). Compared to a null model, which includes only intercept and dispersion parameters, the addition of both patient and facility-level characteristics lead to a reduction in both AIC and BIC statistics. As determined by the C-statistic, the logit component of the patient characteristics and full models were strong. Figure 2.7 illustrates the observed and model predicted speech-language pathology therapy intensity distributions.

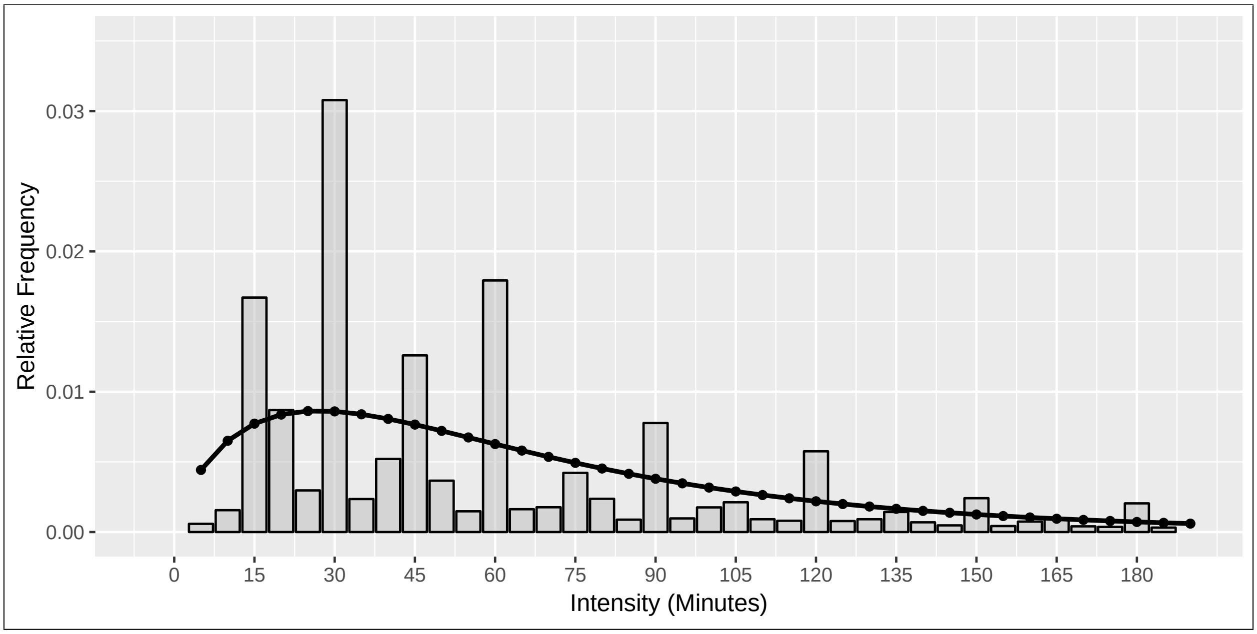
Parameter estimates for the zero-inflated negative binomial regression model for weekly speech-language pathology therapy intensity are divided between Table 2.27 and Table 2.28. The logit model component of the regression model, which predicts receipt of no speech-language pathol-

Table 2.26: Goodness of Fit Statistics for the Zero-inflated Negative Binomial Regression Model for Weekly Speech-language Pathology Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Model Description	AIC	BIC	Pearson Chi-Square	Deviance	C-Statistic (Logit Component Only)
Null Model	253682.5698	253711.1318	119417.2349	253676.5698	-
Patient Characteristics	236570.6525	237237.0998	110642.1485	236386.7636	0.782
Facility Characteristics	247794.1689	248108.3512	115206.8456	247728.1689	0.676
Patient and Facility Characteristics	231557.7243	232509.7918	105751.7589	231357.7243	0.819

ogy therapy minutes during the assessment period, is presented first (Table 2.27). Female patients, and patients aged 65 years and older, were less likely to receive any speech-language pathology therapy during the assessment period. Patients admitted with orthopedic conditions were less likely to receive any speech-language pathology therapy; however, patients with cardiac conditions, other medically complex conditions, stroke, traumatic brain injury, and aphasia were more likely to receive any speech-language pathology therapy. Compared to patients with a CHESS score of zero, patients with a CHESS scores of one, four and five were less likely to receive speech-language pathology therapy. For patients with a CHESS score of two and three, this effect was not statistically significant. Patients with a short-term memory problem and those with modified independence in decision-making were more likely to receive speech-language pathology therapy. There was no difference for patients that were moderately or severely impaired in decision making. Compared to patients that were always able to make themselves understood, patients that were usually or sometimes understood were more likely to receive speech-language pathology therapy. This effect was not significant for patients that were rarely or never understood. Similarly, patients with unclear speech or no ability to speak were more likely to receive speech-language pathology therapy. Compared to patients that are always able to understand others, patients that sometimes, rarely or never understood others were less likely to receive speech-language pathology therapy. Change in communication or hearing, both improvement or deterioration, in the previous 90 days was associated with a increase in the likelihood of receiving speech-language pathology therapy. Compared to patients that were independent in eating as an activity of daily living, patients that required

Figure 2.7: Zero-truncated and Binned Observed and Predicted Distributions for Speech-language Pathology Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788



Observed frequency represented with bars, predicted frequency represented with line.

supervision were less likely to receive physical therapy. Patients that required limited assistance for eating were slightly more likely to receive speech-language pathology therapy. This effect was not statistically significant for all other levels of the eating self-performance scale. Patients with a swallowing problem, need for a feeding tube, and need for a mechanically altered diet were more likely to receive speech-language pathology therapy.

With respect to facility and system-level effects, patients that were admitted to large and medium-sized facilities were more likely to receive speech-language pathology therapy compared to patients in small-sized facilities. Compared to facilities located in urban areas, patients admitted to facilities in rural settings were less likely to receive speech-language pathology therapy. Finally, there was a significant regional effect, whereby patients that were admitted to facilities outside of Toronto Central LHIN were less likely to receive speech-language pathology therapy (Table 2.27).

Table 2.27: Binomial with Logit Link Zero-inflation Model Parameter Estimates Predicting Receipt of No Speech-language Pathology Therapy, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Intercept	1.89	0.05	1219.15	<.0001	
Age (Ref = 0-64)					
65-74	0.19	0.03	32.54	<.0001	0.82 (0.77-0.88)
75-84	0.29	0.03	85.31	<.0001	0.75 (0.71-0.80)
85-94	0.29	0.03	79.43	<.0001	0.75 (0.70-0.80)
95+	0.19	0.06	11.47	0.0007	0.83 (0.74-0.92)
Female (Ref = No)					
Yes	0.17	0.02	71.10	<.0001	0.84 (0.81-0.88)
Cardiac Conditions (Ref = Absent)					
Present	-0.09	0.02	20.37	<.0001	1.10 (1.05-1.14)
Other Medically Complex Conditions (Ref = Absent)					
Present	0.13	0.03	25.56	<.0001	0.87 (0.83-0.92)
Orthopedic Conditions (Ref = Absent)					
Present	0.31	0.03	138.47	<.0001	0.74 (0.70-0.77)
Stroke (Ref = Absent)					
Present	-0.56	0.02	574.94	<.0001	1.75 (1.67-1.83)
Traumatic Brain Injury (Ref = Absent)					
Present	-0.44	0.07	44.97	<.0001	1.56 (1.37-1.77)
Aphasia (Ref = Absent)					
Present	-0.59	0.04	205.48	<.0001	1.80 (1.66-1.95)
CHESS (Ref = 0)					
1	0.11	0.04	9.79	0.0018	0.90 (0.84-0.96)
2	-0.10	0.03	8.82	0.0030	1.11 (1.03-1.18)
3	-0.07	0.04	3.22	0.0727	1.07 (0.99-1.15)
4	0.07	0.04	2.85	0.0911	0.93 (0.86-1.01)
5	0.60	0.05	152.34	<.0001	0.55 (0.50-0.60)
Short-term Memory Problem (Ref = No)					
Yes	-0.20	0.03	56.20	<.0001	1.23 (1.16-1.29)
Cognitive Skills for Decision Making (Ref = Independent)					
Modified Independence	-0.10	0.03	10.42	0.0012	1.10 (1.04-1.17)
Moderately Impaired	0.01	0.04	0.07	0.7920	0.99 (0.92-1.06)
Severally Impaired	0.04	0.05	0.74	0.3907	0.96 (0.88-1.05)
Ability to Make Self Understood (Ref = Understood)					
Usually Understood	-0.13	0.03	16.35	<.0001	1.14 (1.07-1.22)
Sometimes Understood	-0.20	0.05	16.17	<.0001	1.22 (1.11-1.34)
Rarely or Never Understood	0.03	0.08	0.16	0.6901	0.97 (0.83-1.13)
Speech Clarity (Ref = Clear)					
Unclear	-0.38	0.03	149.14	<.0001	1.46 (1.38-1.56)
No Speech	-0.12	0.06	3.91	0.0479	1.13 (1.00-1.27)
Ability to Understand Others (Ref = Understands)					
Usually Understands	0.02	0.03	0.44	0.5051	0.98 (0.92-1.04)
Sometimes Understands	0.21	0.04	23.22	<.0001	0.81 (0.74-0.88)
Rarely or Never Understands	0.46	0.08	35.00	<.0001	0.63 (0.54-0.73)

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Table 2.27 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Inverse Odds Ratio (95% CI)
Change in Communication/Hearing (Ref = No Change)					
Improved	-0.25	0.08	9.10	0.0026	1.29 (1.09-1.52)
Deteriorated	-0.26	0.03	77.08	<.0001	1.30 (1.23-1.38)
Eating Self-performance (Ref = Independent)					
Supervision	0.10	0.03	10.23	0.0014	0.91 (0.86-0.96)
Limited Assistance	-0.06	0.03	3.63	0.0568	1.06 (1.00-1.13)
Extensive Assistance	-0.00	0.04	0.01	0.9428	1.00 (0.93-1.08)
Total Dependence/Did Not Occur	0.04	0.04	1.25	0.2637	0.96 (0.89-1.03)
Swallowing Problem (Ref = No)					
Yes	-1.18	0.03	2098.45	<.0001	3.24 (3.08-3.41)
Feeding Tube (Ref = No)					
Yes	-0.29	0.05	40.02	<.0001	1.33 (1.22-1.46)
Mechanically Altered Diet (Ref = No)					
Yes	-0.85	0.02	1276.54	<.0001	2.35 (2.24-2.46)
Facility Size (Ref = Small)					
Large	-0.20	0.04	28.01	<.0001	1.22 (1.13-1.31)
Medium	-0.34	0.04	95.59	<.0001	1.41 (1.32-1.51)
Urban Area (Ref = Urban)					
Rural	0.71	0.08	87.12	<.0001	0.49 (0.42-0.57)
LHIN (Ref = Toronto Central)					
Central	1.60	0.06	652.05	<.0001	0.20 (0.18-0.23)
Central East	1.51	0.05	795.92	<.0001	0.22 (0.20-0.25)
Central West	1.25	0.08	237.06	<.0001	0.29 (0.24-0.34)
Champlain	1.33	0.05	717.05	<.0001	0.26 (0.24-0.29)
Erie St. Clair	1.50	0.06	737.77	<.0001	0.22 (0.20-0.25)
Hamilton Niagara Haldimand Brant	0.38	0.03	161.82	<.0001	0.68 (0.64-0.72)
Mississauga Halton	1.30	0.05	632.00	<.0001	0.27 (0.25-0.30)
North East	1.74	0.08	444.47	<.0001	0.17 (0.15-0.21)
North Simcoe Muskoka	1.31	0.08	239.10	<.0001	0.27 (0.23-0.32)
North West	0.77	0.05	249.36	<.0001	0.46 (0.42-0.51)
South East	1.79	0.07	641.03	<.0001	0.17 (0.15-0.19)
South West	1.09	0.05	452.84	<.0001	0.34 (0.30-0.37)
Waterloo Wellington	0.87	0.05	273.76	<.0001	0.42 (0.38-0.47)

The negative binomial model component of the regression model predicting speech-language pathology therapy intensity as a count of minutes per week among patients that received occupational therapy during the assessment period is presented in Table 2.28. Older age was associated with a lower rate of provision of speech-language pathology therapy. Patients with other medically complex conditions and orthopedic conditions received speech-language pathology therapy at a lower rate; however, cardiac conditions, stroke, traumatic brain injury, and aphasia were associated with a higher rate of speech-language pathology therapy provision.

Patients with CHESS scores of two received speech-language pathology therapy at a higher rate than patients with a CHESS score of zero. This effect was not significant for patients with a CHESS score of one and three, and patients with a CHESS scores of four and five received speech-language pathology therapy at a lower rate than patients with a score of zero. Patients with a short-term memory problem received speech-language pathology therapy at a higher rate than patients without issues in this area. Compared to patients that were independent in daily decision making, patients that were moderately to severely impaired received speech-language pathology therapy at a lower rate. This effect was not statistically significant for patients with modified independence in decision-making. Patients that had recently experienced an improvement in their cognitive status received speech-language pathology therapy at a lower rate than patients who had not experienced a recent change. However, patients whose cognitive status had recently deteriorated received speech-language pathology therapy at a higher rater. Compared to patients that were always understood, patients that usually understood received speech-language pathology therapy at a higher rate, while patients that were rarely or never understood received it at a lower rate. Patients with unclear or no speech received speech-language pathology therapy at higher rate than patients with clear speech. Deterioration in communication or hearing in the previous 90 days was associated with a higher rate of speech-language pathology therapy provision; however, this effect was not significant for patients whose communication or hearing had improved. Compared to patients that were independent in eating, patients with any level impairment in this activity of daily living received speech-language pathology therapy at a lower rate. There was little differentiation between levels of eating self-performance. Patients with a chewing problem received speech-language pathology therapy at a lower rate, while patients requiring a feeding tube received speech-language pathology therapy at a higher rate.

Unlike the models for the other therapist types, there were no facility-level effects that were associated with rate of speech-language pathology therapy provision. Compared to patients in admitted to facilities in Toronto Central LHIN, patients that were admitted to facilities located in Hamilton Niagara Haldimand Brant and North East LHINs received speech-language pathology therapy at a higher rate. Patients admitted to Central East, Central West, Champlain, Erie St. Clair, Mississauga Halton, North West, South West, and Waterloo Wellington LHINs received speech-language pathology therapy at a lower rate. Finally, this effect was not significant for patients admitted to Central, North Simile Muskoka, and South East LHINs (Table 2.28).

Table 2.28: Negative Binomial with Log Link Count Model Parameter Estimates for Speech-language Pathology Therapy Intensity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Estimate	Standard Error	χ^2	P-Value	Rate Ratio (95% CI)
Intercept	4.33	0.03	29721.80	<.0001	
Age (Ref = 0-64)					
65-74	-0.13	0.02	40.09	<.0001	0.88 (0.85-0.92)
75-84	-0.19	0.02	106.89	<.0001	0.83 (0.80-0.86)
85-94	-0.25	0.02	171.57	<.0001	0.78 (0.75-0.81)
95+	-0.31	0.03	85.14	<.0001	0.74 (0.69-0.78)
Cardiac Conditions (Ref = Absent)					
Present	0.05	0.01	20.03	<.0001	1.06 (1.03-1.08)
Orthopedic Conditions (Ref = Absent)					
Present	-0.09	0.02	28.44	<.0001	0.92 (0.89-0.95)
Stroke (Ref = Absent)					
Present	0.26	0.01	367.85	<.0001	1.30 (1.26-1.33)
Traumatic Brain Injury (Ref = Absent)					
Present	0.25	0.03	53.37	<.0001	1.29 (1.20-1.37)
Aphasia (Ref = Absent)					
Present	0.17	0.02	70.92	<.0001	1.18 (1.14-1.23)
CHESS (Ref = 0)					
1	0.05	0.02	4.74	0.0294	1.05 (1.00-1.09)
2	0.10	0.02	24.54	<.0001	1.11 (1.06-1.16)
3	0.03	0.02	1.95	0.1625	1.03 (0.99-1.08)
4	0.01	0.02	0.07	0.7876	1.01 (0.96-1.06)
5	-0.18	0.03	38.03	<.0001	0.84 (0.79-0.89)
Short-term Memory Problem (Ref = No)					
Yes	0.13	0.02	67.73	<.0001	1.14 (1.10-1.17)
Cognitive Skills for Decision Making (Ref = Independent)					
Modified Independence	-0.00	0.02	0.00	0.9766	1.00 (0.96-1.04)
Moderately Impaired	-0.09	0.02	16.79	<.0001	0.92 (0.88-0.96)
Severally Impaired	-0.09	0.03	11.54	0.0007	0.92 (0.87-0.96)
Ability to Make Self Understood (Ref = Understood)					
Usually Understood	0.04	0.02	5.98	0.0144	1.04 (1.01-1.08)
Sometimes Understood	0.01	0.02	0.33	0.5628	1.01 (0.97-1.06)
Rarely or Never Understood	-0.08	0.03	6.11	0.0134	0.92 (0.87-0.98)
Speech Clarity (Ref = Clear)					
Unclear	0.07	0.02	18.16	<.0001	1.08 (1.04-1.11)
No Speech	0.08	0.03	6.74	0.0094	1.08 (1.02-1.15)
Change in Communication/Hearing (Ref = No Change)					
Improved	0.04	0.05	0.61	0.4336	1.04 (0.95-1.14)
Deteriorated	0.16	0.02	88.48	<.0001	1.17 (1.13-1.21)

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Table 2.28 – continued from previous page

Variable	Estimate	Standard Error	χ^2	P-Value	Rate Ratio (95% CI)
Eating Self-performance (Ref = Independent)					
Supervision	-0.26	0.02	190.21	<.0001	0.77 (0.74-0.80)
Limited Assistance	-0.22	0.02	148.12	<.0001	0.80 (0.77-0.83)
Extensive Assistance	-0.28	0.02	168.89	<.0001	0.76 (0.73-0.79)
Total Dependence/Did Not Occur	-0.32	0.02	227.97	<.0001	0.73 (0.70-0.76)
Chewing Problem (Ref = No)					
Yes	-0.05	0.01	16.84	<.0001	0.95 (0.93-0.97)
Feeding Tube (Ref = No)					
Yes	0.23	0.02	108.00	<.0001	1.26 (1.21-1.32)
LHIN (Ref = Toronto Central)					
Central	-0.06	0.04	2.58	0.1085	0.94 (0.87-1.01)
Central East	-0.38	0.03	124.88	<.0001	0.69 (0.64-0.73)
Central West	-0.24	0.05	25.97	<.0001	0.79 (0.72-0.86)
Champlain	-0.56	0.03	307.49	<.0001	0.57 (0.54-0.61)
Erie St. Clair	-0.30	0.03	71.52	<.0001	0.74 (0.70-0.80)
Hamilton Niagara Haldimand Brant	0.06	0.02	14.92	0.0001	1.06 (1.03-1.09)
Mississauga Halton	-0.20	0.03	39.48	<.0001	0.82 (0.77-0.87)
North East	0.20	0.05	14.13	0.0002	1.22 (1.10-1.36)
North Simcoe Muskoka	0.09	0.05	3.04	0.0812	1.10 (0.99-1.21)
North West	-0.17	0.03	29.46	<.0001	0.85 (0.80-0.90)
South East	0.06	0.04	1.69	0.1941	1.06 (0.97-1.15)
South West	-0.11	0.03	12.35	0.0004	0.89 (0.84-0.95)
Waterloo Wellington	-0.27	0.03	61.40	<.0001	0.77 (0.72-0.82)
Dispersion	0.52	0.01			

2.5 Discussion

This study represents the first exhaustive exploration of the patient, facility, and system-level factors associated with rehabilitation service patterns in Ontario CCC hospitals. It also extends upon the current rehabilitative care literature by examining the factors associated with both the provision and intensity of physical therapy, occupational therapy, and speech-language pathology therapy using one of the largest and most comprehensive sources of patient-level health information for patients in post-acute care. The implications of these findings from the perspective of health service utilization health system capacity planning are discussed.

2.5.1 Rehabilitation Service Patterns in Complex Continuing Care Hospitals

The distributions for physical therapy, occupational therapy, and speech-language pathology therapy intensity for patients in Ontario CCC hospitals are overdispersed, meaning that there is large variance in the intensity of rehabilitation that patients receive in these facilities. To some extent, this may be explained by the heterogeneous patient population that is found in Ontario CCC hospitals. Patients that are admitted to CCC hospitals present with a variety of conditions and may have physical, cognitive, and medical issues that may span from mild to severe (Hirdes et al., 2011). Additionally, patients admitted to CCC hospitals may follow both positive and negative outcome trajectories. For example, in 2016/2017, 34% of CCC patients were discharged home and 35% died in facility (Canadian Institute for Health Information, 2016a). As previously discussed, patients are typically admitted to CCC hospitals for rehabilitation because they are deemed to be too frail to tolerate the intensity of therapy offered in inpatient rehabilitation facilities (Tourangeau et al., 2011).

Patients in the current study received an average 103 minutes of physical therapy, 75 minutes of occupational therapy and 11 minutes of speech-language pathology therapy per week. Examining the percentage that received at least some therapy, 79% of patients received at least fifteen minutes of physical therapy, 69% received at least fifteen minutes of occupational therapy, and 16% received

15 or more minutes of speech-language pathology therapy time. Compared to the estimates reported by Wodchis et al. (2004), patients in the current study received approximately 30% fewer minutes of physical and occupational therapy per week; however, they were 22-28% more likely to receive any amount of physical and occupational therapy. In part, these shifts in therapy provision patterns may be attributable to the adoption of a prospective payment system in Ontario (i.e., Health Based Allocation Model) wherein a portion of funding allocation is based on relative patient need. In the United States, the adoption of prospective payment systems for post-acute care lead to an increase in the proportion of patients that received rehabilitation therapy and a decrease in the mean number of therapy minutes provided each week (Murray et al., 2005; Latham et al., 2008). This lead to an overall reduction in length of stay in post-acute care facilities (Kramer et al., 2006); however, the impact of these changes on functional outcomes has not yet been studied.

2.5.2 Patient-level Factors Associated with Provision of Rehabilitation Therapy

Given the heterogeneous nature of the patient population served in Ontario CCC hospitals, before identifying factors associated with rehabilitation intensity, consideration for the patient-level factors associated with provision of any amount of rehabilitation should be made. By studying the rehabilitation service patterns using an observational approach, this work provides insight into the patient characteristics that are both indicative and counter-indicative for need for rehabilitation in this post-acute care setting. C-statistics ranging from 0.73 to 0.84 for the logistic models containing only patient-level characteristics indicate that patient health status information collected using the MDS 2.0 assessment can be used to identify patients that are most likely to receive rehabilitation therapy in CCC hospitals.

The logistic regression component of the zero-inflated negative binomial regression models that were fit in this study showed that patients with health conditions associated with medical instability and advanced illness were less likely to receive physical and occupational therapy. Factors related to medical instability that were significant effects across the models included cancer diagnoses, CHESS scores of three or greater, need for advanced medical treatments such as IV medication and oxygen therapy, and a lack of participation in facility activities. Patients with these conditions are likely to be clinically complex and have a significantly greater risk of near-term mortality (Hirdes et al., 2014). Despite this, rehabilitation at the end of life may be used to maintain functional independence and alleviate mood disorder symptoms, fatigue, shortness of breath, and pain (Wittry et al., 2017). Therefore, while medical instability and advanced illness may limit capacity to participate in physical therapy, when tolerated, it may have therapeutic benefit towards maximizing quality of life.

Cognitive impairment was also associated with lower odds of receiving any amount of physical therapy. This finding is congruent with other studies conducted in nursing homes (McArthur et al., 2015; Chen et al., 2002; Berg et al., 1997), skilled nursing facilities (Wodchis, 2004; Chen et al., 2002), and rehabilitation hospitals (Chen et al., 2002) and suggests that providers may target patients without severe cognitive impairment when determining eligibility for rehabilitation. As discussed by Leemrijse et al. (2007), despite provider behaviour, older patients with cognitive impairment may demonstrate comparable rehabilitation outcomes as unimpaired patients, and should still be considered as candidates for rehabilitation therapy. Despite many similarities between the physical therapy and occupational therapy models, the strength of the relationship between CPS and therapy provision was attenuated in the occupational therapy model. Occupational therapists employ a variety of remedial and compensatory approaches to treat patients with cognitive deficits (Hoffmann et al., 2010); therefore, impairment in this domain is not expected to act as an exclusionary factor for provision of occupational therapy.

In the current study, level of functional impairment at admission to the CCC hospital was associated with a greater likelihood of receiving both physical and occupational therapy in the present study. In both the physical therapy and occupational therapy model, the effect of the ADL-H Scale was curvilinear such that patients with moderate levels of functional impairment were most likely of all groups to receive therapy. Previous studies have modelled this effect as a continuous variable and found that greater functional impairment was associated with lower odds of receiving both physical and occupational therapy (Wodchis et al., 2004). However, when modelled as a quadratic term, the effect was statistically significant (McArthur et al., 2015). Patients with moderate levels of functional impairment may represent the optimal balance between need for physical and occupational therapy and rehabilitation potential.

2.5.3 Facility and System-Level Factors Associated with Provision of Rehabilitation Therapy

After adjusting for patient-level characteristics, the current study found that both facility and system-level characteristics were associated with likelihood of receiving rehabilitation in CCC hospitals. Although the effect of facility size was relatively modest for physical therapy, patients that were admitted to small-sized facilities were less likely to receive occupational and speech-language pathology therapy. The CCRS data source that contains the MDS 2.0 assessments used in this study does not provide a means of differentiating stand-alone CCC hospitals from CCC units located in acute care hospital. However, given that small facilities have between 1 and 25 beds, this designation is most likely to describe CCC units located within a larger hospital setting. To date, little information is known about the use of CCC units located in acute care hospitals, including the availability of occupational and speech-language pathology therapy services. Though further investigation is necessary, it is possible that patients that are admitted to CCC units from other acute care units may have been previously assessed during the acute phase of their episode of care, and therefore are less likely to receive occupational and speech-language pathology therapy after transferring to a CCC unit. Similarly, patients that were admitted to facilities located in rural areas were less likely to receive therapy from all three therapy provider types. This effect was strongest for occupational and speech-language pathology therapy and is believed to be attributable to a reduced capacity to delivery these services in rural areas.

In addition to facility-level effects, the likelihood of receiving any amount of therapy from a physical therapist, occupational therapist, or speech-language pathology therapist varied widely across regions. An investigation of the region-level practice pattern and funding differences that may explain these effects is beyond the scope of this study; however, these findings suggest that there are differences in the use of CCC beds for rehabilitation across the province. Armstrong et al. (2015) also found that region accounted for a substantial proportion of the variation in therapy provision among Ontario home care clients, indicating that these practice pattern differences are not limited to hospital-based care settings. From this study alone, the implications of these region-level differences are unknown. At a surface-level it suggests that there may be equity issues for rehabilitation access in some regions of Ontario; however, given the lack of standardized eligibility criteria for rehabilitation (Auditor General of Ontario, 2013), facilities located in resource-constrained regions may target patients with the most rehabilitation potential to maximize patient outcomes. Future studies should seek to better understand these inter-regional factors that explain these differences.

2.5.4 Patient-level Factors Associated with Rehabilitation Intensity

Among patients that received rehabilitation therapy in CCC hospitals, few patient-level factors were found to be strongly associated with greater therapy provision rates. These findings are in line with previous studies (Chen et al., 2002; Horn et al., 2005) and suggest that after determining eligibility for rehabilitation, providers allocate therapy based on ancillary factors beyond patient need such as payment system configuration (Wodchis, 2004) and broad facility-based practice patterns (e.g., "Patients on the post-acute rehab unit receive three 30-minute therapy sessions per week"). Evidence of a nodal therapy intensity pattern in line with the RUG-III case-mix system structure (Wodchis, 2004) was also observed in the distribution of therapy minutes for the current study.

Despite small therapy intensity differences within condition severity levels, for example within levels of functional and cognitive impairment, it is unknown how these factors affect the content of the therapy session. This is a limitation of using the MDS 2.0 assessment to characterize rehabilitation service patterns as only time spent in therapy is recorded with the assessment. For patients with stroke (Richards et al., 2005; De Wit et al., 2006) and traumatic brain injury (Beaulieu et al., 2015), the content of therapy sessions has been shown to vary based on level of disability. For patients with severe impairment, it is also possible that a greater percentage of therapy session time is spent on tasks outside of active practice such as set-up and instruction.

2.5.5 Facility and System-Level Factors Associated with Rehabilitation Intensity

After adjusting for patient-level factors, substantial variation in the intensity of therapy that patients received across health regions was observed. Interestingly, the region effect differed between the logistic and negative binomial count models. For example, patients in Central West LHIN were unlikely to receive any amount of therapy; however, patients that qualified for rehabilitation received therapy at an elevated rate. In contrast, patients admitted to facilities in the Hamilton Niagara Haldimand Brant LHIN were more likely to receive therapy and also received therapy at an elevated rate. This variation across health regions is believed to be attributable to differences in facility staffing patterns. Given that rehabilitation staff time is typically a fixed resource, capacity to provide rehabilitation services may be simplified as the balance between eligibility for rehabilitation and therapy intensity. Facilities and regions with the capacity to provide rehabilitation therapy at an increased intensity may only do so if they limit the number of patients that receive rehabilitation or increase the amount of staff time available to provide the service. Unfortunately, the MDS 2.0 assessment used as the primary data source for this study may not be used to understand facility budget and staffing patterns.

2.5.6 Practical Implications

Given that the current study was an observational study of rehabilitation service patterns in CCC hospitals, it can only describe historical service use patterns and can not be used to establish eligibility criteria for rehabilitation in CCC hospitals. Simply stated, the current study describes "who" receives rehabilitation as opposed to "who should" receive rehabilitation. Intertwined with the concept of eligibility for rehabilitation services is the concept of rehabilitation potential. The GTA Rehab Network (2009) defines rehabilitation potential as demonstrated potential to return to premorbid/baseline function or to increase functional level through documented progress. These guidelines suggest that patients with rehabilitation potential should be medically stable and not have behavioural or psychiatric issues that may limit their participation in rehabilitation. Interviews with clinicians reveal that rehabilitation potential is conceptualized as the level of goal achievement and carry-over that patients maintain between rehabilitation sessions and takes into account patient motivation and attention (Burton et al., 2014). In resource constrained environments, rehabilitation potential may be used to prioritize allocation of therapy, especially for patients in the early stages of impairment (Burton et al., 2014). However, rehabilitation potential alone is not a sufficient condition for rehabilitation service eligibility as utilization patterns are ultimately determined by service capacity.

Consistent with the broad range of therapy goals for patients in CCC hospitals (Rehabilitative Care Alliance, 2014), the current study reveals that the majority of patients receive some form of rehabilitation therapy. However, without systematic methods of determining eligibility for rehabilitation, CCC hospitals are challenged to balance rehabilitation eligibility and service intensity, a trade-off that is further complicated by diverse goals of care. Recent physical therapy policy directives in Ontario long-term care facilities (McArthur et al., 2018) imply a value hierarchy that prioritizes rehabilitation for functional improvement over maintenance or prevention of decline. In the current study, patients that were believed to be capable of increased independence in at least some ADLs were more likely to receive rehabilitation therapy. This subjective appraisal of rehabilitation potential suggests that CCC providers also prioritize functional gain over other goals of care when allocating services. Unfortunately, patient goals of care (i.e., functional gain, maintenance, prevention of decline) cannot be discerned using information from the MDS 2.0 alone. The MDS 2.0 assessment is a previous generation interRAI instrument that is no longer actively developed; however, next generation interRAI assessments such as the interRAI PAC assessment should consider the inclusion of additional items to identify patient goals of care. This information may have utility when developing patient care plans and may provide health system planners with valuable information that can be used for performance monitoring.

Decision support tools such as the interRAI ADL Clinical Assessment Protocol (CAP) have been developed to identify need for rehabilitation services. This algorithm considers deficits in

ADLs, ability to understand others, and a variety of other indicators of rehabilitation potential (Zhu et al., 2014). Performance wise, the ADL CAP accurately identifies 60% of home care clients with rehabilitation potential, which was defined as improvement in ADL function over a one-year period, or remaining at home at the end of the home care treatment program (Zhu et al., 2007; Zhu et al., 2014). The ADL CAP can also be derived using information from the MDS 2.0 assessment; however, the CAP is easily triggered in post-acute care settings as provision of physical therapy and a hospital stay in the past 90 days are sufficient to classify patients with a need to facilitate improvement in ADLs. To date, its performance in a post-acute care setting has not been evaluated. To enhance the ADL CAP's utility in CCC hospitals, some refinements to the algorithm should be considered, such as the removal of process oriented variables to identify need. In care settings where the majority of patients demonstrate need for rehabilitation, new algorithms that categorize patients along a continuum of rehabilitation potential should be developed to assist providers in prioritizing patients for rehabilitation services, both in terms of eligibility and therapy intensity.

2.5.7 Limitations

Given that lack of studies that detail rehabilitation service utilization in CCC hospitals, the current study aimed to create a census-level sample of all patients admitted to this care setting. With a sample of more than 100,000 patients, this study succeeds as one of the most comprehensive studies of post-acute rehabilitative care to date. However, it is important to note that due to contextual assessment practices and policies, CCC hospitals are only required to complete the MDS 2.0 assessment on patients with an expected length of stay of fourteen days or greater. As a result, the current study is unable to describe rehabilitation service patterns for short-stay CCC patients. Although the exact number of short-stay patients is unknown, CIHI reports that in 2017/2018, 13% of patients that were admitted to a CCC hospital were not assessed with an MDS 2.0 assessment (Canadian Institute for Health Information, 2018).

The current study describes rehabilitation service patterns using only the admission MDS 2.0 assessment, meaning that the therapy intensity measures were collected from the seventh to fourteenth day of stay. As previously discussed (Section 2.3.1), preliminary analysis using small sample of CCC patients indicates that, apart from occupational therapy time, rehabilitation intensity does not vary substantially over the course of an episode of care. However, given that the assessment period is at the beginning of the episode of care, its expected that some amount of therapy time was used for assessment purposes. Examining the difference in the percentage of patients that received 15+ minutes of therapy compared to 45+ minutes of therapy suggests that a non-trivial number of patients in the sample received only a single therapy session during the assessment period. Future studies should seek to better understand how rehabilitation service patterns change after admission, including the patient and facility-level factors that influence specific treatment modalities.

A second limitation of using admission assessments as the source of therapy intensity measures is that the rehabilitation service utilization patterns in the later stages of the episode of care for long-stay patients can not be described. The MDS 2.0 assessment is repeated at 90 day intervals for all Ontario CCC patients; therefore, it is possible to study changes in rehabilitation intensity over the course of an episode of care for long-stay patients. However, the current study was constrained to information collected using the admission MDS 2.0 assessment because patients that are admitted for LTLD therapy are typically discharged before a re-assessment is completed. To circumvent this limitation, future studies may use a true cross-sectional sample that includes all assessments completed in a given fiscal quarter. This approach may also be used to establish a yearly prevalence sample that can be used to study changes in rehabilitation practice patterns over time.

Chapter 3

Predictors of Functional Outcomes Following Rehabilitation in Ontario Complex Continuing Care Hospitals

3.1 Introduction

Although the majority of Ontario Complex Continuing Care (CCC) patients receive physical and occupational therapy, and maintenance or recovery of function are fundamental goals of care in CCC hospitals (Rehabilitative Care Alliance, 2014), little is known about patterns of recovery and functional outcomes after receipt of Low Tolerance Long Duration (LTLD) therapy. Given that CCC is a transitional care setting, functional change is an important patient outcome as it determines the level of support that a patient will require after discharge. As discussed previously, this information void is largely attributable to the lack of a mandated discharge assessment. Several quality indicators related to physical function are publicly reported by the Canadian Institute for Health Information (CIHI) as part of their indicator development and public reporting initiative, but these are only available for patients who stay for 90 days or longer. For example, risk-adjusted quality indicators reflect that in 2017/2018, 32% of CCC patients improved or remained independent in mid-loss Activities of Daily Living (ADLs) and that 14% of patients improved or remained independent in early-loss ADLs (Canadian Institute for Health Information, 2018). However, because these quality indicators are calculated using information collected from two consecutive Minimum Data Set 2.0 (MDS 2.0) assessments, they only represent a minority of all patients that were admitted to a CCC hospital.

Beyond absolute measures of functional change, information such as discharge destination may be be used to describe patient outcomes following rehabilitation. For example, among a sample of 81 stroke patients admitted to CCC hospitals for LTLD therapy, 48% were discharged to an independent or semi-independent care setting such as community care (Tourangeau et al., 2011). Although this outcome does not provide an indication of the extent of functional improvement that was achieved during the episode of care, discharge to a community-based care setting is typically seen as a favourable outcome compared to other more resource-intensive care settings such as a nursing home. Implicit in the use of discharge destination an outcome measure following rehabilitation is the assumption that discharge to a less intensive care setting is only possible if a certain threshold of functional independence is achieved. However, this approach ignores the availability of other enabling factors such as family caregivers and health system capacity to provide formal care in a community care setting that may influence discharge destination beyond level of function at discharge. Similarly, Wodchis et al. (2005) studied the dose-response relationship between rehabilitation therapy intensity and time to community discharge for stroke patients in United States skilled nursing facilities and Ontario CCC hospitals. This study found that greater therapy intensity was associated with both greater likelihood of community discharge and accelerated time to community discharge. In 2017/2018, 33% of all patients that were discharged from Ontario CCC hospitals returned home with or without formal support and 14% were discharged to a residential care setting. The remainder died in the CCC hospital (36%) or were discharged to another hospital-based care setting (16%).

Given that no previous studies have attempted to describe functional change for patients in CCC hospitals, this literature review included studies in other post-acute care settings such as inpatient rehabilitation facilities and skilled nursing facilities. A systematic review of 27 studies predicting Barthel Index (BI) and Functional Independence Measure (FIM) scores at discharge from inpatient rehabilitation facilities identified a limited number of variables that were consistently associated with physical function among stroke patients (Meyer et al., 2014). Patient age, functional status on admission to inpatient rehabilitation, previous stroke, and several neurological outcomes including dysphasia and impulsivity were often included in the predictive models and were consistently associated with functional outcomes. Stroke type, left hemiparesis, and time between stroke onset and admission to rehabilitation were inconsistently associated with functional outcomes across the various models (Meyer et al., 2014). Many of these patient characteristics were also found to be associated with functional outcomes in studies of patients with spinal cord injury (AlHuthaifi et al., 2016). In this systematic review, patient age, body mass index, functional status at admission, level of spinal cord injury, rehabilitation length of stay, and delayed admission to rehabilitation were consistently associated with FIM Motor sub-scale score at discharge (AlHuthaifi et al., 2016).

Across patient groups, functional status at admission to post-acute rehabilitation is often an important predictor of functional outcomes at discharge. For patients admitted to post-acute rehabilitation following hip fracture, self-care and mobility function at discharge are both associated with baseline level of function in these domains at admission (Mallinson et al., 2014). Similarly, after adjusting for age and number of comorbidities, baseline physical function was the only significant covariate in a model that explained discharge FIM Motor sub-scale score among patients receiving rehabilitation after lower extremity surgery (Lee and Higgins, 2008). For patients with spinal cord injury receiving inpatient rehabilitation, patient characteristics, including admission FIM motor sub-scale explained 65% of the variance in FIM Motor sub-scale score at discharge (Ozelie et al., 2012).

Functional status, typically measured using FIM or BI score, was treated in many studies as a continuous measure. However, the relationship between functional status at admission and discharge may not always be linear. Stratifying older adult post-acute rehabilitation patients into quartiles based on BI score at admission reveals a curvilinear relationship in the proportion of patients experiencing at least a 30% improvement in functional status at discharge (Seematter-Bagnoud et al., 2013). This may be explained by a ceiling effect for patients with high functional status at admission and suggests that patients with less functional status at admission may have lower rehabilitation potential (Seematter-Bagnoud et al., 2013). In contrast, Passalent et al. (2011) found that patients with low admission FIM scores had the greatest increase in FIM score between admission and discharge.

The results of these studies highlight some methodological issues with the use of functional status at discharge and functional gain (e.g., admission FIM score subtracted from discharge FIM) as outcome measures as they fail to consider length of stay in rehabilitation or rehabilitation potential (Koh et al., 2013). Patients with low functional status on admission that make sufficient gains to live independently will, by definition, achieve greater functional change than patients admitted with medium or high function who are discharged sooner. Similarly, patients with premorbid dependence in ADLs may have less rehabilitation potential. To address these issues, composite rehabilitation outcomes measures that control for premorbid functional status and length of stay have been developed (Koh et al., 2013). The most commonly used composite rehabilitation outcome measure is termed *rehabilitation efficiency* and is the change in functional status score (e.g., FIM, BI) per day of hospitalization. *Relative functional efficiency* expands on this measure to consider change in functional status score as a fraction of maximum or premorbid functional status score (Koh et al., 2013).

Though many studies employ global measures of functional status such as total FIM and FIM motor and cognitive sub-scales when identifying functional outcomes predictors, single items representing individual basic ADLs often have greater explanatory power as they represent a stronger relationship with a given outcome (Gialanella et al., 2013). For patients receiving inpatient stroke rehabilitation, social interaction, grooming, upper body dressing, and bowel control were more important outcome predictors than FIM sub-scales at admission (Gialanella et al., 2013).

Given that performance of most ADLs is reliant on motor and cognitive assets (Gialanella et al., 2013), cognitive impairment is often associated with reduced functional outcomes. Lenze et al. (2004) found that lower Mini–Mental State Examination (MMSE) scores were significantly associated with lower improvement and efficiency in the FIM Motor sub-scale for elderly patients admitted for rehabilitation following hip fracture. Similarly, in a study of post-acute care rehabilitation patients with a range of diagnoses including stroke and hip fracture, after adjusting patient characteristics and length of stay, greater cognitive impairment was associated with lower odds of improvement in ADLs (Gindin et al., 2007). Despite the association of cognitive impairment with a reduced rate of functional gain, individuals with some degree of cognitive impairment may still have rehabilitation potential. In a systematic review of eleven studies of patients with hip fracture, Muir and Yohannes (2009) concluded that patients with cognitive impairment were able to achieve functional gains following rehabilitation, but may require a longer length of stay to achieve these gains. Although all studies in this systematic review were required to evaluate outcomes in terms of cognitive status, because a variety of different cognitive assessments were used, comparisons between studies were not possible. Also, its not clear at what severity of cognitive impairment patients may no longer benefit from rehabilitation therapy.

Few studies have investigated the trajectory of recovery as a predictor of functional outcomes following rehabilitation. Among a sample of 161 individuals seeking geriatric inpatient rehabilitation, Denkinger et al. (2010) found a negative correlation between change in physical function in the first week of rehabilitation and improvement in the subsequent two weeks. Conversely, they found that there was a positive correlation between change in physical function in the first week of rehabilitation and change in function for the entire rehabilitation period (Denkinger et al., 2010). This suggests that most functional gain is achieved at the early stages of the episode of care.

3.1.1 Intensity of Rehabilitation

Several systematic reviews and meta-analyses have addressed the effect of greater physiotherapy intensity on functional outcomes following stroke (Cooke et al., 2010; Veerbeek et al., 2014; Langhorne et al., 1996; Kwakkel et al., 2004). All together, these four systematic reviews spanning almost two decades suggest that there is a weak positive effect of increased physiotherapy intensity on functional outcomes such as muscle strength, gait speed, and ability to complete ADLs. However, the reviews conducted by Langhorne et al. (1996) and Cooke et al. (2010) found that significant differences in functional outcomes were often only detectable soon after initiation of a rehabilitation program and that long-term differences between treatments groups were not significant. For a majority of the studies that were included in these systematic reviews and meta-analyses, patients that were part of the intervention group often did not receive exceedingly more rehabilitation compared to the control group. For example, Kwakkel et al. (2004) and Veerbeek et al. (2014) found that on average patients in the intervention group received between 58 and 102 additional minutes of rehabilitation per week. In many cases, this amount of additional therapy would be insufficient to be placed in a more resource intensive Resource Utilization Groups Version III (RUG-III) Special Rehabilitation group.

Fewer studies have investigated the effect of increased occupational therapy intensity on functional outcomes following stroke. Foley et al. (2012) found that after accounting for length of stay, physiotherapy time, and admission FIM, additional occupational therapy time was significantly associated with FIM gain at discharge. Over the length of stay, each 55-minute increase in occupational therapy time was associated with a 1-point increase in FIM score. Additional physiotherapy time was not significantly associated with FIM gain (Foley et al., 2012).

Canadian stroke best practice guidelines suggest that patients in inpatient rehabilitation facilities receive at least three hours of therapy per day, five days a week (Canadian Stroke Best Practices and Standards Working Group, 2013). Evidence for this recommendation is based primarily on a study by Wang et al. (2013) that found that patients that received less than three hours per day of therapy achieved significantly less total FIM gain compared to those receiving between 3 and 3.5 hours and those receiving more than 3.5 hours. This study suggests that there are thresholds where additional therapy intensity may not lead to greater functional gain. Patients that received more than 3.5 hours of therapy a day were no more likely to experience total FIM gains over patients that received between 3 and 3.5 hours of therapy (Wang et al., 2013).

Increased rehabilitation intensity may have a differential effect based on patient condition, rehabilitation provider type, and the specific functional outcome that is measured. Jette et al. (2005) found that patients with stroke, orthopedic, and cardiovascular/pulmonary conditions who received increased daily therapy had greater odds of improving functional independence in mobility and

ADLs. Patients with cardiovascular/pulmonary conditions were most likely to improve functional independence in mobility with additional daily physiotherapy time, while stroke patients were most likely to improve functional independence in ADLs with additional daily occupational therapy time (Jette et al., 2005). This study also found evidence for a lower-bound threshold for daily speech language therapy time for stroke patients. Only at a minimum intensity of 0.75 hours per day of speech language therapy were patients more likely to improve their functional independence in executive control (Jette et al., 2005).

Therapy session content is also associated with functional level at discharge from therapy for patients that sustained a spinal cord injury. After adjusting for factors such as baseline FIM Motor and Cognitive sub-scale, injury location, and length of stay, the number hours that occupational therapist spent performing various treatments was both positively and negatively associated with discharge Motor FIM score (Ozelie et al., 2012). For example, a greater number of hours spent on assessment, balance training, lower body dressing, and home management skills were associated with better discharge motor FIM score. Conversely, more occupational therapist time spent on treatments such as respiratory management, upper body dressing, and transfers was negatively associated with functional outcomes. As discussed by the Ozelie et al. (2012), these negative associations are likely a reflection of need that could not be accounted for using the baseline measures. Additionally, the FIM motor scale may not be sensitive to small changes in these domains.

In a large study of patients in United States skilled nursing facilities with an array of conditions including stroke, neurological, orthopedic, cardiopulmonary, and other conditions, after adjusting for patient characteristics including age, sex, medical condition, and admission FIMs score, greater daily therapy intensity was associated with a greater mean length of stay efficiency (i.e., change in FIM as a fraction of length of stay) (Jette et al., 2004). This study also found that facility's nursing staff level, measured as the number hours per patient per day, was positively associated with length of stay efficiency, suggesting that additional nursing time may allow patients more opportunities to develop independence in self-care (Jette et al., 2004). Though these results indicate that independent of patient characteristics, an increased rate of functional change may be achieved by increasing staffing levels and rehabilitation provision inputs, this model explained only 35% of variation in length of stay efficiency. This suggests that there is substantial individual variation in recovery rate that may not be explained by these relatively few structural characteristics and process inputs.

An approach to increase the amount of therapy provided to post-acute rehabilitation facilities is to provide therapy on weekends. English et al. (2016) pooled the results of two randomized control trials where patients received therapy on six or seven days of the week. After adjusting for patient factors such as age, function at admission, and number of comorbidities, patients receiving weekend therapy had mean length of stay that was 7.5 days shorter than the usual care group (English et al., 2016). Increasing rehabilitation intensity through weekend therapy is also associated with greater functional improvement. In a study comparing patients admitted to Italian and Israeli post-acute rehabilitation facilities, after adjusting for patient demographics, illness characteristics, and length of stay, patients receiving care in Italian facilities were 2.8 times more likely to improve by at least one point on an eight point ADL scale that measured mobility in bed, transfer, locomotion, dressing upper body, dressing lower body, eating, toilet use, and bathing (Gindin et al., 2007). Although this study did not measure rehabilitation intensity directly, the rehabilitation programs in these two countries differed as Italian patients were able to access therapy six days per week compared to only five days per week in Israel.

In addition to intensity of rehabilitation, it is important to consider level of patient engagement with rehabilitation as it may influence the amount of active time spent in rehabilitation. Lenze et al. (2012) demonstrated that a patient directed approach to increase engagement with rehabilitation resulted in a significant improvement in gait speed over standard care for patients admitted to skilled nursing facilities. In a larger observational study, after adjusting for age, gender, functional and cognitive status, mood, and illness severity, level of participation in rehabilitation therapy sessions was positively associated with level of functional gain (Morghen et al., 2016). Among patients with traumatic brain injury, the addition of a level of effort measure explained additional variance in discharge FIM motor sub-scale score at discharge over patient demographic and injury characteristics alone (Horn et al., 2015). The amount of variance that was explained by the addition of level of effort decreased with admission cognitive status. For example, among the least cognitively impairment patients, level of effort explained an additional 21% of the variance in the motor sub-scale score. However, for the most cognitively impaired patients, level of effort only explained an additional 0.08%. This effect was more pronounced among patient group with lower admission FIM cognitive sub-scale scores. Finally, greater participation in occupational therapy sessions among individuals with spinal cord injury was a predictor of better functional outcomes, social participation, employment, and reduced re-hospitalizations following discharge (Ozelie et al., 2012).

3.2 Rationale and Objectives

Given the lack of discharge assessments in Ontario CCC hospitals, there is a paucity of information related to the amount of functional gain that patients achieve through rehabilitation in this care setting. From a system and capacity planning perspective, this information may be used to guide the development of eligibility criteria for rehabilitation. This information can also be used to identify patients that would benefit from the provision of therapy and to develop systematic methods of determining eligibility for rehabilitation at various intensity thresholds.

The objective of this study is to characterize patterns of recovery in Ontario CCC hospitals and to identify patient, facility, and system-level factors that are associated with level of functional gain. A central focus of this study is to characterize the association between rehabilitation intensity and nursing rehabilitation activities with rehabilitation outcomes.

3.2.1 Phase 1: Characterization of Patterns of Recovery in Ontario Complex Continuing Care Hospitals

The aim of this research is to characterize patterns of recovery between CCC admission and first follow-up for patients that are either discharged to the community with home care services, discharged to an Ontario Long-term Care (LTC) facility, or remain in a CCC facility 90 days after the completion of the initial MDS 2.0 admission assessment.

This phase will aim to answer the following questions:

- What amount of functional change in achieved over the course of an episode of care in an Ontario CCC hospital?
- What patient-level factors are associated with differential functional outcomes over the course of an episode of care in Ontario CCC hospital?

3.2.2 Phase 2: Factors Associated with Functional Gain in Ontario Complex Continuing Care Hospitals

The aim of this phase is to identify patient, facility, and system-level factors that are associated with functional change following rehabilitation in an Ontario CCC hospital. This model is expected to have utility for identifying patient-level factors that explain variance in functional outcomes, and may be used to support the effectiveness of LTLD therapy offered in CCC hospitals. Additionally, it may be used to identify minimum and maximal thresholds of rehabilitation intensity associated with positive functional outcomes.

This phase will aim to answer the following questions:

- What patient-level factors at admission to CCC are associated with functional gain?
- After accounting for patient characteristics, are measures of provider-specific rehabilitation intensity associated with greater functional gain?
- After accounting for patient characteristics and therapy provision, are nursing rehabilitation activities associated with greater functional gain?
- After accounting for patient characteristics, rehabilitation intensity, and provision of nursing rehabilitation, are there other facility and region-level factors that are associated with functional gain?

3.3 Methods

3.3.1 Data Source

In addition to the interRAI MDS 2.0 assessments described in Section 2.3.1, this study used interRAI's Minimum Data Set Home Care (RAI-HC) assessments contained in the CIHI maintained Home Care Reporting System (HCRS) data repository. Similar to the MDS 2.0, the RAI-HC is a comprehensive clinical assessment used in community care settings to evaluate patients across a broad range of health domains (Morris et al., 1997b). The items on the RAI-HC overlap substantially with the MDS 2.0; however, given that it is designed for a community setting, it includes measures of Instrumental Activities of Daily Living (IADL) self-performance and difficulty, locomotion and stamina, informal supports, and an environmental assessment (Morris et al., 1997b).

In Ontario, the RAI-HC assessment is completed for all long-stay home care clients expected to receive services for a period of at least 60 days. For those that remain on service for prolonged periods of time, RAI-HC re-assessments are completed every six to twelve months. The HCRS data repository represents all Ontario home care clients assessed using the RAI-HC instrument beginning January 1st, 2002.

The RAI-HC assessment has many of the same evidence-informed applications as the MDS 2.0. Given the substantial item overlap between the two assessments, many of the outcome measures and scales that may be computed from the MDS 2.0 assessment are available for the RAI-HC assessment. Examples of outcome measures and scales that are available for both assessments include the Cognitive Performance Scale (CPS), Activities of Daily Living Hierarchy Scale (ADL-H), Activities of Daily Living Long Form Scale (ADL-Long) and the Pain scale.

Reliability

The reliability of items on the RAI-HC was assessed in a study by Morris et al. (1997b) using a sample of 251 randomly selected clients from Japan, the United States, Canada, Australia, and the Czech Republic. The average weighted Kappa for all items on the RAI-HC was 0.72, while the 57 items that are unique from the MDS 2.0 assessment achieved an average weighted Kappa of 0.70. Hence, the RAI-HC shares the strong inter-rater reliability properties of the MDS 2.0.

With respect to items related to physical function, an ADL difficulty outcome scale, which is a sum of items measuring difficulty in completing mobility, transfers, locomotion, dressing, eating, toileting, personal hygiene, and bathing activities, achieved excellent internal consistency ($Cronbach's\ \alpha = 0.95$) (Morris et al., 2000). This ADL difficulty outcome scale is similar to the ADL-Long Scale; however, it does not include the bathing item.

Validity of Items and Scales Related to Physical Function

Unlike the five-point scale using on the MDS 2.0, the RAI-HC assesses ADL self-performance using a seven-point scale to accommodate additional levels of self-performance for patients requiring setup help only and maximal assistance to complete a given task. It is also important to note that the RAI-HC uses a shorter three-day assessment period unlike the seven-day period used on the MDS 2.0. Bathing self-performance is assessed using the same scale as all other ADL self-performance items on the assessment; however, raters are instructed to code for the most dependent episode in the previous seven days. In a study identifying predictors of physiotherapy and occupational therapy provision in Ontario older adult long-stay home care clients, impairment in ADL measures on the RAI-HC were associated with greater likelihood of receiving service (Armstrong et al., 2015).

The ADL-Long Scale that was described in Section 2.3.1 can also be calculated using ADL self-performance items from the RAI-HC assessment. The expanded ADL self-performance scale from the RAI-HC assessment is collapsed following the logic that is presented in Table 3.1 so that the ADL-Long Scale may take on values from 0 to 28 and be compared directly with the scale derived from the MDS 2.0 assessment. Since the RAI-HC assessment separates the “Dressing” ADL into “Dressing Upper Body” and “Dressing Lower Body”, the ADL-Long Scale from the RAI-HC uses the item that the patient is most dependent in to calculate the scale. Landi et al. (2000)

completed the earliest validation of the ADL-Long Scale using a sample of frail elderly home care clients in Italy. This study found that there was a strong positive correlation ($r^2 = 0.75$) between the ADL-Long Scale and the BI.

Independent Variables

In addition to the independent variables described in Section 2.3.1, a series of ordinal variables for provider-specific (i.e., physical therapy, occupational therapy, speech-language pathology therapy) therapy intensity measured on the admission MDS 2.0 assessment were created. Possible values for these variables ranged from zero to five. Patients that did not receive any therapy from a given provider type, were assigned a zero score. All other patients were then ranked by the number of minutes of therapy they received and divided into quintiles so that they may be assigned a score from one to five. The ordinal variable for rehabilitation intensity based on the RUG-III case-mix system Special Rehabilitation sub-categories that is described in Section 2.3.1 was also used in this phase of the study.

3.3.2 Phase 1: Characterization of Patterns of Recovery in Ontario Complex Continuing Care Hospitals

Study Design and Sample

This study was a retrospective cross-sectional study of patients admitted to Ontario CCC hospitals between January 1st, 2010 and March 31st, 2015. Using linked assessments performed in CCC hospitals or across hospital and residential or community care settings, this study characterized the level of functional change achieved through rehabilitation in a CCC facility. Following the same analytic procedure outlined in Section 2.3.2, the unit of analysis for this study was episodes of care that began with an admission to a CCC hospital. All patients in the sample were assessed with an MDS 2.0 assessment within 15 days of admission to the CCC hospital. However, unlike the first study, only the first episode of care for each individual was retained in the sample. For long-stay patients with a CCC length of stay of 105 days or greater, the first MDS 2.0 re-assessment that was completed between 75 and 105 days after the admission MDS 2.0 assessment was retained to measure functional change between assessments. For patients that were discharged to the community with home care services or to a residential care setting before an MDS 2.0 re-assessment was completed in the admitting CCC hospital, linked interRAI assessments (i.e., RAI-HC or MDS 2.0) completed within 30 days of CCC discharge were used to measure functional change. Episodes of care where the patient was comatose on admission to the CCC facility were removed from the sample. Additionally, episodes of care where an improbable therapy intensity was recorded on the MDS 2.0 assessment for either physical therapy, occupational therapy, or speech-language pathology therapy were removed from the sample. These thresholds were selected by identifying episodes of care at the 99.99th percentile for each therapy type. A total of 14 outlier cases were removed. A final sample of 30,924 episodes of care was used for this phase of the study. From this final sample, 11,279 (36.5%) episodes of care were from long-stay CCC patients, meaning that an MDS 2.0 assessment completed in CCC was used as the source of follow-up information. The remainder of the sample was composed of short-stay episodes of care, 12,130 (39.2%) of which were discharged to home care and assessed with a RAI-HC assessment and the remaining 7,515 (24.3%) episodes of care were discharged to a residential care setting (e.g., nursing home) and assessed with an MDS 2.0 assessment.

Analytic Strategy

Change in functional status was computed using the index admission MDS 2.0 assessment linked to the associated follow-up MDS 2.0 or RAI-HC assessment completed either in the CCC facility, residential long-term care setting, or community setting. Change in functional status was measured by calculating the difference between admission and follow-up for measures of physical function such as ADL self-performance items and the ADL-Long Scale. The expanded RAI-HC ADL self-performance item response set was collapsed to accommodate the response set used on the MDS 2.0 assessment. Patients that are coded on the RAI-HC as requiring “Setup Help Only” to complete the task were re-coded to “Independent,” while those that were coded as requiring

"Maximal Assistance" to complete the task were re-coded to "Extensive Assistance." On both the MDS 2.0 and the RAI-HC assessment, if a patient did not complete the ADL during the assessment period, they were re-coded as "Total Dependence." Table 3.1 provides a summary of this ADL Self-performance scale re-scaling procedure.

Table 3.1: Re-scaled ADL Self-performance Response Values from MDS 2.0 and RAI-HC Assessments

Re-scaled Self-performance Response	MDS 2.0 ADL Self-performance Response	RAI-HC Self-performance Response
0	0 - Independent	0 - Independent 1 - Setup Help Only
1	1 - Supervision	2 - Supervision
2	2 - Limited Assistance	3 - Limited Assistance
3	3 - Extensive Assistance	4 - Extensive Assistance 5 - Maximal Assistance
4	4 - Total Dependence 8 - Activity Did Not Occur	6 - Total Dependence 8 - Activity Did Not Occur

Mean change between assessments for ADL self-performance items and the ADL-Long Scale was completed using a series of paired *t-tests*. The Cohen's d statistic was also calculated for each item to provide an effect size measure for the magnitude of the change. These analyses were repeated for each discharge setting sub-sample. Subsequently, mean change in the ADL-Long Scale stratified by patient, facility, and system factors was computed using the least-squares means (i.e., marginal means) from a series of bivariate linear regression models. The Dunnest post-hoc test was used to perform multiple comparisons between levels of the stratification variable and a reference level (i.e., control). The Tukey post-hoc test was also applied to the means stratified by therapy intensity variables to perform comparisons between all levels of the stratification variable. This analysis was repeated to include the time elapsed between the admission and follow-up assessment in the bivariate linear regression models to compute a time-adjusted measure of functional gain. Although the ADL-Long is a discrete interval scale, change between assessments was reported as a mean to facilitate the creation of the multivariable regression models in Phase 2 of this study. All analyses were performed using SAS® 9.4 (SAS Institute, Inc., Cary, NC).

3.3.3 Phase 2: Factors Associated with Functional Gain in Ontario Complex Continuing Care Hospitals

Study Design and Sample

Using the cross-sectional sample of 30,924 episodes of care for patients admitted to Ontario CCC hospitals between January 1st, 2010 and March 31st, 2015 from Phase 1 of this study, this second phase sought to understand the patient, facility, and system-level factors that were associated with functional gain after rehabilitation in a CCC hospital. To achieve this goal, a series of multivariate linear regression models predicting change between admission and follow-up ADL-Long Scale score were fit. These models were stratified by the admission ADL-Long Scale tertile. The model was developed on the second tertile to protect against bias in the gain score introduced by regression towards the mean. This approach also reduces ceiling and floor effects as there is more latitude for patients to improve or decline within the 28 levels of the ADL-Long Scale. The following thresholds were used to create the ADL-Long Scale tertiles: 0-13 (first tertile, mild), 15-20 (second tertile, moderate), 21-28 (third tertile, severe).

Analytic Strategy

Independent variables that were found to be significantly associated with functional gain in Phase 1 of this study were used as candidate variables for the stratified multivariable regression model predicting functional gain after receiving care in a CCC hospital. Model building was conducted in a forward selection manner using patients in the second ADL-Long Scale tertile. Candidate variables were entered as a series of blocks, beginning first with patient-level variables (e.g., age, cognition status, use of gait aide), followed by therapy service use variables (e.g., physical therapy intensity), nursing rehabilitation activities, and facility and system-level variables. The time that elapsed between the admission MDS 2.0 assessment and the follow-up MDS 2.0 or RAI-HC assessment was included in all model building steps by a variable called "Assessment Gap." Variables were retained in the final model if the effect *P-value* was 0.05 or lower and there was a reduction in the Akaike Information Criterion (AIC) statistic for the model. After fitting the model using patients in the second ADL-Long Scale tertiles, the model was applied to patients in the first and second ADL-Long Scale tertiles. All analyses were performed using SAS® 9.4 (SAS Institute, Inc., Cary, NC).

3.4 Results

3.4.1 Sample Description

The clinical characteristics of the sample used in Phase 1 and 2 of this study are presented in Appendix B.1. More than two-thirds of the overall sample were 75 years and older, and had a support person that was positive towards discharge (Table B.1). The most frequently represented diagnostic groups were cardiac conditions, arthritis, orthopedic conditions, and stroke (Table B.2). Approximately half of the sample had unsteady gait and health conditions that caused their health status to fluctuate (Table B.3). Nearly three-quarters of the sample required at least extensive assistance to complete some basic ADLs, 40% had moderate or worse cognitive impairment, and 56% had moderate or worse health instability. Approximately two-thirds of the sample experienced pain and 21% showed signs of depression (Table B.4). In the past 90 days, 60% of the sample experienced a deterioration in their ADL function and 30% experienced a deterioration in their cognitive status. More than half of the sample were thought to have some rehabilitation potential (Table B.7). The time thresholds by provider that correspond to each therapy intensity quintile are presented in Table 3.2.

Table 3.2: Therapy Intensity Quintiles Time Thresholds, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

Quintile	Physical Therapy	Occupational Therapy	SLP Therapy
1st Quintile	1-60 minutes	1-40 minutes	1-30 minutes
2nd Quintile	61-90 minutes	41-65 minutes	31-42 minutes
3rd Quintile	91-133 minutes	66-105 minutes	43-60 minutes
4th Quintile	134-180 minutes	106-165 minutes	61-110 minutes
5th Quintile	181+ minutes	166+ minutes	111+ minutes

3.4.2 Phase 1: Characterization of Patterns of Recovery in Ontario Complex Continuing Care Hospitals

Functional Change Between Admission and Follow-up

At admission to a CCC hospital, the median ADL-Long Scale score among the overall sample was 17 ($IQR = 11\ to\ 22$) and at follow-up it was 14 ($IQR = 4\ to\ 20$). There was little change in the distribution of ADL-Long Scale scores between admission and follow-up for patients that that were not discharged from the CCC hospital and patients that were discharged to a long-term care facility. However, for patients that were discharged to home care, the median admission ADL-Long Scale score was 14 ($IQR = 18\ to\ 9$) at admission and 4 ($IQR = 10\ to\ 1$) at follow-up (Figure 3.1).

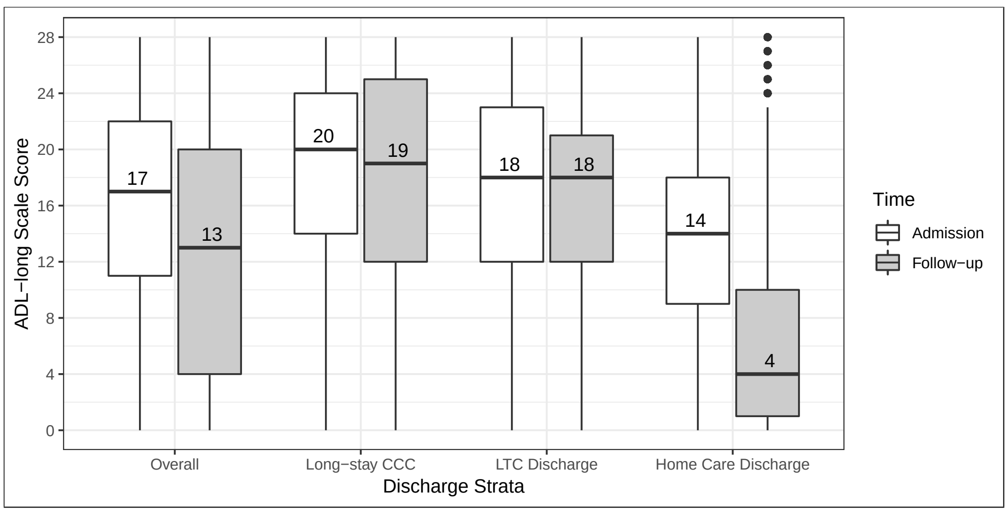

Figure 3.1: ADL-Long Scale Distribution at Admission and Follow-up, Stratified by Discharge Setting Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

The frequency response distribution for the ADL self-performance items at admission and follow-up for the overall sample are presented in Table 3.3. The frequency response distributions between admission and follow-up were statistically different for each ADL that was examined, and patients were generally less dependent at follow-up compared to at admission. This analysis was repeated for each of the three discharge setting strata and is presented in Appendix B.2.

Table 3.4 presents the mean change for ADL-Long Scale and ADL self-performance items

Table 3.3: Level of ADL Self-performance at Admission and Follow-up, Full Sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL Self-performance					
ADL	Time	Independent	Supervision	Limited Assistance	Extensive Assistance	Total Dependence	*P-value*
Bed Mobility	Admission	21.3	6.6	27.3	27.9	16.9	<0.0001
	Follow-up	43.0	5.3	15.2	22.6	13.9	
Transfer	Admission	10.1	8.5	27.1	28.7	25.6	<0.0001
	Follow-up	30.2	8.6	16.8	23.5	21.0	
Locomotion	Admission	16.5	11.4	20.9	14.8	36.4	<0.0001
	Follow-up	34.5	13.8	12.5	13.1	26.0	
Eating	Admission	38.9	23.3	19.1	7.5	11.3	<0.0001
	Follow-up	53.2	19.8	11.1	6.5	9.4	
Toilet Use	Admission	21.3	6.6	27.3	27.9	16.9	<0.0001
	Follow-up	43.0	5.3	15.2	22.6	13.9	
Personal Hygiene	Admission	8.0	7.6	28.7	31.0	24.7	<0.0001
	Follow-up	23.8	7.5	21.2	27.4	20.1	
Bathing	Admission	2.3	3.8	8.7	42.9	42.2	<0.0001
	Follow-up	4.1	3.5	15.2	43.7	33.5	

for the overall sample. The mean change in the ADL-Long Scale between admission to the CCC hospital and the time of follow-up was -3.24 points ($s = 6.69,\ t(37,481) = -93.73,\ P < 0.0001$). The Cohen's d statistic of -0.36 indicates that this improvement was a small to medium-sized effect. Among all patients, statically significant change was achieved in all ADL self-performance items that could be measured at both admission and follow-up. Based on the Cohen's d statistic, the greatest change was observed in the toilet use ($d = -0.41$), transfer ($d = -0.39$) and locomotion ($d = -0.39$) ADLs. Comparatively, the effect sizes for change in bathing ($d = -0.21$) and eating ($d = -0.22$) self-performance were small.

The analysis measuring change in the ADL-Long Scale and ADL self-performance items between the admission and follow-up assessments was repeated for each discharge setting strata (Table 3.5, Table 3.6, Table 3.7). Although statistically significant change in the ADL-Long Scale was achieved across all strata, the size of this effect was very small in the long-stay CCC and long-term care discharge strata. In the case of the home care discharge strata, patients improved by an average of 7.14 points ($s = 6.61,\ t(14,318) = -130.79,\ P < 0.0001$), a change of 1.07 standard

Table 3.4: Functional Change Between Assessments, Full Sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

Variable	Mean Change	Standard Deviation	*t Statistic*	*P-Value*	Cohen's *d*
ADL-Long Scale	-3.22	6.69	-84.11	<.0001	-0.36
Bed Mobility	-0.52	1.39	-65.87	<.0001	-0.36
Transfer	-0.54	1.26	-75.07	<.0001	-0.39
Locomotion	-0.60	1.48	-71.57	<.0001	-0.39
Eating	-0.30	1.10	-46.70	<.0001	-0.23
Toilet Use	-0.58	1.31	-76.84	<.0001	-0.41
Personal Hygiene	-0.44	1.25	-62.16	<.0001	-0.34
Bathing	-0.20	1.00	-34.53	<.0001	-0.21

Negative values indicate improvement

deviations from the average score at admission. Examining individual ADL self-performance items, on average, patients in the long-stay CCC strata improved significantly; however, the effect size for these changes was very small ($d = -0.06$ *to* -0.16) (Table 3.5). Patients in the home care discharge strata improved significantly on all ADLs. The effect size for these changes was large ($d = -0.89$ *to* -1.10) for nearly all ADLs except for eating ($d = -0.63$) and bathing ($d = -0.46$) (Table 3.6). Finally, patients in the long-term care facility strata did not improve significantly in the bed mobility), personal hygiene and bathing self-performance items. All other ADLs had small effect sizes ($d = -0.02$ *to* -0.22) (Table 3.7).

Table 3.5: Functional Change Between Assessments, Long-stay CCC Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 14,319

Variable	Mean Change	Standard Deviation	*t Statistic*	*P-Value*	Cohen's *d*
ADL-Long Scale	-0.89	5.07	-18.26	<.0001	-0.11
Bed Mobility	-0.13	1.01	-13.07	<.0001	-0.09
Transfer	-0.17	0.97	-18.54	<.0001	-0.13
Locomotion	-0.26	1.22	-22.37	<.0001	-0.17
Eating	-0.02	0.99	-1.92	0.0545	-0.01
Toilet Use	-0.12	0.93	-13.79	<.0001	-0.10
Personal Hygiene	-0.08	0.86	-10.14	<.0001	-0.07
Bathing	-0.06	0.71	-8.60	<.0001	-0.07

Negative values indicate improvement

Table 3.6: Functional Change Between Assessments, Home Care Discharge Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 14,638

Variable	Mean Change	Standard Deviation	*t Statistic*	*P-Value*	Cohen's *d*
ADL-Long Scale	-7.07	6.61	-117.36	<.0001	-1.05
Bed Mobility	-1.24	1.38	-99.10	<.0001	-1.07
Transfer	-1.21	1.30	-101.84	<.0001	-1.01
Locomotion	-1.17	1.52	-84.17	<.0001	-0.87
Eating	-0.56	1.04	-59.95	<.0001	-0.61
Toilet Use	-1.31	1.39	-103.79	<.0001	-1.04
Personal Hygiene	-1.06	1.36	-86.01	<.0001	-0.91
Bathing	-0.46	1.19	-41.92	<.0001	-0.46

Negative values indicate improvement

Table 3.7: Functional Change Between Assessments, Long-term Care Facility Discharge Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 8,525

Variable	Mean Change	Standard Deviation	*t Statistic*	*P-Value*	Cohen's *d*
ADL-Long Scale	-0.51	6.00	-7.39	<.0001	-0.07
Bed Mobility	0.04	1.40	2.53	0.0116	0.03
Transfer	-0.02	1.10	-1.69	0.0905	-0.02
Locomotion	-0.21	1.48	-12.38	<.0001	-0.14
Eating	-0.28	1.27	-18.92	<.0001	-0.22
Toilet Use	-0.07	1.13	-5.63	<.0001	-0.06
Personal Hygiene	0.02	1.13	1.60	0.1107	0.02
Bathing	0.01	0.95	0.82	0.4117	0.01

Negative values indicate improvement

Patient Factors Associated with Functional Change Between Admission and Follow-up

Table 3.8 presents both the raw and the time-adjusted mean change for the ADL-Long Scale, stratified by patient demographic factors. Female patients made significantly greater improvements compared to patients that were not female. Although this effect was attenuated after adjusting for time between assessments, the difference remained statically significant. Patients that were 65-94 years made greater functional improvements over patients that were 0-64 years old; however, after adjusting for time between assessments the difference was not significant. Finally, patients with a support person that was positive towards discharge made substantially more gains compared to patients without a support person that was positive towards discharge.

Compared to patients without cognitive impairment (CPS = 0), patients with CPS scores of two and greater achieved less functional improvement. This effect followed a negative pattern whereby patients with severe cognitive impairment achieved less functional improvement. This was true after adjusting for time elapsed between assessments. Patients with minimal (CHESS = 1) to high (CHESS = 4) health instability achieved greater functional change than patients with no health instability (CHESS = 0). This was true after adjusting for time elapsed between assessments. Patients with very high health instability (CHESS = 5) did not make greater functional gains compared to patients with no health instability after adjusting for time. Compared to patients without any pain, patients with occasional pain (Pain Scale = 1) achieved greater functional improvement during the episode of care. This effect was greater for patients that had daily pain that was not severe. Finally, patients that showed signs of a mood disorder achieved slightly less functional improvement; however, there was no difference between groups after adjusting for time elapsed between assessments (Table 3.9).

Patients with cardiac conditions, orthopedic conditions, pulmonary conditions, and other medically complex conditions, made greater functional gains than patients without these conditions. This was true after adjusting for time between assessments. Conversely, patients that had received an amputation, had a cancer diagnosis, neurological condition, spinal cord injury, stroke, and traumatic brain injury achieved less functional improvement than patients without these conditions. In the case of amputation and traumatic brain injury, these differences were not significant after adjusting for time between assessments (Table 3.10).

Table 3.11 presents both the mean change for the ADL-Long Scale and the time-adjusted mean change for the ADL-Long Scale, stratified by receipt of nursing rehabilitation on five or more days during the assessment period. Except for eating or swallowing training, patients that received each nursing rehabilitation activity made greater functional gains than patients that did not receive the therapy. This was also true after adjusting for time elapsed between assessments. The count of nursing rehabilitation therapies that patients received for five or more days during the assessment period was also associated with greater functional improvement. Patients that received between one and four nursing rehabilitation therapies improved by an average of 0.9 points on the ADL-Long Scale, and patients that received five or more therapies improved by an average of 1.9 points.

There was a positive relationship between the intensity of physical and occupational therapy that patients received and the amount functional gain that was achieved during the episode of care. This was also true for the time-adjusted marginal means. Conversely, there was no relationship between the intensity of speech-language pathology therapy that was provided and the difference in the ADL-Long Scale scores between admission and follow-up. Finally, change in the ADL-Long Scale score followed a curvilinear pattern when stratified Special Rehabilitation RUG-III group therapy intensity. Compared to patients that did not qualify for a Special Rehabilitation RUG-III group, patients that were classified into the High Intensity groups achieved the most functional improvement (Table 3.12). Appendix B.4 presents Tukey multiple comparison test matrices for raw and time-adjusted pairwise differences between therapy intensity measures and change in ADL-Long Scale score. Raw and time-adjusted mean differences for the ADL-Long Scale stratified by health condition, rehabilitation potential, social engagement, participation in activities, facility characteristics, and region are presented in Appendix B.3.

Table 3.8: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Demographic Variables, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time-adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Female	No (Ref)	-2.8 (0.1)			-2.9 (0.1)		
	Yes	-3.5 (0.0)	-0.7 (-0.9, -0.6)	<.0001	-3.4 (0.1)	-0.5 (-0.7, -0.4)	<.0001
Age Group	0-64 (Ref)	-3.0 (0.1)			-3.5 (0.1)		
	65-74	-3.2 (0.1)	-0.1 (-0.5, 0.2)	0.8177	-3.3 (0.1)	0.2 (-0.2, 0.6)	0.4554
	75-84	-3.3 (0.1)	-0.3 (-0.6, 0.0)	0.1150	-3.3 (0.1)	0.2 (-0.1, 0.6)	0.1516
	85-94	-3.2 (0.1)	-0.2 (-0.5, 0.1)	0.3426	-3.1 (0.1)	0.4 (0.1, 0.8)	0.0025
	95+	-2.8 (0.2)	0.2 (-0.3, 0.8)	0.6623	-2.6 (0.2)	0.9 (0.4, 1.4)	0.0001
Married	No (Ref)	-3.3 (0.0)			-3.3 (0.1)		
	Yes	-3.1 (0.1)	0.1 (-0.0, 0.3)	0.0638	-3.2 (0.1)	0.1 (-0.1, 0.2)	0.1946
Support Person Positive Towards Discharge	No (Ref)	-1.1 (0.1)			-1.4 (0.1)		
	Yes	-4.1 (0.0)	-3.1 (-3.2, -2.9)	<.0001	-4.0 (0.0)	-2.6 (-2.8, -2.4)	<.0001

Negative values indicate that the comparison group improved more than the reference group

Table 3.9: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Outcome Measures, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time-adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Cognitive Performance Scale	0 (Ref)	-4.2 (0.1)			-4.0 (0.1)		
	1	-3.9 (0.1)	0.3 (0.0, 0.6)	0.0498	-3.8 (0.1)	0.2 (-0.1, 0.5)	0.2552
	2	-3.5 (0.1)	0.7 (0.4, 1.0)	<.0001	-3.5 (0.1)	0.6 (0.3, 0.9)	<.0001
	3	-2.8 (0.1)	1.4 (1.1, 1.7)	<.0001	-2.8 (0.1)	1.2 (0.9, 1.5)	<.0001
	4	-2.1 (0.2)	2.1 (1.6, 2.6)	<.0001	-2.4 (0.2)	1.6 (1.1, 2.1)	<.0001
	5	-1.3 (0.1)	2.9 (2.5, 3.2)	<.0001	-1.4 (0.1)	2.6 (2.2, 3.0)	<.0001
	6	-1.7 (0.2)	2.4 (1.9, 2.9)	<.0001	-2.1 (0.2)	1.9 (1.4, 2.4)	<.0001
CHESS	0 (Ref)	-2.1 (0.1)			-2.2 (0.1)		
	1	-3.4 (0.1)	-1.3 (-1.6, -1.0)	<.0001	-3.4 (0.1)	-1.1 (-1.4, -0.8)	<.0001
	2	-3.6 (0.1)	-1.5 (-1.8, -1.2)	<.0001	-3.5 (0.1)	-1.3 (-1.6, -1.1)	<.0001
	3	-3.8 (0.1)	-1.7 (-2.0, -1.4)	<.0001	-3.8 (0.1)	-1.5 (-1.9, -1.2)	<.0001
	4	-3.0 (0.1)	-0.8 (-1.3, -0.4)	<.0001	-3.1 (0.1)	-0.9 (-1.3, -0.5)	<.0001
	5	-0.8 (0.3)	1.3 (0.4, 2.2)	0.0009	-1.6 (0.3)	0.6 (-0.3, 1.5)	0.2830
Pain Scale	0 (Ref)	-2.5 (0.1)			-2.5 (0.1)		
	1	-3.2 (0.1)	-0.7 (-0.9, -0.4)	<.0001	-3.2 (0.1)	-0.7 (-0.9, -0.5)	<.0001
	2	-3.9 (0.1)	-1.4 (-1.7, -1.2)	<.0001	-3.9 (0.1)	-1.4 (-1.6, -1.2)	<.0001
	3	-3.6 (0.2)	-1.1 (-1.5, -0.6)	<.0001	-3.7 (0.2)	-1.2 (-1.7, -0.8)	<.0001
Depression Rating Scale	0-2 (Ref)	-3.3 (0.0)			-3.2 (0.0)		
	3+	-2.9 (0.1)	0.3 (0.2, 0.5)	0.0003	-3.1 (0.1)	0.2 (-0.0, 0.3)	0.0714

Negative values indicate that the comparison group improved more than the reference group

Table 3.10: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Disease, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time-adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Amputation	No (Ref)	-3.2 (0.0)			-3.2 (0.0)		
	Yes	-2.7 (0.3)	0.6 (0.0, 1.1)	0.0382	-3.0 (0.3)	0.3 (-0.3, 0.8)	0.3510
Cancer	No (Ref)	-3.4 (0.0)			-3.4 (0.0)		
	Yes	-2.1 (0.1)	1.3 (1.1, 1.5)	<.0001	-2.3 (0.1)	1.1 (0.9, 1.3)	<.0001
Cardiac Conditions	No (Ref)	-2.9 (0.1)			-3.0 (0.1)		
	Yes	-3.5 (0.1)	-0.6 (-0.7, -0.4)	<.0001	-3.5 (0.1)	-0.5 (-0.6, -0.3)	<.0001
Neurological Conditions	No (Ref)	-3.3 (0.0)			-3.3 (0.0)		
	Yes	-2.6 (0.1)	0.7 (0.5, 1.0)	<.0001	-2.7 (0.1)	0.6 (0.4, 0.8)	<.0001
Orthopedic Conditions	No (Ref)	-2.6 (0.0)			-2.7 (0.0)		
	Yes	-4.9 (0.1)	-2.2 (-2.4, -2.0)	<.0001	-4.8 (0.1)	-2.1 (-2.2, -1.9)	<.0001
Other Medically Complex Conditions	No (Ref)	-3.2 (0.0)			-3.2 (0.0)		
	Yes	-3.4 (0.1)	-0.2 (-0.4, -0.0)	0.0450	-3.4 (0.1)	-0.2 (-0.5, -0.0)	0.0190
Pulmonary Conditions	No (Ref)	-3.1 (0.0)			-3.1 (0.0)		
	Yes	-3.7 (0.1)	-0.6 (-0.8, -0.4)	<.0001	-3.6 (0.1)	-0.5 (-0.6, -0.3)	<.0001
Spinal Cord Injury	No (Ref)	-3.2 (0.0)			-3.2 (0.0)		
	Yes	-1.7 (0.3)	1.5 (0.9, 2.1)	<.0001	-2.5 (0.3)	0.7 (0.1, 1.3)	0.0141
Stroke	No (Ref)	-3.3 (0.0)			-3.3 (0.0)		
	Yes	-2.9 (0.1)	0.5 (0.3, 0.6)	<.0001	-3.1 (0.1)	0.2 (0.0, 0.4)	0.0237
Traumatic Brain Injury	No (Ref)	-3.2 (0.0)			-3.2 (0.0)		
	Yes	-2.9 (0.3)	0.3 (-0.3, 0.9)	0.3483	-3.4 (0.3)	-0.2 (-0.8, 0.4)	0.5004

Negative values indicate that the comparison group improved more than the reference group

Table 3.11: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Nursing Rehabilitation Activities, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time-adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Range of Motion (Passive)	No (Ref)	-2.9 (0.1)			-2.8 (0.1)		
	Yes	-3.6 (0.1)	-0.6 (-0.8, -0.5)	<.0001	-3.7 (0.1)	-0.9 (-1.0, -0.7)	<.0001
Range of Motion (Active)	No (Ref)	-2.8 (0.1)			-2.8 (0.1)		
	Yes	-3.7 (0.1)	-0.9 (-1.0, -0.7)	<.0001	-3.7 (0.1)	-0.9 (-1.0, -0.7)	<.0001
Bed Mobility	No (Ref)	-2.4 (0.1)			-2.4 (0.1)		
	Yes	-4.0 (0.1)	-1.6 (-1.8, -1.5)	<.0001	-4.0 (0.1)	-1.6 (-1.8, -1.5)	<.0001
Transfer	No (Ref)	-2.1 (0.1)			-2.2 (0.1)		
	Yes	-4.1 (0.1)	-2.1 (-2.2, -1.9)	<.0001	-4.0 (0.1)	-1.8 (-2.0, -1.7)	<.0001
Walking	No (Ref)	-2.7 (0.0)			-2.9 (0.1)		
	Yes	-4.0 (0.1)	-1.3 (-1.4, -1.1)	<.0001	-3.7 (0.1)	-0.8 (-0.9, -0.6)	<.0001
Dressing or Grooming	No (Ref)	-2.4 (0.1)			-2.4 (0.1)		
	Yes	-3.9 (0.1)	-1.6 (-1.7, -1.4)	<.0001	-3.9 (0.1)	-1.5 (-1.6, -1.3)	<.0001
Eating or Swallowing	No (Ref)	-3.3 (0.0)			-3.2 (0.0)		
	Yes	-3.0 (0.1)	0.2 (0.1, 0.4)	0.0077	-3.2 (0.1)	0.1 (-0.1, 0.2)	0.4164
Count of Nursing Rehabilitation Therapies	0 (Ref)	-2.2 (0.1)			-2.2 (0.1)		
	1-4	-3.1 (0.1)	-0.9 (-1.1, -0.7)	<.0001	-3.1 (0.1)	-0.9 (-1.1, -0.7)	<.0001
	5+	-3.9 (0.1)	-1.7 (-1.9, -1.5)	<.0001	-3.9 (0.1)	-1.6 (-1.9, -1.4)	<.0001

Negative values indicate that the comparison group improved more than the reference group

Table 3.12: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Therapy Intensity, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time-adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Physical Therapy Intensity	No Therapy (Ref)	-0.5 (0.1)			-0.7 (0.1)		
	1st Quintile	-2.0 (0.1)	-1.5 (-1.8, -1.2)	<.0001	-2.1 (0.1)	-1.4 (-1.8, -1.1)	<.0001
	2nd Quintile	-3.0 (0.1)	-2.5 (-2.8, -2.1)	<.0001	-3.0 (0.1)	-2.4 (-2.7, -2.0)	<.0001
	3rd Quintile	-3.9 (0.1)	-3.4 (-3.8, -3.1)	<.0001	-3.9 (0.1)	-3.2 (-3.6, -2.9)	<.0001
	4th Quintile	-4.7 (0.1)	-4.2 (-4.5, -3.9)	<.0001	-4.5 (0.1)	-3.9 (-4.2, -3.6)	<.0001
	5th Quintile	-5.2 (0.1)	-4.7 (-5.0, -4.4)	<.0001	-5.0 (0.1)	-4.4 (-4.7, -4.1)	<.0001
Occupational Therapy Intensity	No Therapy (Ref)	-1.8 (0.1)			-1.9 (0.1)		
	1st Quintile	-3.0 (0.1)	-1.2 (-1.5, -0.9)	<.0001	-3.0 (0.1)	-1.2 (-1.5, -0.9)	<.0001
	2nd Quintile	-3.2 (0.1)	-1.4 (-1.7, -1.1)	<.0001	-3.2 (0.1)	-1.4 (-1.7, -1.0)	<.0001
	3rd Quintile	-3.7 (0.1)	-1.9 (-2.2, -1.6)	<.0001	-3.7 (0.1)	-1.9 (-2.2, -1.6)	<.0001
	4th Quintile	-4.4 (0.1)	-2.6 (-2.9, -2.3)	<.0001	-4.4 (0.1)	-2.5 (-2.8, -2.2)	<.0001
	5th Quintile	-4.6 (0.1)	-2.7 (-3.0, -2.4)	<.0001	-4.5 (0.1)	-2.7 (-3.0, -2.4)	<.0001
SLP Therapy Intensity	No Therapy (Ref)	-3.3 (0.0)			-3.2 (0.0)		
	1st Quintile	-3.1 (0.2)	0.1 (-0.3, 0.6)	0.9187	-3.4 (0.2)	-0.2 (-0.6, 0.3)	0.8611
	2nd Quintile	-2.7 (0.3)	0.6 (-0.1, 1.3)	0.1360	-2.9 (0.3)	0.3 (-0.4, 0.9)	0.8579
	3rd Quintile	-2.8 (0.2)	0.4 (-0.2, 1.1)	0.3008	-3.1 (0.2)	0.1 (-0.6, 0.7)	0.9999
	4th Quintile	-2.9 (0.2)	0.4 (-0.2, 1.0)	0.4298	-3.3 (0.2)	-0.1 (-0.7, 0.5)	0.9844
	5th Quintile	-3.3 (0.2)	-0.1 (-0.6, 0.5)	0.9996	-3.9 (0.2)	-0.7 (-1.2, -0.1)	0.0087
Special Rehabilitation Intensity	Did Not Qualify (Ref)	-1.3 (0.1)			-1.4 (0.1)		
	Low Intensity (RL*)	-3.0 (0.1)	-1.7 (-2.0, -1.5)	<.0001	-3.0 (0.1)	-1.7 (-2.0, -1.4)	<.0001
	Medium Intensity (RM*)	-4.2 (0.1)	-2.9 (-3.1, -2.7)	<.0001	-4.1 (0.1)	-2.7 (-3.0, -2.5)	<.0001
	High Intensity (RH*)	-5.3 (0.1)	-4.0 (-4.4, -3.7)	<.0001	-5.1 (0.1)	-3.7 (-4.1, -3.4)	<.0001
	Very High Intensity (RV*)	-4.9 (0.2)	-3.7 (-4.2, -3.1)	<.0001	-5.0 (0.2)	-3.6 (-4.1, -3.1)	<.0001
	Ultra High Intensity (RU*)	-3.9 (0.4)	-2.6 (-3.5, -1.7)	<.0001	-4.2 (0.3)	-2.8 (-3.7, -1.9)	<.0001

Negative values indicate that the comparison group improved more than the reference group

3.4.3 Phase 2: Factors Associated with Functional Gain in Ontario Complex Continuing Care Hospitals

Parameter estimates for the multiple linear regression model predicting functional gain among patients in the second ADL-Long Scale tertile are presented across Table 3.14, Table 3.15, and Table 3.18. The parameter estimates for when the model is applied to patients in the first and third ADL-Long Scale tertiles are presented in Appendix B.5. Across ADL-Long Scale tertiles, the full model explained 19 to 23% of the variance for change in the ADL-Long Scale score between admission and follow-up (Table 3.13).

Table 3.13: Fit Statistics for the Multiple Linear Regression Models Predicting Change in the ADL-long Scale

Model	*F Statistic*	Explained Variance (R^2)	Coefficient of Variation	Root Mean Square Error
First Tertile				
Full Model	$F(68, 10, 911) = 37.10,\ p < 0.001$	0.19	-381.99	5.81
Patient Characteristics	$F(41, 10, 938) = 47.58,\ p < 0.001$	0.15	-389.98	5.93
Therapy Intensity	$F(11, 10, 968) = 122.32,\ p < 0.001$	0.11	-398.99	6.07
Nursing Rehabilitation	$F(3, 10, 976) = 139.85,\ p < 0.001$	0.04	-414.75	6.31
Facility Characteristics	$F(16, 10, 963) = 46.14\ p < 0.001$	0.06	-409.29	6.22
Second Tertile				
Full Model	$F(68, 10, 428) = 45.61,\ p < 0.001$	0.23	-139.84	6.30
Patient Characteristics	$F(41, 10, 455) = 63.06,\ p < 0.001$	0.20	-142.44	6.42
Therapy Intensity	$F(11, 10, 485) = 111.47,\ p < 0.001$	0.10	-150.30	6.77
Nursing Rehabilitation	$F(3, 10, 493) = 287.03,\ p < 0.001$	0.08	-152.65	6.88
Facility Characteristics	$F(16, 10, 480) = 62.05,\ p < 0.001$	0.09	-151.85	6.84
Third Tertile				
Full Model	$F(68, 9, 377) = 40.50,\ p < 0.001$	0.23	-144.49	5.44
Patient Characteristics	$F(41, 9, 404) = 60.32,\ p < 0.001$	0.21	-146.03	5.50
Therapy Intensity	$F(11, 9, 434) = 111.25,\ p < 0.001$	0.11	-154.15	5.81
Nursing Rehabilitation	$F(3, 9, 442) = 300.93,\ p < 0.001$	0.09	-156.47	5.89
Facility Characteristics	$F(16, 9, 429) = 56.30,\ p < 0.001$	0.09	-156.58	5.90

All models include assessment time gap as a covariate.

Compared to patients aged 0-64 years, patients that were 65 years and older were expected to experience a decline on the ADL-Long Scale. The amount of expected decline increased with age. The CPS followed a similar pattern, whereby greater cognitive impairment was associated with greater functional decline. A recent change in ADL function had a negative regression weight, meaning that patients that improved or declined in ADL function were expected to experience functional gain. Diseases and health conditions with positive regression weights included cancer, neurological conditions, spinal cord injury, and stroke. Patients with these conditions were expected to experience functional decline over the course of the episode of care. Conversely, patients with pulmonary conditions, orthopedic conditions, and traumatic brain injury were expected to experience functional improvement or the course of the episode of care. Bowel and bladder incontinence was associated with functional decline, and generally increased with severity. In the case of bladder incontinence, only patients that were frequently or always incontinent were expected to experience functional decline (Table 3.14).

Patients that used a cane, walker or crutch were expected to experience functional improvement. Surgical wounds, which are likely to be indicative of a recent surgery, were associated with functional improvement. Patients with fluctuating health status and an end-stage condition were expected to experience functional decline. Patients with rehabilitation potential were expected to experience functional improvement. The magnitude of the expected change was greatest when both the patient and the care provider believed the patient had rehabilitation potential. Patients that did not spend most of their time involved in activities were expected to experience functional decline. Patients that wished to return to the community and those that had a support person that was positive towards discharge were expected to experience functional improvement. Finally, each day that elapsed between the admission and follow-up assessment was associated with 0.05 point decline in the ADL-Long Scale score (Table 3.14).

Table 3.14: Multiple Linear Regression Model Predicting Change in ADL-long Scale, Patient Characteristics, Parameter Estimates for 2nd ADL-long Scale Tertile, Ontario Complex Continuing Care, 2010 - 2015, n = 10,498

Variable	Estimate (SE)	*t-statistic*	*P-value*
Intercept	-6.48 (0.49)	-13.14	<.0001
Age Group (Ref = 0-64)			
65-74	0.58 (0.27)	2.20	0.0277
75-84	0.78 (0.24)	3.29	0.0010
85-94	1.39 (0.24)	5.76	<.0001

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Table 3.14 – continued from previous page

Variable	Estimate (SE)	*t-statistic*	*P-value*
95+	2.27 (0.36)	6.26	<.0001
Cognitive Performance Scale (Ref = 0)			
1	0.79 (0.20)	4.01	<.0001
2	0.93 (0.19)	4.77	<.0001
3	1.17 (0.20)	5.98	<.0001
4	1.76 (0.36)	4.91	<.0001
5	2.08 (0.27)	7.66	<.0001
6	2.43 (1.02)	2.38	0.0174
Change in ADL Function (Ref = No Change)			
Improved	-0.74 (0.25)	-3.00	0.0027
Deteriorated	-0.65 (0.16)	-4.10	<.0001
Cancer	0.79 (0.17)	4.54	<.0001
Pulmonary Condition	-0.60 (0.16)	-3.77	0.0002
Neurological Condition	1.18 (0.20)	5.81	<.0001
Orthopedic Condition	-0.86 (0.14)	-5.96	<.0001
Spinal Cord Injury	2.77 (0.65)	4.25	<.0001
Traumatic Brain Injury	-1.96 (0.56)	-3.51	0.0005
Stroke	0.36 (0.15)	2.36	0.0183
Bowel Continence (Ref = Continent)			
Usually Continent	0.46 (0.19)	2.35	0.0188
Occasionally Incontinent	0.90 (0.21)	4.33	<.0001
Frequently Incontinent	1.03 (0.22)	4.68	<.0001
Incontinent	1.09 (0.23)	4.82	<.0001
Bladder Continence (Ref = Continent)			
Usually Continent	0.10 (0.22)	0.45	0.6501
Occasionally Incontinent	0.40 (0.21)	1.95	0.0515
Frequently Incontinent	0.97 (0.19)	5.11	<.0001
Incontinent	1.11 (0.21)	5.31	<.0001
Uses Cane, Walker or Crutch	-0.51 (0.15)	-3.48	0.0005
Surgical Wounds	-0.82 (0.17)	-4.93	<.0001
Fluctuating Health Status	0.53 (0.14)	3.88	0.0001
End-stage Condition	1.80 (0.35)	5.20	<.0001
Rehabilitation Potential (Ref = Neither Patient or Provider)			
Only Patient	-0.55 (0.26)	-2.13	0.0329
Only Provider	-0.83 (0.19)	-4.35	<.0001
Both Patient and Provider	-1.58 (0.17)	-9.42	<.0001
Time Involved in Activities (Ref = Most)			
Some	0.15 (0.17)	0.88	0.3789
Little	0.48 (0.18)	2.65	0.0080
None	0.54 (0.29)	1.88	0.0599
Community Return Desired	-1.12 (0.20)	-5.74	<.0001
Support Person Positive Towards Discharge	-0.56 (0.18)	-3.15	0.0016
Assessment Gap (Days)	0.05 (0.00)	19.38	<.0001

Across all three admission ADL-Long Scale tertile strata, compared to patients that did not receive any therapy, greater physical therapy intensity was generally associated with greater functional improvement over the course of the episode of care (Table 3.15). However, when examining pairwise comparisons of least squares mean difference for physical therapy intensity groups, there was no difference between patients that did not receive any physical therapy and patients that received 30 minutes or less of therapy (Table 3.16). When comparing adjacent physical therapy intensity quintiles there was generally no difference in mean functional gain between quintiles. Finally, except when comparing the third and fifth quintile for patients in the second and third ADL-Long Scale tertile strata, comparisons between non-adjacent quintiles were statistically significant. To summarize, these findings suggest that small amounts of additional physical therapy (i.e., between adjacent quintiles), do not yield additional functional gain. They also suggest that additional physical therapy intensity beyond the third quintile generally does not yield additional functional gain (Table 3.16).

With respect to occupational therapy, compared to patients that did not receive any therapy, more intensive therapy was generally associated with greater functional improvement for patients in the first ADL-Long Scale tertile strata (Table 3.15). Pairwise comparisons of least squares means for all other occupational therapy intensity quintiles and baseline function strata were not significant (Table 3.17). Speech-language pathology therapy intensity was not associated with functional change after adjusting for patient characteristics and was not included in the regression model. Finally, with respect to nursing rehabilitation activities, walking training for at least 15 minutes on five or more days during the assessment period was associated with functional gain across all admission function tertiles. Conversely, patients in the second and third ADL-Long Scale tertile strata, eating or swallowing training were expected to experience functional decline (Table 3.15).

Compared to patients that were admitted to small facilities, patients that were admitted to large-sized facilities were expected to experience an improvement on the ADL-Long scale. Compared to patients admitted to facilities located in Toronto Central LHIN, patients that were admitted to facilities in North Simcoe Muskoka, North West, and Waterloo Wellington LHINs were expected to make functional gains. Conversely, patients that were admitted to Central East and Erie St. Clair LHINs were expected to experience functional decline. There was no difference compared to the reference group for all other regions (Table 3.18).

Table 3.15: Multiple Linear Regression Model Predicting Change in ADL-long Scale, Therapy Intensity and Nursing Rehabilitation, Parameter Estimates for All ADL-long Scale Tertiles, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	1st ADL-long Scale Tertile			2nd ADL-long Scale Tertile			3rd ADL-long Scale Tertile		
Variable	Estimate (SE)	*t-statistic*	*P-Value*	Estimate (SE)	*t-statistic*	*P-Value*	Estimate (SE)	*t-statistic*	*P-Value*
Physical Therapy Quintile (Ref = No Therapy)									
1st Quintile	-0.50 (0.21)	-2.38	0.0175	-0.46 (0.26)	-1.75	0.0808	-0.22 (0.18)	-1.24	0.2153
2nd Quintile	-1.11 (0.23)	-4.78	<.0001	-0.88 (0.28)	-3.14	0.0017	-0.52 (0.22)	-2.39	0.0168
3rd Quintile	-1.47 (0.23)	-6.43	<.0001	-1.35 (0.28)	-4.88	<.0001	-0.91 (0.22)	-4.13	<.0001
4th Quintile	-1.89 (0.23)	-8.28	<.0001	-1.64 (0.28)	-5.81	<.0001	-1.61 (0.24)	-6.64	<.0001
5th Quintile	-2.08 (0.24)	-8.56	<.0001	-1.55 (0.29)	-5.30	<.0001	-1.31 (0.25)	-5.18	<.0001
Occupational Therapy Quintile (Ref = No Therapy)									
1st Quintile	-0.57 (0.19)	-2.93	0.0034	-0.16 (0.22)	-0.73	0.4683	-0.43 (0.17)	-2.44	0.0147
2nd Quintile	-0.66 (0.20)	-3.24	0.0012	-0.14 (0.23)	-0.60	0.5471	-0.16 (0.20)	-0.82	0.4138
3rd Quintile	-0.72 (0.20)	-3.56	0.0004	-0.46 (0.23)	-2.04	0.0418	-0.07 (0.20)	-0.34	0.7349
4th Quintile	-1.00 (0.21)	-4.84	<.0001	-0.56 (0.24)	-2.35	0.0189	-0.44 (0.22)	-1.97	0.0488
5th Quintile	-1.02 (0.22)	-4.63	<.0001	-0.56 (0.24)	-2.31	0.0212	0.23 (0.24)	0.96	0.3371
Nursing Rehabilitation									
Walking Training	-0.60 (0.13)	-4.51	<.0001	-1.04 (0.15)	-6.93	<.0001	-0.62 (0.17)	-3.59	0.0003
Eating or Swallowing Training	0.03 (0.16)	0.17	0.8638	0.68 (0.16)	4.33	<.0001	-0.04 (0.13)	-0.33	0.7447

Table 3.16: Pairwise Comparison of ADL-long Scale Least Squares Mean Differences by Physical Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		1st ADL-long Scale Tertile		2nd ADL-long Scale Tertile		3rd ADL-long Scale Tertile	
Comparison	Reference	Difference	*P-value*	Difference	*P-value*	Difference	*P-value*
Reference = No Therapy							
1st Quintile	No Therapy	-0.50 (-1.10, 0.10)	0.1647	-0.46 (-1.21, 0.29)	0.5012	-0.22 (-0.73, 0.29)	0.8175
2nd Quintile	No Therapy	-1.11 (-1.78, -0.45)	<.0001	-0.88 (-1.69, -0.08)	0.0211	-0.52 (-1.15, 0.10)	0.1592
3rd Quintile	No Therapy	-1.47 (-2.12, -0.82)	<.0001	-1.35 (-2.14, -0.56)	<.0001	-0.91 (-1.54, -0.28)	0.0005
4th Quintile	No Therapy	-1.89 (-2.54, -1.24)	<.0001	-1.64 (-2.44, -0.83)	<.0001	-1.61 (-2.30, -0.92)	<.0001
5th Quintile	No Therapy	-2.08 (-2.77, -1.39)	<.0001	-1.55 (-2.38, -0.72)	<.0001	-1.31 (-2.04, -0.59)	<.0001
Reference = Adjacent Quintile							
1st Quintile	2nd Quintile	0.61 (0.03, 1.19)	0.0309	0.42 (-0.21, 1.06)	0.3940	0.30 (-0.25, 0.85)	0.6173
2nd Quintile	3rd Quintile	0.36 (-0.23, 0.95)	0.5026	0.47 (-0.16, 1.09)	0.2758	0.39 (-0.23, 1.01)	0.4671
3rd Quintile	4th Quintile	0.42 (-0.12, 0.96)	0.2396	0.29 (-0.30, 0.87)	0.7271	0.70 (0.05, 1.34)	0.0244
4th Quintile	5th Quintile	0.19 (-0.36, 0.73)	0.9237	-0.09 (-0.67, 0.49)	0.9978	-0.30 (-0.96, 0.36)	0.7918
Reference = Non-adjacent Quintile							
1st Quintile	3rd Quintile	0.97 (0.41, 1.54)	<.0001	0.89 (0.28, 1.50)	0.0004	0.69 (0.14, 1.25)	0.0051
1st Quintile	4th Quintile	1.39 (0.82, 1.96)	<.0001	1.18 (0.55, 1.80)	<.0001	1.39 (0.78, 2.00)	<.0001
1st Quintile	5th Quintile	1.58 (0.97, 2.18)	<.0001	1.09 (0.43, 1.74)	<.0001	1.09 (0.44, 1.74)	<.0001
2nd Quintile	4th Quintile	0.78 (0.19, 1.36)	0.0022	0.75 (0.11, 1.39)	0.0102	1.09 (0.43, 1.75)	<.0001
2nd Quintile	5th Quintile	0.96 (0.34, 1.59)	0.0001	0.66 (0.00, 1.33)	0.0494	0.79 (0.10, 1.48)	0.0142
3rd Quintile	5th Quintile	0.61 (0.03, 1.18)	0.0327	0.20 (-0.41, 0.80)	0.9393	0.40 (-0.27, 1.06)	0.5235

Difference is calculated by subtracting the least squares mean of the comparison group column from the reference group column. Negative values indicate that the comparison group improved more than the reference group.

Table 3.17: Pairwise Comparison of ADL-long Scale Least Squares Mean Differences by Occupational Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		1st ADL-long Scale Tertile		2nd ADL-long Scale Tertile		3rd ADL-long Scale Tertile	
Comparison	Reference	Difference	*P-value*	Difference	*P-value*	Difference	*P-value*
Reference = No Therapy							
1st Quintile	No Therapy	-0.57 (-1.12, -0.02)	0.0397	-0.16 (-0.78, 0.46)	0.9789	-0.43 (-0.92, 0.07)	0.1426
2nd Quintile	No Therapy	-0.66 (-1.24, -0.08)	0.0154	-0.14 (-0.78, 0.51)	0.9909	-0.16 (-0.72, 0.40)	0.9645
3rd Quintile	No Therapy	-0.72 (-1.29, -0.14)	0.0050	-0.46 (-1.11, 0.19)	0.3222	-0.07 (-0.65, 0.51)	0.9994
4th Quintile	No Therapy	-1.00 (-1.59, -0.41)	<.0001	-0.56 (-1.24, 0.12)	0.1752	-0.44 (-1.08, 0.20)	0.3592
5th Quintile	No Therapy	-1.02 (-1.64, -0.39)	<.0001	-0.56 (-1.25, 0.13)	0.1917	0.23 (-0.45, 0.91)	0.9304
Reference = Adjacent Quintile							
1st Quintile	2nd Quintile	0.09 (-0.52, 0.71)	0.9983	-0.02 (-0.67, 0.63)	1.0000	-0.26 (-0.85, 0.32)	0.7965
2nd Quintile	3rd Quintile	0.06 (-0.55, 0.66)	0.9998	0.33 (-0.32, 0.98)	0.7065	-0.09 (-0.73, 0.54)	0.9984
3rd Quintile	4th Quintile	0.28 (-0.31, 0.87)	0.7487	0.10 (-0.56, 0.75)	0.9984	0.37 (-0.29, 1.04)	0.5998
4th Quintile	5th Quintile	0.02 (-0.58, 0.62)	1.0000	0.00 (-0.64, 0.64)	1.0000	-0.67 (-1.38, 0.04)	0.0762
Reference = Non-adjacent Quintile							
1st Quintile	3rd Quintile	0.15 (-0.46, 0.75)	0.9821	0.31 (-0.34, 0.96)	0.7608	-0.36 (-0.96, 0.24)	0.5336
1st Quintile	4th Quintile	0.43 (-0.19, 1.04)	0.3472	0.40 (-0.27, 1.08)	0.5293	0.02 (-0.64, 0.67)	1.0000
1st Quintile	5th Quintile	0.45 (-0.20, 1.10)	0.3647	0.40 (-0.28, 1.09)	0.5435	-0.65 (-1.34, 0.04)	0.0746
2nd Quintile	4th Quintile	0.34 (-0.28, 0.96)	0.6256	0.42 (-0.25, 1.10)	0.4689	0.28 (-0.40, 0.96)	0.8534
2nd Quintile	5th Quintile	0.36 (-0.30, 1.01)	0.6286	0.42 (-0.26, 1.11)	0.4869	-0.39 (-1.11, 0.33)	0.6334
3rd Quintile	5th Quintile	0.30 (-0.32, 0.92)	0.7424	0.10 (-0.56, 0.76)	0.9984	-0.30 (-0.99, 0.40)	0.8286

Difference is calculated by subtracting the least squares mean of the comparison group column from the reference group column. Negative values indicate that the comparison group improved more than the reference group.

Table 3.18: Multiple Linear Regression Model Predicting Change in ADL-long Scale, Facility and System Factors, Parameter Estimates for 2nd ADL-long Scale Tertile, Ontario Complex Continuing Care, 2010 - 2015, n = 10,498

Variable	Estimate (SE)	*t-statistic*	*P-value*
Facility Size (Ref = Small)			
Medium	-0.14 (0.19)	-0.72	0.4692
Large	-0.54 (0.23)	-2.38	0.0174
LHIN (Ref = Toronto Central)			
Central	0.59 (0.37)	1.62	0.1063
Central East	1.87 (0.29)	6.42	<.0001
Central West	-0.38 (0.49)	-0.78	0.4377
Champlain	0.12 (0.33)	0.36	0.7157
Erie St. Clair	1.71 (0.32)	5.27	<.0001
HNHB*	-0.06 (0.22)	-0.28	0.7759
Mississauga Halton	-0.35 (0.31)	-1.11	0.2650
North East	-0.67 (0.39)	-1.71	0.0868
North Simcoe Muskoka	-1.53 (0.43)	-3.56	0.0004
North West	-1.62 (0.39)	-4.16	<.0001
South East	-0.10 (0.36)	-0.27	0.7866
South West	1.08 (0.31)	3.52	0.0004
Waterloo Wellington	-0.61 (0.32)	-1.87	0.0610

* Hamilton Niagara Haldimand Brant

3.5 Discussion

Given that Ontario CCC hospitals have not been required to complete discharge assessments since the MDS 2.0 assessment was mandated for use in 1996, this was the first comprehensive study of functional outcomes in this post-acute care setting that was made possible by using linked interRAI assessments in residential long-term care facilities and home care settings. This study also extends upon the current rehabilitative care literature by examining the association of LTLD physical and occupational therapy intensity with functional outcomes. Further, it identifies other patient, facility, and system-level factors that are associated with differential functional outcomes among this patient population.

As discussed in Chapter 2, the CCC patient population is heterogeneous with respect to condition severity and therapy intensity. The results of this study also illustrate that CCC patients experience diverse outcomes with respect to functional change across numerous ADLs. When comparing level of functional change by discharge destination, as expected, patients that are discharged to home care achieved substantial gains within four months of their initial post-acute care hospitalization. Although some functional improvement was detected among long-stay CCC patients and patients that were discharged to residential long-term care facilities, the magnitude of this effect was small, especially compared to the home care discharge strata. The current study did not attempt to characterize the effect of functional gain on discharge destination. However, comparing admission and follow-up ADL-Long Scale scores by discharge strata, it suggests that patients that are discharged to community care settings are more likely to be less dependent on admission and have the greatest rehabilitation potential.

Depending on the baseline level of dependence for ADL performance, the full multiple linear regression models in this study explained between 19% and 23% of the variance in the functional change outcome measure at follow-up. Compared to other studies that modelled rehabilitation outcomes in post-acute care settings (Ozelie et al., 2012; Horn et al., 2015; Lee and Higgins, 2008; Mallinson et al., 2014), the amount of variance explained by the models in the current study are substantially lower. In part, this difference is because the other studies modelled functional status at discharge as the dependent variable, which allows baseline level of function to be included as covariate in the model. For example, in the two models created by Mallinson et al. (2014), the addition of function at admission increased the explained variance of the models by 29% and 39%.

In the current study, patient characteristics alone explained a substantial proportion of the variance in functional gain across all three baseline function tertiles. Horn et al. (2015) observed a similar effect, whereby the addition of hours of discipline-specific therapy per week to models that included patient and injury characteristics only explained an additional 1.5% of variance across outcomes. However, the addition of variables related to minutes of discipline-specific activities (e.g., personal care, therapeutic exercise, swallowing) lead to a 13.1% increase in explained variance. Similarly, hours spent on specific occupational therapy treatments improved the explained variance by an average of 23.5% over patient characteristics alone in models predicting FIM motor and cognitive sub-scale scores at discharge for patients with spinal cord injury (Ozelie et al., 2012). This suggests that after accounting for patient characteristics, functional outcomes in post-acute care settings may be less dependent on time spent in therapy and more dependent on the content of the therapy session (Horn et al., 2015).

The appropriateness of regression analysis using gain scores versus analysis of covariance adjusting for baseline has been subject to some debate (Allison, 1990). Given that this was a large and observational longitudinal study, the gain score approach was chosen because treatment group assignment, namely therapy intensity quintile, could not be randomized and is partly dependent on baseline physical function (see Chapter 2). Depending on the approach to baseline adjustment that is used, different and conflicting results may be obtained for the same set of observational data. However, Fitzmaurice et al. (2011) note that this incongruity is attributable to differences in the interpretation of each analytic approach. The gain score approach used in this study seeks to determine whether groups differ with respect to their mean change over time. The analysis of covariance approach seeks to determine whether an individual in one group is expected to change more than an individual in another group, given that they have the same ADL-Long Scale score at admission (Fitzmaurice et al., 2011). The current study sought to understand the relationship between numerous patient-level factors and functional gain. There is no reason to assume the distribution of the baseline functional measure would be equal between groups (e.g., within levels of CPS, age, rehabilitation potential).

3.5.1 Patient-level Factors Associated with Functional Gain

This research identified several patient characteristics that are both positively and negatively associated with functional gain following admission to a CCC hospital. Many of the studies that explored this outcome in the post-acute care literature used FIM or BI assessments as the primary source of patient-level information (Meyer et al., 2014; AlHuthaifi et al., 2016). For this reason, motor and cognitive function are often used as the primary explanatory variables in models predicting function at discharge. As discussed, motor function was not included in the generalized linear models in this study to avoid multicollinearity issues; however, greater cognitive impairment severity at baseline was consistently associated with lower mean functional gain across the stratified models. This effect has been demonstrated in numerous other studies (Lee and Higgins, 2008; Mallinson et al., 2014; Folden and Tappen, 2007; Gialanella et al., 2013). Given that the MDS 2.0 is a comprehensive health assessment, the current study was able to explore a broader array of patient-level factors associated with functional outcomes including subjective appraisal of rehabilitation potential, presence of a support person that is positive towards discharge, and motivation to return to a community setting. As demonstrated in the current study, these patient-level factors are important predictors of functional outcomes in post-acute care and should be considered in conjunction with the traditional measures of rehabilitation potential when identifying candidate patients.

3.5.2 Rehabilitation Intensity

One of the primary objectives of the current study was to identify therapy intensity thresholds where CCC patients may not benefit from additional rehabilitation. After adjusting for patient, facility, and system-level factors, results from the current study suggest that additional physical therapy time beyond the third intensity quintile is not associated with additional functional gain.

Also, except for the least functionally impaired patients, provision of any amount of occupational therapy was not associated with functional improvement. These finding have important implications for both the delivery and planning of rehabilitation services in Ontario CCC hospitals and other similar post-acute care settings. At a surface level, policymakers seeking to contain costs may choose to use this information to set upper thresholds for physical therapy service intensity and occupational therapy eligibility criteria. However, before implementing broad policies of this nature, it is important to acknowledge the limitations of the analytical approach used in this study.

First, given that this study relied on a generalized linear model to model change in physical function, these findings represent the average response to therapy services for a large and diverse sample of CCC patients. At a population level, there are likely sub-groups of patients that may still derive additional therapeutic benefit from more intensive rehabilitation therapy. Future studies should seek to characterize the therapy dose-response relationship for patient sub-groups differentiated by impairment level, impairment type, and comorbidities, as this information may have utility when developing condition-specific practice guidelines and policies. While these models explained a substantial proportion of variance in functional change, they are unable to account for unmeasured factors (e.g., therapy session content) and random inter-patient variation. Based on these limitations, instead of imposing therapy intensity maximums on Ontario CCC hospitals, providers should be required to justify the provision of high-intensity of rehabilitation with documented justification for its delivery and evidence of therapeutic benefit at an individual patient level. With this approach, clinicians are empowered to allocate additional when necessary; however, it establishes a mechanism for the oversight of high-intensity therapy by the Ontario Ministry of Health and Long-term Care.

Second, this study modelled patient response to therapy using a global measure of physical function. The ADL-Long Scale is the most responsive measure of functional change that can be derived using the MDS 2.0 assessment (Morris et al., 1997b). However, because it is an additive scale that is based on the level of support needed to perform ADLs, it is not sensitive to physical change that does not lead to change in functional performance. From a patient perspective, rehabilitation outcomes such as increased strength or range of motion may have positive value and may lead to improved quality of life. However, from a health services perspective, these rehabilitation outcomes may not affect the level of support a patient requires at the end of the episode of care. This research succeeds in describing patient-level changes in functional performance using linked interRAI assessments. However, given that these assessments are designed to be widely applicable to a broad range of patients within a health service setting, they are unable to measure some highly detailed and condition-specific rehabilitation outcomes. In part, this may explain why receipt of occupational and speech-language pathology therapy was generally not associated with functional gain in the fully adjusted regression models. Additionally, some percentage of the time that is captured as "therapy" on the MDS 2.0 may be used for other activities performed by a therapist such as assessment (e.g., swallowing assessment by speech-language pathology therapists), configuration of mobility devices, and caregiver education. While these are important activities that may support patient recovery and enhance quality of life, their effect may not translate directly to functional gain.

3.5.3 Nursing Rehabilitation and Other Therapeutic Activities

This study focused primarily on the association between physical therapy and occupational therapy utilization and functional outcomes. These therapy types were selected as they are commonly provided in CCC hospitals (Canadian Institute for Health Information, 2018), and they are used in the RUG-III case-mix system algorithm (Fries et al., 1994) used to allocate a portion of funding in this care setting. The RUG-III algorithm uses nursing rehabilitation and restorative care activities as a qualifier for the low intensity Special Rehabilitation groups and as a classifier in several other RUG-III categories (Fries et al., 1994). These nursing rehabilitation and restorative care activities are frequently provided to CCC patients; however, there is little evidence to support their use for improving functional status (Talley et al., 2015; Galik et al., 2008). In the current study, only walking training was significantly associated with functional gain in the adjusted models. However, it is possible that these nursing rehabilitation activities may have also prevented against functional decline. Future research should seek to better understand the role of nursing rehabilitation on trajectories of recovery for patients post-acute care settings. In addition to the therapies that were focus of the current study, approximately one-third of Ontario CCC patients participate in recreation therapy (Canadian Institute for Health Information, 2018), which may also positively affect functional outcomes. Although the current study did not study the effect of recreation therapy directly, time spent involved in activities, such as recreation therapy, was an important factor in the multivariate models predicting functional change.

3.5.4 Limitations

Beyond limitations that are attributable to the analytical approach of the current study, some sample-related limitations should be discussed. The use of linked interRAI assessments across hospital, community, and residential long-term care settings has facilitated this first study of functional outcomes in Ontario CCC hospitals. However, due to this study's reliance on the availability of a follow-up interRAI assessment, patients that are discharged to care settings where interRAI assessments are not commonly used were not retained in the sample. This includes patients that were discharged to other hospital-based care settings such as inpatient rehabilitation facilities and acute care hospitals. Additionally, patients that were discharged to community care settings without long-stay home care services were also not included in the sample as these patients are typically not assessed with a RAI-HC assessment. Finally, patients that died in hospital before an MDS 2.0 re-assessment were not included in the sample. The full effect of these sample limitations on the results of this study are unknown. Although a substantial percentage of CCC patients die in facility (Canadian Institute for Health Information, 2018), these patients are likely not strong candidates for rehabilitation. However, patients that are discharged home without support or to inpatient rehabilitation facilities are likely to have strong rehabilitation potential. This study limitation highlights the need to adopt a modernized comprehensive health assessment in CCC hospitals that measures patient function at admission, regular follow-up intervals, and discharge to allow for outcome measurement and quality monitoring. Until this time, future studies, including Chapter 4 of this dissertation, should seek to understand the effect of patient characteristics and therapy intensity on alternative measures of rehabilitation outcomes such as discharge destination. Doing so will provide near census-level measures of rehabilitation outcomes in CCC hospitals.

Given that CCC patients are re-assessed with the MDS 2.0 assessment on 90-day intervals, information about therapy utilization between assessments is unavailable. Although preliminary analysis of the CAN-STRIVE data (Hirdes et al., n.d.) suggests that therapy intensity does not change substantially between assessments (see Appendix A.3), these staff time data were collected on a relativity small sample of patients and rehabilitation provider behaviour may have been influenced by the Hawthorne Effect (Sedgwick and Greenwood, 2015). While it is unclear how changes in rehabilitation intensity over the course of the episode of care affected the results of this study, several scenarios are possible. In instances where patients received less intensive therapy after the initial assessment period, the effect of high-intensity therapy would be attenuated. However, there may also be a subset of patients that were not be able to tolerate high-intensity therapy early in the episode of care. In these instances, the effect of low-intensity therapy on functional outcomes would have been strengthened. While both scenarios are likely, they don't discredit the results of this study as the rehabilitation intensity measures were collected at the same time as the patient health severity measures that were used as covariates in the models. Future studies should consider collecting therapy intensity measures at more frequent intervals so that mean therapy time may be used as a dependent variable. This would provide a more representative measure of therapy intensity over the episode of care.

Chapter 4

Patient Outcomes Following Rehabilitation in Ontario Complex Continuing Care Hospitals

4.1 Introduction

4.1.1 Patient Characteristics Associated with Adverse Events Following Discharge from Post-Acute Rehabilitation Facilities

Many studies have described patient characteristics that are associated with unplanned hospital readmission or acute care utilization following discharge from skilled nursing facility and inpatient rehabilitation facility rehabilitative care settings; however, only one study has been completed to date in an Ontario Complex Continuing Care (CCC) facility. Sinn et al. (2016) studied factors associated with readmission to a CCC facility within six-months of community discharge. In the adjusted models in that study, functional status and cognitive performance at admission were not associated with greater odds of readmission following discharge. Rather, factors associated with medical instability and advanced illness were best able to differentiate on this outcome. This study did not constrain the sample to patients receiving rehabilitation. Rehabilitation potential from the perspective of the patient and care staff was associated with decreased odds of readmission (Sinn et al., 2016), and given that rehabilitation potential is associated with increased likelihood of therapy provision (McArthur et al., 2015), it is possible that provision of rehabilitation may reduce the likelihood of readmission. This dissertation will aim to characterize this relationship. It should also be noted that the outcome of the Sinn et al. (2016) study was readmission to a CCC facility, as opposed to the more commonly used outcome of readmission to an acute care hospital. It is possible that the individuals experiencing this outcome are medically complex given their need for readmission to post-acute care.

A limited number of studies have described patient-level risk factors for readmission to acute care or emergency department visits following discharge from skilled nursing facilities. With respect to demographic factors, older (Hall et al., 2015; Leland et al., 2015), male, and African American (Toles et al., 2014; Leland et al., 2015) patients are more likely to experience unplanned hospital readmissions within 30 days of skilled nursing facility discharge. A greater number of comorbidities, measured using the Charlson and Elixhauser indices (Toles et al., 2014; Hall et al., 2015; Leland et al., 2015), and select conditions including neoplasm, respiratory (Toles et al., 2014), and skin conditions (Toles et al., 2014; Hall et al., 2015) are associated with accelerated time to acute care use within 30 days of skilled nursing facility discharge. Conversely, patients admitted with a fracture had a reduced hazard ratio for acute care use (Toles et al., 2014), suggesting that patients admitted to skilled nursing facilities primarily for complex medical conditions were more likely to be readmitted to acute care than those admitted for rehabilitation. Unfortunately, these studies failed to explore the association between physical and cognitive function on unplanned hospital readmission risk. The proportion of patients in these studies that received rehabilitation during the skilled nursing facility portion of their episode of care is unknown.

A similar set of patient characteristics were found to be associated with unplanned hospital readmissions following care in inpatient rehabilitation facilities. Patient demographic factors associated with unplanned hospital readmission include older age (Galloway et al., 2016; Middleton et al., 2016; Ottenbacher et al., 2003), male gender (Cahow et al., 2012; Ottenbacher et al., 2014), and African American or Hispanic ethnicity (Fisher et al., 2016; Middleton et al., 2016; Ottenbacher et al., 2014). There is also evidence for interaction effects between gender and ethnicity, potentially as a result of gender role and cultural differences that may affect health service utilization. For example, Ottenbacher et al. (2003) found that Hispanic males were less likely to be rehospitalized than white males within 180 days of discharge from an inpatient rehabilitation facility. Finally, patients with low levels of social support (Ottenbacher et al., 2012) and those that are not married (Galloway et al., 2016) are more likely to experience unplanned hospital readmissions.

Numerous studies have identified functional status at admission and discharge, in addition to functional gain during the rehabilitation episode of care, as important predictors of unplanned hospital readmissions. In a large sample of 25,908 deconditioned and medically complex Medicare patients that ranked in the highest risk quartile of the Centre for Medicare & Medicaid Services' risk-standardized hospital-wide all-cause readmission measure, Functional Independence Measure (FIM) motor sub-scale change was identified as the measure that best discriminated patients by readmission status (Fisher et al., 2016). Other discriminatory variables that were included in the final decision tree included length of stay and FIM motor sub-scale measured at discharge. These variables were included in favour of demographic variables, length of stay in acute care, comorbidity tier, and admission FIM. After adjusting for patient demographics, episode of care length of stay, comorbidity tier, and admission FIM cognitive sub-scale score, each five-point FIM motor sub-scale gain was associated with 0.81 (95% CI 0.80–0.82) lower odds of 30-day rehospitalization (Fisher et al., 2016). Similarly, Ottenbacher et al. (2014) found that greater FIM motor sub-scale gain resulted in decreased likelihood of 30-day unplanned hospital readmission for a range rehabilitation impairment categories (e.g., stroke, brain dysfunction, neurological conditions, fracture, joint replacement, and debility). Fisher et al. (2016) suggests that poor functional improvement may be an indicator of a worsening underlying health condition, placing patients at increased risk of readmission if it is not addressed prior to discharge.

Though change in functional status during inpatient rehabilitation may be representative of a patient's health status and rehabilitation potential, functional status at discharge is an indication of a patient's remaining needs (Middleton et al., 2016) and the level of support required to reside in a community setting. Several studies found that lower discharge FIM motor, mobility, and self-care sub-scale scores were associated with greater odds of unplanned hospital readmission (Dossa et al., 2011; Middleton et al., 2016; Fisher et al., 2016). Using a sample of 45,424 Medicare beneficiaries with debility, Galloway et al. (2016) studied time-varying factors that are associated with 90-day hospital readmission. Higher discharge FIM motor sub-scale scales were more protective up until 60 days after discharge. It is believed that over time, the reliability of functional status measures at discharge may degrade as factors such as patient physical activity and outpatient therapy may influence functional status after discharge (Galloway et al., 2016). This review of the literature did not identify studies comparing in-hospital and community-based measures on patient outcomes following discharge.

Severity of illness (Cahow et al., 2012), comorbidity tier (Galloway et al., 2016; Ottenbacher et al., 2014), number of comorbidities (Dossa et al., 2011), and select conditions associated with clinical instability (e.g., renal failure, liver disease, cancer, congestive heart failure, chronic obstructive pulmonary disease) (Galloway et al., 2016) are associated with unplanned hospital readmissions following discharge inpatient rehabilitation facilities. Hakkarainen et al. (2016) found that lower functional status and a greater number of comorbid conditions had significantly lower risk or unplanned hospital readmission within 7 days, but higher risk of readmission 30 days after discharge. It is believed that readmissions after 30 days are more likely to be related to preexisting conditions (Hakkarainen et al., 2016).

Kumar et al. (2017) compared five comorbidity indices (i.e., Charlson comorbidity index, Elixhauser comorbidity index, functional comorbidity index, hierarchical condition category, and Tier comorbidity system) on their ability to discriminate patients based on 30-day all-cause readmission to hospital in stroke, joint replacement, and fracture rehabilitation impairment categories. These comorbidity indices were developed to serve different purposes and differ primarily by the number and types comorbidities that are included within them. For example, the Charlson index consists of 18 conditions and was designed to predict 1-year all-cause mortality, while the Elixhauser index is designed to predict acute-hospital mortality and consists of 30 conditions (Kumar et al., 2017). The addition of the individual comorbidity indices to a base model improved the C-statistic by only 0.03–0.09, suggesting the comorbidity indices are weakly associated with 30-day hospital readmission in these populations. Lending further support for its discriminatory power, level of function at discharge alone improved the base model C-statistics by 0.06–0.09 and further improved the models containing comorbidity indices by 0.06–0.09 (Kumar et al., 2017).

Compared to unplanned hospital readmissions, few studies have explored the relationship between patient characteristics and mortality following discharge from skilled nursing facility and Inpatient Rehabilitation Facilities (IRF). This is likely because patients that are most likely to die following post-acute rehabilitation are readmitted to acute care before expiring. In fact, Hakkarainen et al. (2016) found that after controlling for patient and clinical characteristics, rehospitalization within 7 days of discharge was the strongest predictor of death. Demographic factors such as older age (Edgerton et al., 2013; Hakkarainen et al., 2016), male gender (Hakkarainen et al., 2016) are associated with increased risk. Factors associated with advanced or severe illness such as moderate to severe clinical instability (Sinn et al., 2016), greater number of comorbid conditions (Hakkarainen et al., 2016), condition such as chronic obstructive pulmonary disease, heart failure, and other heart conditions (Sinn et al., 2016; Edgerton et al., 2013), pressure ulcers, need for parenteral nutrition (Sinn et al., 2016; Hakkarainen et al., 2016), and decreased kidney function requiring dialysis (Edgerton et al., 2013) are also associated with increased risk of mortality. Though functional status is a strong predictor of hospital readmissions, it was only identified as a predictor of mortality following post-acute discharge in one study (Hakkarainen et al., 2016).

4.1.2 Facility Characteristics

Facility characteristics have also been associated with unplanned hospital readmissions; however, relative to patient characteristics, they have less discriminatory power. For example, the addition of facility over patient and treatment covariates only improved the C-statistic by 0.01 in a model predicting 1-year hospital readmission for patients with spinal cord injury (Cahow et al., 2012). The United States Centers for Medicare & Medicaid Services report skilled nursing facility quality using a 5-star rating system. The 90-day readmission hazard ratio for low-ranking (1-2 Star) facilities is 4-8% greater than for top-ranked facilities (Unroe et al., 2012). After adjusting for quality rating, large facility size, and for-profit facility ownership is also associated with greater odds of 90-day hospital readmission (Unroe et al., 2012). Similar associations were found for mortality following skilled nursing facility discharge; however, the increased hazard ratio for low-ranking facilities was 5-15% greater than for 5-Star facilities (Unroe et al., 2012). Toles et al. (2014) also found that for-profit ownership was associated with 30-day hospital readmission; however, there was no relationship between facility size and 30-day hospital readmission in this study. There is also some evidence that increased patient to licensed practical nurse and registered nurse ratios may reduce unplanned hospital readmission risk (Toles et al., 2014); however, additional investigation is necessary as this was not true among patients with end-stage renal disease (Hall et al., 2015).

4.1.3 Interventions

A few studies have evaluated the effectiveness of interventions aimed at reducing unplanned hospital readmissions following discharge from skilled nursing facilities. Using a natural experiment pre-post design, Park et al. (2013) studied the use of a post-discharge clinic in a population of United States Veterans Affairs skilled nursing facility patients. The intervention consisted of a 2-hour visit with a nurse practitioner prior to discharge for medication reconciliation, arrangement for home medical supplies and home health services, patient and family education, and communication with the primary care provider. Following the implementation of the post-discharge clinic, there was a significant reduction in the 30-day rehospitalization from 23% to 14% ($\rho = 0.02$), in addition to a significant reduction in inpatient days and emergency department visits per 1,000 patient follow-up days (Park et al., 2013). This intervention was believed to be effective as it allows for early detection of potential problems that would ordinarily be addressed with primary care providers following discharge.

Reidt et al. (2016) evaluated a similar post-discharge clinic; however, the intervention was delivered by a pharmacist and focused primarily on reducing medication related problems. In addition to medication reconciliation and communication with the patient's primary care provider, patients received an in-home visit shortly after discharge to assess medication adherence. After adjusting for demographic factors and comorbidities, there was significant reduction in the likelihood of emergency department visits within 30 days of discharge; however, group differences for 30-day unplanned hospital readmission were not significant (Reidt et al., 2016). In contrast to the nurse practitioner-led intervention that was evaluated by Park et al. (2013), pre-discharge medication reconciliation and follow-up by a pharmacist may not address issues related to disease management and self-sufficiency that may result in rehospitalization following skilled nursing facility discharge.

A challenge of evaluating multi-component interventions such as the aforementioned post-discharge clinics studied by Park et al. (2013) and Reidt et al. (2016) is that it is difficult to discern if individual components or the synergy of components lead to a reduction in unplanned hospital readmissions and emergency department visits. For example, Donovan et al. (2016) evaluated the use of automated messages to primary care providers five-days after patients discharge. Though communication with primary care providers was a component both post-discharge clinic interventions, Donovan et al. (2016) did not observe a reduction in 30-day rehospitalization in their intervention. Future research should aim to identify the components of patient transition interventions that are both effective and cost-efficient means of reducing unplanned hospital readmissions.

This review of the literature is limited in its coverage of studies comparing facility and community-based services, especially rehabilitation. Stolee et al. (2012) completed a systematic review comparing outcomes of older adults with musculoskeletal conditions receiving home-based rehabilitation compared to inpatient rehabilitation. In seven of the twelve studies that were reviewed, rehabilitation was delivered in an acute care hospital, with the therapy provided in rehabilitation facilities in the remaining five studies. A third of the articles included in the review tracked mortality rates and found no difference between home-based and inpatient rehabilitation (Stolee et al., 2012). Cook et al. (2013) investigated the effect of physiotherapy and occupational therapy on state transitions in home care clients. At all levels of functional impairment at baseline, patients that received therapy were more likely to be discharged from home care services within six months. The most functionally impaired group at baseline were less likely to die or be discharged to hospital or Long-term Care (LTC) if they received therapy (Cook et al., 2013).

4.2 Rationale and Objectives

In addition to functional gain, provision of rehabilitation in Ontario CCC hospitals may influence discharge destination (i.e., community, LTC) and likelihood of adverse events such as acute care rehospitalization and mortality. The first objective of this study is to determine if greater rehabilitation therapy intensity reduces the likelihood of transitions due to adverse events or functional decline in favour of more desirable discharge destinations such as community care. The second objective of this study is to determine if CCC rehabilitation is associated with state transitions following discharge to community care. Together, these research objectives provide evidence of the relative of effect of hospital-based therapy on short and long-term patient outcomes.

4.2.1 Phase 1: Multistate Transitions Following Rehabilitative Care in Complex Continuing Care

The aim of this phase is to develop a multistate transition model using patient, facility, and system-level covariates to explore transition rates within baseline functional status groups. The transitions of interest included discharge to community care, discharge to an LTC facility, discharge to acute care, death, and remaining in CCC 90 days after the admission assessment with improvement or decline in functional status.

This phase aimed to answer the following questions:

- What patient-level factors measured at admission to CCC are associated with state transitions following rehabilitation?
- After controlling for patient-level factors, what is the relative effect of increased rehabilitation intensity on state transitions in CCC?
- After adjusting for patient and treatment factors, are there facility and system-level factors that are associated with state transitions in CCC?

4.2.2 Phase 2: Multistate Transitions in Home Care Following Discharge from Complex Continuing Care

The aim of this phase is to develop a multistate transition model using Markov chains with patient, facility, and system-level covariates to explore transition rates within baseline functional status groups for patients that were discharged to home care following rehabilitation in CCC hospitals. The transitions of interest included improvement or decline in functional status, acute care admission, admission to a LTC facility, death, and discontinuation of home care services.

This phase aimed to answer the following questions:

- What patient-level factors measured in CCC and community care are associated with state transitions after discharge?
- After controlling for patient-level factors, what is the relative effect of increased rehabilitation intensity in CCC on state transitions in community care?

4.3 Methods

4.3.1 Data Sources

The primary sources of patient-level health information used in this study used were Minimum Data Set 2.0 (MDS 2.0) and Minimum Data Set Home Care (RAI-HC) assessments that were linked to administrative hospital records contained in the Discharge Abstract Database (DAD) and National Ambulatory Care Reporting System (NACRS) databases. The MDS 2.0 and RAI-HC assessments were described in Section 2.3.1 and Section 3.3.1.

NACRS contains patient-level records of all ambulatory care visits, including day surgery, ambulatory care clinics, and emergency departments for patients residing in Prince Edward Island, Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, and the Yukon (Canadian Institute for Health Information, 2017; Canadian Institute for Health Information, 2016c). Though emergency department facility coverage varies by province, as of fiscal year 2015/2016, provinces with complete coverage included Ontario, Alberta, and the Yukon (Canadian Institute for Health Information, 2016c). As of fiscal year 2015/2016, Ontario contributed 6,279,031 emergency department records (Canadian Institute for Health Information, 2016c). DAD contains patient-level records for all acute inpatient hospital discharges in all Canadian provinces and territories. As of fiscal year 2015/2016, Ontario contributed 1,167,032 discharge records (Canadian Institute for Health Information, 2016b).

These various sources of patient health assessments and administrative hospital records were linked together using a unique but meaningless patient identification number. The temporal order of patient transitions through the Ontario health system was determined using admission and discharge dates available in each database used in this study.

State Transitions

Similar to the approach used by Cook et al. (2013), patients were assigned to one of three initial states based on their functional status measured using the Activities of Daily Living Long Form Scale (ADL-Long) Scale. The cut points used to identify each initial state vary for each phase of this study, as the sub-sample of patients that were discharged to community were inherently less impaired than the full sample of CCC patients. Patients were assigned to the next state based on the first event that occurred following the initial state. For example, patients that were discharged to community care and subsequently re-hospitalized were assigned to the community care next state. Next states that removed the patient from the care setting where they were assigned to the initial state (e.g., long-term care facility admission, death) were considered absorbing states. In cases where a patient did not transition to an absorbing state, their next state was determined using their Activities of Daily Living Hierarchy Scale (ADL-H) score on the next available MDS 2.0 assessment in CCC.

Independent Variables

In addition to the independent variables described in Section 2.3.1 and Section 3.3.1, clinical outcome scales calculated using information from the RAI-HC were used. These scales included the Cognitive Performance Scale (CPS) and Changes in Health, End-Stage Disease, Signs, and Symptoms Scale (CHESS), which share a common algorithm, range of scores, and interpretation when used with a home care population. Unlike in CCC where the majority of patients receive rehabilitation therapy, only a minority of patients in home care receive physical and occupational therapy visits. Therefore, binary variables for receipt of any amount of physical and occupational therapy home care were created.

4.3.2 Phase 1: Multistate Transitions Following Rehabilitative Care in Complex Continuing Care

Study Design and Sample

This study was a retrospective cross-sectional study of patients admitted to Ontario CCC hospitals between January 1st, 2010 and March 31st, 2015. Patients were assigned to one of three initial states based on their ADL-H scale score from their admission MDS 2.0 assessment. The following cut points were used:

- State 1: ADL-H 0-2
- State 2: ADL-H 3-4
- State 3: ADL-H 5-6

Patients that were discharged before an MDS 2.0 re-assessment occurred between 75 and 105 days after the initial MDS 2.0 were assigned to one of four possible absorbing next states using information from the MDS 2.0 "Discharge Tracking Form." Possible absorbing next states were:

- State 4: Community Discharge
- State 5: Residential Long-term Care Discharge
- State 6: Acute Care (Hospital) Discharge
- State 7: Death

State 4 (community discharge) included patients discharged to home care services, board and care residential care services (e.g., private retirement home), and home without home care. State 5 (LTC discharge) included patients discharged to 24-hour nursing residential care settings. State 6 (hospital discharge) included patients that were discharged to inpatient acute care services without a return to CCC care within 14 days of discharge. State 7 (death) included patients that died in the CCC facility and patients that died after discharge to an acute care hospital. This was determined using information from available DAD records. Patients that were not discharged within 105 days of the admission MDS 2.0 assessment were assigned to their next state based on their functional status on the first available re-assessment that occurred between 75 to 105 days after the admission MDS 2.0 assessment was completed. Patients that did not receive a re-assessment and were not discharged to one of the aforementioned absorbing states were removed from the sample. A state-space diagram of the possible transition states is depicted in Figure 4.1. A final sample of 76,132 episodes of care was used for this phase of the study.

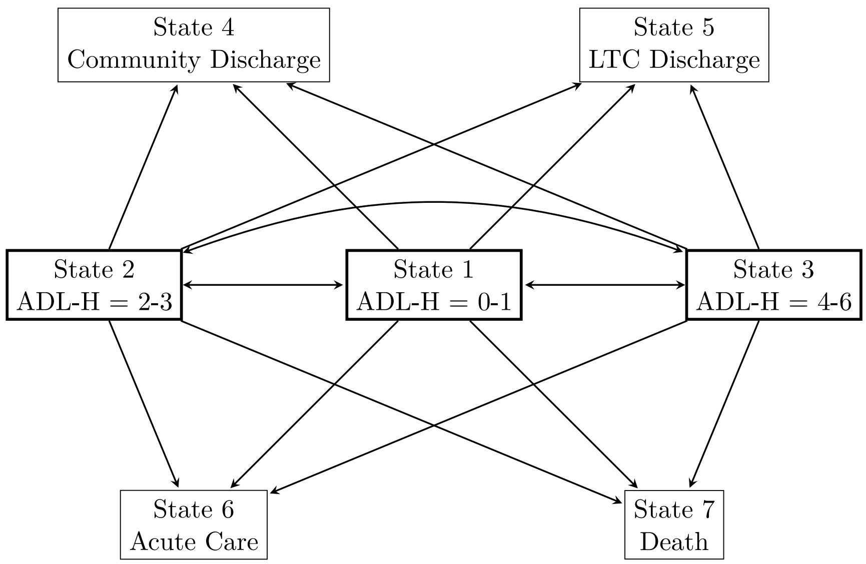

Figure 4.1: State-space Diagram for Transitions within Complex Continuing Care

Analytic Strategy

Next state frequency distributions stratified by initial state were computed for patient, facility, and system-level covariates of interest. The statistical significance of differences in the next state frequency response for each covariate was ascertained using Chi-square tests. Covariates that were statistically significant at the bivariate level were then used to fit the multistate transition model. This was accomplished by fitting a multinominal logit model for each initial state using the `SAS proc LOGISTIC` procedure. Model specification was performed in a forward selection manner. Variables were retained in the final model if the effect *P-value* was 0.05 or lower for at least one of the initial states and there was a reduction in the Akaike Information Criterion (AIC) statistic. Odds ratios and associated confidence intervals for each state transition were pooled from each of the three multinominal logit models and presented as a matrix for each effect. All analyses were performed using SAS® 9.4 (SAS Institute, Inc., Cary, NC).

4.3.3 Phase 2: Multistate Transitions Following Community Discharge from Complex Continuing Care

Study Design and Sample

This study was a retrospective cross-sectional study of patients admitted to Ontario CCC hospitals between January 1st, 2010 and March 31st, 2014 who were subsequently discharged to the community and received long-stay home care services. Using all available RAI-HC assessments completed after CCC discharge, a series of assessment pairs were constructed for consecutive assessments completed within the same home care episode. For example, a patient that received three consecutive RAI-HC assessments was represented as two assessment pairs in the sample (i.e., admission and follow-up #1, follow-up#1 and follow-up#2). When an assessment pair could not be constructed due to a lack of a follow-up RAI-HC assessment, hospital admission, LTC admission, and mortality data from linked Continuing Care Reporting System (CCRS), DAD, and NACRS databases were used to determine the patient's next state. For example, a patient that died at home after their second consecutive RAI-HC assessment was represented twice in the sample, once as an assessment pair and once as a discharge event (i.e., admission and follow-up #1, follow-up #1 and death). These assessment pairs and discharge events were used to establish a series of state transitions following discharge from CCC. All patients in the sample received a RAI-HC assessment within 105 days of discharge from CCC. Subsequent RAI-HC assessments were included in the sample if the assessment date was within one-year of the CCC discharge date.

Using RAI-HC assessment data collected in home care, the ADL-H scale was used to establish initial and transitional states. However, due to sample size limitations and the fact that the majority of patients that were discharged to home care were situated towards the left side of the ADL-H distribution, only two initial states could be established to maintain sufficient cell counts across all possible transition states. The following cut points were used to establish initial and transitional functional states:

- State 1: ADL-H 0-1
- State 2: ADL-H 2+

Possible absorbing next states included:

- State 4: Residential Long-term Care (LTC) Admission
- State 5: Admission to Acute Care (Hospital)
- State 6: Death
- State 7: Home Care Services Discontinued (Other)

Except for death in hospital, patients were assigned to the next absorbing state based on the first state change event that occurred. For example, patients that were admitted to hospital before being admitted to a residential long-term care facility were assigned to State 5 (hospital). In 80.9% of cases, the “Home Care Discontinued” state represented patients that were discharged from home care because the client no longer required service. Other possible reasons why home care services were discontinued was because the client was referred to another health service that was not captured by the other absorbing states (7.3%), the client withdrew from services (9.5%), or the home care agency was unable to contact the client (2.3%). A state-space diagram of the possible transition states is depicted in Figure 4.2.

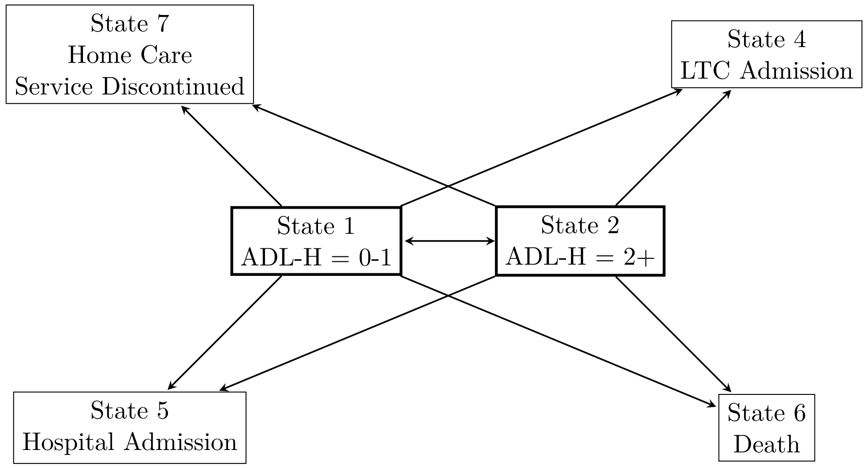

Figure 4.2: State-space Diagram for Transitions Following Complex Continuing Care Discharge to Home Care

Analytic Strategy

State transition rates were computed for patient, facility, and system-level variables, and the statistical significance of difference in frequency response were ascertained using Chi-square tests. A Markov chain multistate transition model was fit by producing a series of multinominal logit models for each initial state using the `SAS proc LOGISTIC` procedure. Markov chain multistate transition models satisfy the Markov property, such that probability of transitioning to any next state is dependent only on the patient's current state. As with the model fit in Phase 1, model specification was performed in a forward selection manner. Variables were retained in the final model if the effect *P-value* was 0.05 or lower for at least one of the initial states and there was a reduction in the model AIC value. A parameter called "Assessment Pair" to denote the number of assessment pairs contributed to the sample by each patient was also included. Odds ratios and associated confidence intervals for each state transition were pooled together from both of the multinominal logit models and presented as a matrix for each effect. All analyses were performed using SAS® 9.4 (SAS Institute, Inc., Cary, NC).

4.4 Results

4.4.1 Phase 1: Multistate Transitions Within Complex Continuing Care

Sample Description

The clinical characteristics of the sample used in Phase 1 of this study are presented in Appendix C.1.1. More than two-thirds of the overall sample were 75 years and older, 39.5% were married, and 65.1% had a support person that was positive towards discharge (Table C.1). The most frequently represented diagnosis groups were cardiac conditions, arthritis, cancer, orthopedic conditions, pulmonary conditions, and stroke (Table C.2). Unsteady gait and fluctuating health status were experienced by half of the overall sample (Table C.3). Seventy percent of the sample required extensive assistance or more to complete Activities of Daily Living (ADLs), and approximately 37% had moderate or worse cognitive impairment and moderate or worse health instability. More than 40% of the sample experienced daily pain and 20% of showed signs and symptoms of depression (Table C.4). Subjective appraisal indicated that approximately 50% of the overall sample had rehabilitation potential (Table C.7). Approximately one-third of the sample did not qualify for a "Special Rehabilitation" Resource Utilization Groups Version III (RUG-III) group based on the intensity of rehabilitation therapy and nursing rehabilitation they received. Of those that qualified for a "Special Rehabilitation" group, 15.4% were classified into a low intensity group and 36.2% were classified into a medium-intensity group (Table C.8). The Toronto Central and Hamilton Niagara Haldimand Brant Local Health Integration Networks (LHINs) were most frequently represented, accounting for more than 40% of the overall sample combined (Table C.9). The time thresholds by provider that correspond to each therapy intensity quintile are presented in Table 4.1.

Table 4.1: Therapy Intensity Quintiles Time Thresholds, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Quintile	Physical Therapy	Occupational Therapy	SLP Therapy
1st Quintile	1-60 minutes	1-35 minutes	1-30 minutes
2nd Quintile	61-90 minutes	36-60 minutes	31-40 minutes
3rd Quintile	91-130 minutes	61-100 minutes	41-60 minutes
4th Quintile	131-180 minutes	101-160 minutes	61-100 minutes
5th Quintile	181+ minutes	161+ minutes	101+ minutes

Transition Rates at Discharge or Re-assessment in Complex Continuing Care

More than two-thirds of patients that were admitted to CCC in the ADL-H 0-2 state were discharged to community care. The remainder of patients that were discharged within 105 days of their admission MDS 2.0 assessment were approximately evenly split across the three other absorbing states. Among patients that were not discharged, few progressed to a more functionally impaired state. Patients that were admitted in the ADL-H 3-4 state were less likely to be discharged to the community; however, this remained the most common next state. Finally, patients that were admitted in the ADL-H 5-6 state were most likely to have died at follow-up (Table 4.2).

Table 4.2: Discharge Destination and State Transition Rates, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Next State							*P-value*
	ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	
ADL-H 0-2	7.8	1.3	0.7	67.8	9.2	6.2	7.0	<0.0001
ADL-H 3-4	3.3	13.1	2.7	46.7	11.9	9.0	13.3	
ADL-H 5-6	1.4	2.9	16.0	22.1	11.3	7.5	38.8	

State transition rates by demographic variables are presented Table 4.3. Across all three initial states, a greater percentage of female patients were discharged to community care and residential long-term care settings within 105 days of the admission MDS 2.0 assessment. Female patients were generally less likely to transition to all other states. Transition rates by marital status generally differed by a negligible amount. Generally, married patients were more likely to be discharged to the community and less likely to be discharged to residential long-term care, but the difference declined as the severity of ADL impairment at baseline increased. Patients that lived alone prior to entering the CCC hospital were slightly more likely to be discharged to a residential long-term care facility. In cases where the prior living arrangement was unknown, patients were generally more likely to die or be discharged to an acute care hospital. Across all initial states, patients that had a desire to return to the community were much more likely to be discharged to the community and much less likely to die. A similar trend was observed for patients with a support person that was positive towards discharge. Across initial states, the percentage of patients that were discharged to the community and the percentage of patients that died did not differ substantially by age group. However, with increasing age, patients were more likely to be discharged to a residential long-term care facility and less likely to be discharged to hospital (Table 4.4).

Among patients at the ADL-H 0-2 initial state, patients with amputation, cancer, and spinal cord injury were substantially less likely to be discharged to the community compared to patients without these conditions. Patients with these conditions were also less likely to be discharged to residential long-term care, in addition to patients with orthopedic conditions, other medically complex conditions, and traumatic brain injury. Patients with amputation or spinal cord injury were substantially more likely to be discharged to hospital compared to patients without these conditions. Finally, patients with cancer and other medically complex conditions were more likely to die before a follow-up re-assessment is completed compared to patients without these conditions (Table 4.5). In general, these trends persisted for patients with ADL-H 3-4 (Table 4.6) and ADL-H 5-6 (Table 4.7) initial states.

Across initial states, patients with CHESS scores of 0 and 1-2 were approximately equally likely to be discharged to the community; however, patients with CHESS scores of 3+ were less likely to be discharged to the community. As expected, these patients have a high mortality rate before a follow-up. Among patients in the ADL-H 5-6 initial state, the percentage of patients with a CHESS score of 3+ that were discharged to hospital and residential long-term care was substantially lower than patients with CHESS scores of 0 and 1-2. Those with a high baseline ADL-H of 5-6 with CHESS 3+ were most likely to die as their next state transition (Table 4.8). When stratified by CPS, the percentage of patients that were discharged to the community and hospital decreased with the severity of cognitive impairment and baseline ADL-H score. Conversely, the percentage of patients that were either discharged to residential long-term care or died increased with the severity of cognitive impairment (Table 4.9).

For all initial states, the percentage of patients that were discharged to the community was greatest when both the patient and the care provider believed that the patient had rehabilitation potential. Across all states, patients were most likely to die when neither the patient nor the care provider believed that the patient had rehabilitation potential. Patients were more likely to die when only the patient believed that they had rehabilitation potential compared to when only the care provider thought the patient had rehabilitation potential (Table 4.10).

Across all initial states, the percentage of patients that were discharged to the community increased with the intensity of physical and occupational therapy. Conversely, the percentage of patients that were either discharged to residential long-term care or died generally decreased with greater physical and occupational therapy intensity in the first two ADL-H states (Table 4.11 and 4.12). Bivariate state transition rates for the remainder of candidate variables that were considered in this phase of the study are presented in Appendix C.1.2.

Table 4.3: Discharge Destination State Transition by Demographic Variables, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

			Next State							
Variable	Initial State		ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
Female	ADL-H 0-2	No	9.2	1.8	0.8	64.7	7.8	6.9	8.9	<.0001
		Yes	6.9	1.0	0.7	69.9	10.2	5.7	5.7	
	ADL-H 3-4	No	3.3	16.0	3.1	42.1	10.3	9.7	15.6	<.0001
		Yes	3.3	10.9	2.4	50.2	13.1	8.5	11.6	
	ADL-H 5-6	No	1.2	3.4	17.3	18.3	9.5	8.6	41.7	<.0001
		Yes	1.5	2.5	15.0	25.0	12.6	6.7	36.7	
Married	ADL-H 0-2	No	8.9	1.3	0.7	65.5	10.4	6.2	6.9	<.0001
		Yes	5.7	1.3	0.7	72.0	6.9	6.2	7.2	
	ADL-H 3-4	No	3.7	13.0	2.5	45.3	13.6	9.0	12.9	<.0001
		Yes	2.7	13.2	3.1	48.8	9.2	9.1	14.0	
	ADL-H 5-6	No	1.6	2.9	16.0	22.2	12.9	7.1	37.3	<.0001
		Yes	1.1	2.9	16.0	22.0	9.2	8.1	40.8	
Lived Alone Prior to Entry	ADL-H 0-2	No	7.3	1.4	0.7	68.8	8.4	6.1	7.2	<.0001
		Yes	8.5	1.1	0.6	66.9	11.2	5.9	5.9	
		Unknown	8.3	1.3	1.0	65.0	6.4	7.9	10.0	
	ADL-H 3-4	No	2.8	13.1	2.8	47.2	11.8	8.8	13.5	<.0001
		Yes	3.7	11.5	2.1	48.5	13.5	8.7	12.0	
		Unknown	5.9	18.1	3.8	36.7	6.9	11.7	17.0	
	ADL-H 5-6	No	1.1	2.7	15.9	22.8	11.6	7.2	38.6	<.0001
		Yes	2.2	3.3	14.9	23.4	12.6	8.2	35.4	
		Unknown	1.6	3.2	19.2	14.5	6.1	7.9	47.4	
Desire to Return to Community	ADL-H 0-2	No	17.5	4.0	2.6	26.8	17.3	5.3	26.4	<.0001
		Yes	6.2	0.8	0.4	74.4	7.9	6.4	3.9	
	ADL-H 3-4	No	2.5	22.6	5.9	15.2	14.0	6.5	33.3	<.0001
		Yes	3.6	10.4	1.8	55.4	11.3	9.7	7.8	
	ADL-H 5-6	No	0.8	2.0	18.0	7.5	8.6	5.0	58.1	<.0001
		Yes	2.0	3.8	13.9	37.7	14.2	10.1	18.2	
Support Person Positive Towards Discharge	ADL-H 0-2	No	16.4	3.2	2.1	36.3	15.7	5.9	20.4	<.0001
		Yes	5.6	0.8	0.3	76.1	7.5	6.3	3.5	
	ADL-H 3-4	No	3.2	21.5	5.0	20.3	13.4	6.9	29.7	<.0001
		Yes	3.4	9.9	1.8	56.8	11.3	9.8	7.1	
	ADL-H 5-6	No	1.0	2.4	17.9	6.3	6.5	5.2	60.7	<.0001
		Yes	1.8	3.4	14.1	37.9	16.1	9.8	17.0	

Table 4.4: Discharge Destination and State Transition Rates by Age Group, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	Age 0-64	11.3	1.0	0.9	65.2	3.4	9.1	9.0	<.0001
	Age 65-74	7.2	1.1	0.7	69.2	6.5	6.9	8.4	
	Age 75-84	7.0	1.3	0.7	69.6	9.3	5.6	6.3	
	Age 85-94	7.1	1.4	0.6	66.7	13.4	5.1	5.8	
	Age 95+	8.3	2.3	0.9	60.0	18.0	3.4	7.0	
ADL-H 3-4	Age 0-64	5.0	16.8	2.8	42.8	5.0	12.9	14.6	<.0001
	Age 65-74	3.3	13.0	2.6	47.7	8.0	10.5	15.0	
	Age 75-84	3.3	11.5	2.6	48.2	12.4	8.8	13.2	
	Age 85-94	2.9	13.4	2.8	46.0	15.0	7.4	12.4	
	Age 95+	1.4	12.1	3.0	47.2	19.3	5.8	11.2	
ADL-H 5-6	Age 0-64	1.8	3.6	21.7	19.0	4.5	11.0	38.3	<.0001
	Age 65-74	1.5	2.7	15.7	20.1	6.9	9.3	43.8	
	Age 75-84	1.3	2.9	15.5	22.5	11.3	7.3	39.2	
	Age 85-94	1.2	2.7	14.2	23.9	15.9	5.7	36.4	
	Age 95+	0.6	2.5	15.5	24.2	17.2	3.7	36.3	

Table 4.5: Discharge Destination and State Transition Rates by Diagnosis Group for Patients with ADL-H 0-2 Initial State, Ontario Complex Continuing Care, 2010 - 2015, n = 22,637

Disease		Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
Amputation	No	7.7	1.3	0.7	67.9	9.3	6.0	7.1	<.0001
	Yes	11.2	1.2	0.6	59.4	4.3	18.4	4.8	
Arthritis	No	8.3	1.4	0.8	66.1	9.1	6.4	7.9	<.0001
	Yes	6.5	0.9	0.6	72.0	9.5	5.9	4.6	
Cancer	No	7.8	1.2	0.4	71.4	9.8	6.4	3.0	<.0001
	Yes	8.1	1.7	1.8	53.0	6.8	5.5	23.2	
Cardiac Conditions	No	8.5	1.2	0.8	66.8	9.2	5.9	7.5	<.0001
	Yes	6.9	1.4	0.6	69.0	9.2	6.6	6.4	
Neurological Conditions	No	7.6	1.2	0.7	67.9	9.1	6.3	7.2	<.0001
	Yes	10.2	2.4	1.1	66.3	9.7	5.9	4.3	
Orthopedic Conditions	No	8.4	1.4	0.8	64.6	9.8	6.4	8.5	<.0001
	Yes	5.9	0.8	0.4	77.8	7.2	5.5	2.3	
Other Medically Complex Conditions	No	7.9	1.3	0.7	68.3	9.5	5.9	6.4	<.0001
	Yes	7.5	1.4	0.7	64.4	7.2	8.4	10.4	
Pulmonary Conditions	No	8.0	1.3	0.7	67.6	9.5	6.1	6.8	<.0001
	Yes	7.2	1.1	0.8	68.3	7.9	6.8	7.9	
Spinal Cord Injury	No	7.8	1.3	0.7	67.8	9.2	6.2	7.0	<.0001
	Yes	26.2	1.6	1.6	54.1	3.3	13.1	0.0	
Stroke	No	7.5	1.2	0.7	67.7	9.2	6.1	7.6	<.0001
	Yes	9.5	1.7	0.7	68.1	9.4	6.8	3.8	
Traumatic Brain Injury	No	7.8	1.3	0.7	67.8	9.2	6.2	7.1	<.0001
	Yes	13.3	3.6	1.2	65.9	6.4	7.6	2.0	

Table 4.6: Discharge Destination and State Transition Rates by Diagnosis Group for Patients with ADL-H 3-4 Initial State, Ontario Complex Continuing Care, 2010 - 2015, n = 21,759

Disease		Next State							
		ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
Amputation	No	3.3	13.0	2.7	46.9	12.0	8.7	13.5	<.0001
	Yes	3.8	17.0	3.3	39.6	8.2	18.9	9.2	
Arthritis	No	3.6	13.7	2.9	44.2	11.0	9.5	15.1	<.0001
	Yes	2.7	11.7	2.3	51.9	13.7	8.1	9.6	
Cancer	No	3.7	13.8	2.4	50.8	13.0	9.5	6.9	<.0001
	Yes	2.1	10.6	3.8	32.2	7.8	7.3	36.1	
Cardiac Conditions	No	3.7	14.1	2.9	45.5	11.6	8.3	14.0	<.0001
	Yes	3.0	12.0	2.5	47.9	12.2	9.7	12.7	
Neurological Conditions	No	3.4	12.8	2.6	46.5	11.8	9.0	13.9	<.0001
	Yes	3.0	15.9	3.2	48.5	12.0	8.8	8.6	
Orthopedic Conditions	No	3.0	14.2	3.1	42.4	12.2	9.1	16.0	<.0001
	Yes	4.1	10.3	1.7	57.6	10.9	8.9	6.4	
Other Medically Complex Conditions	No	3.4	13.2	2.8	47.5	12.4	8.4	12.4	<.0001
	Yes	3.1	12.3	2.3	42.9	9.3	12.1	17.9	
Pulmonary Conditions	No	3.6	13.6	2.8	46.4	12.0	8.9	12.8	<.0001
	Yes	2.3	11.1	2.3	47.9	11.3	9.6	15.6	
Spinal Cord Injury	No	3.3	12.8	2.7	46.9	11.9	8.9	13.4	<.0001
	Yes	1.5	28.6	4.9	35.0	6.1	15.5	8.5	
Stroke	No	3.1	11.9	2.5	47.4	11.6	8.9	14.5	<.0001
	Yes	4.1	17.4	3.4	44.1	12.8	9.5	8.7	
Traumatic Brain Injury	No	3.3	12.9	2.7	46.8	11.9	9.0	13.5	<.0001
	Yes	7.1	26.2	1.9	40.1	9.4	11.6	3.7	

Table 4.7: Discharge Destination and State Transition Rates by Diagnosis Group for Patients with ADL-Hierarchy Scale 5-6 Initial State, Ontario Complex Continuing Care, 2010 - 2015, n = 31,735

Disease		Next State ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
Amputation	No	1.4	2.8	15.9	22.2	11.3	7.3	39.0	<.0001
	Yes	0.7	5.9	20.2	18.7	9.4	16.7	28.3	
Arthritis	No	1.3	2.8	16.1	20.4	10.3	7.4	41.8	<.0001
	Yes	1.5	3.2	15.8	27.3	14.3	7.9	29.9	
Cancer	No	1.7	3.7	19.5	28.6	15.2	9.6	21.6	<.0001
	Yes	0.8	1.5	9.9	10.8	4.5	3.9	68.7	
Cardiac Conditions	No	1.5	2.6	16.7	21.0	10.1	6.6	41.5	<.0001
	Yes	1.3	3.2	15.2	23.6	12.8	8.5	35.5	
Neurological Conditions	No	1.4	2.9	15.1	21.7	11.1	7.4	40.3	<.0001
	Yes	1.0	2.8	22.6	25.4	12.6	8.4	27.3	
Orthopedic Conditions	No	1.3	2.7	16.5	18.6	10.5	7.4	43.1	<.0001
	Yes	1.8	3.8	14.1	36.1	14.7	8.0	21.6	
Other Medically Complex Conditions	No	1.4	3.0	16.4	22.8	12.0	7.3	37.2	<.0001
	Yes	1.2	2.4	14.3	18.9	8.2	8.7	46.3	
Pulmonary Conditions	No	1.3	2.9	16.5	22.0	11.4	7.4	38.4	<.0001
	Yes	1.6	2.6	13.9	22.7	10.8	7.9	40.5	
Spinal Cord Injury	No	1.4	2.9	15.3	22.3	11.5	7.3	39.4	<.0001
	Yes	0.9	3.3	40.8	17.5	4.0	15.1	18.5	
Stroke	No	1.3	2.5	14.4	22.2	10.5	6.9	42.2	<.0001
	Yes	1.5	4.3	21.9	21.9	14.2	9.7	26.5	
Traumatic Brain Injury	No	1.4	2.9	15.6	22.2	11.4	7.4	39.2	<.0001
	Yes	1.5	3.8	36.9	19.3	8.0	15.0	15.4	

Table 4.8: Discharge Destination and State Transition Rates by Changes in Health, End-Stage Disease, Signs, and Symptoms Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	CHESS 0	9.4	1.4	0.3	70.8	9.6	5.9	2.5	<.0001
	CHESS 1-2	7.2	1.1	0.7	71.5	8.9	6.1	4.5	
	CHESS 3+	7.4	1.6	1.3	50.4	9.7	7.1	22.5	
ADL-H 3-4	CHESS 0	4.2	21.2	2.8	49.0	10.6	8.9	3.2	<.0001
	CHESS 1-2	3.6	13.3	2.4	52.4	12.0	9.9	6.4	
	CHESS 3+	2.4	9.2	3.2	36.1	12.2	7.6	29.5	
ADL-H 5-6	CHESS 0	2.4	4.8	30.6	30.3	14.3	10.6	7.0	<.0001
	CHESS 1-2	2.0	4.1	21.6	32.0	14.2	10.5	15.6	
	CHESS 3+	0.8	1.8	10.0	14.5	9.0	5.1	59.0	

Table 4.9: Discharge Destination and State Transition Rates by Cognitive Performance Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State							
Initial State	Level	ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	CPS 0-1	6.4	0.8	0.5	73.1	5.9	6.5	6.8	<.0001
	CPS 2-3	9.7	1.8	1.0	61.0	13.8	5.7	7.1	
	CPS 4-6	14.5	3.8	1.6	43.4	21.2	5.7	9.8	
ADL-H 3-4	CPS 0-1	3.5	10.1	1.9	54.4	7.9	10.7	11.6	<.0001
	CPS 2-3	3.3	13.8	2.8	43.4	14.1	8.1	14.4	
	CPS 4-6	2.6	21.9	5.3	29.4	18.7	6.0	16.0	
ADL-H 5-6	CPS 0-1	2.0	3.2	13.9	31.6	9.1	9.2	31.0	<.0001
	CPS 2-3	1.5	3.3	14.6	20.9	12.3	7.0	40.4	
	CPS 4-6	0.5	2.1	20.0	13.5	12.4	6.3	45.2	

Table 4.10: Discharge Destination and State Transition Rates by Subjective Rehabilitation Potential, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State							
Initial State	Level	ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	Neither Patient or Provider	9.1	1.9	1.1	59.0	11.4	5.9	11.7	<.0001
	Only Patient	8.8	1.3	1.1	64.7	11.0	5.8	7.3	
	Only Provider	8.8	2.0	0.8	61.4	12.7	7.9	6.4	
	Both Patient and Provider	6.5	0.7	0.3	76.1	6.6	6.3	3.5	
ADL-H 3-4	Neither Patient or Provider	2.4	15.1	4.0	34.7	13.3	8.0	22.5	<.0001
	Only Patient	2.9	16.4	2.6	42.2	11.9	9.2	14.9	
	Only Provider	3.4	14.5	3.0	47.0	14.0	10.0	8.2	
	Both Patient and Provider	4.3	10.0	1.3	59.7	9.7	9.7	5.2	
ADL-H 5-6	Neither Patient or Provider	0.9	2.2	16.5	14.6	10.5	6.4	48.9	<.0001
	Only Patient	2.1	3.8	16.6	28.1	12.8	8.2	28.4	
	Only Provider	2.2	4.7	17.1	35.9	14.6	10.4	15.0	
	Both Patient and Provider	2.9	4.5	13.0	46.8	12.2	10.6	10.0	

Table 4.11: Discharge Destination and State Transition Rates by Physical Therapy Intensity Quintile, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	No Therapy	13.6	2.3	1.5	39.9	19.6	5.6	17.4	<.0001
	1st Quintile	10.9	2.3	0.9	55.4	12.6	6.5	11.3	
	2nd Quintile	7.4	1.4	0.9	68.7	9.8	6.4	5.5	
	3rd Quintile	6.1	0.9	0.9	73.3	7.5	6.6	4.7	
	4th Quintile	5.5	0.6	0.4	79.2	5.3	5.9	3.1	
	5th Quintile	5.3	0.5	0.2	81.0	3.9	6.3	2.9	
ADL-H 3-4	No Therapy	2.4	18.6	3.9	18.4	15.9	7.0	33.7	<.0001
	1st Quintile	2.7	17.4	4.2	31.8	14.7	9.1	20.2	
	2nd Quintile	3.7	13.9	2.7	45.0	13.0	10.3	11.4	
	3rd Quintile	4.3	11.4	2.3	51.6	11.5	9.0	9.9	
	4th Quintile	3.2	9.7	1.9	59.8	8.6	9.3	7.5	
	5th Quintile	3.5	10.2	1.8	60.7	9.7	9.0	5.1	
ADL-H 5-6	No Therapy	0.6	1.5	12.8	8.0	8.8	4.3	64.1	<.0001
	1st Quintile	1.3	2.4	18.7	17.8	13.5	8.0	38.3	
	2nd Quintile	1.9	3.9	20.0	25.8	12.3	9.4	26.8	
	3rd Quintile	1.9	4.4	17.7	32.7	12.6	9.7	21.0	
	4th Quintile	2.5	4.5	14.1	41.6	10.8	9.9	16.6	
	5th Quintile	1.9	4.2	15.0	45.4	11.8	9.8	11.8	

Table 4.12: Discharge Destination and State Transition Rates by Occupational Therapy Intensity Quintile, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	No Therapy	11.3	2.1	0.9	50.6	16.8	6.4	11.9	<.0001
	1st Quintile	7.4	1.4	0.9	64.4	10.0	5.9	9.9	
	2nd Quintile	6.8	1.3	0.8	69.7	8.8	6.0	6.6	
	3rd Quintile	6.3	0.8	0.6	75.2	6.3	6.4	4.3	
	4th Quintile	6.0	1.0	0.6	78.2	4.6	6.0	3.7	
	5th Quintile	6.6	0.6	0.4	79.2	3.6	6.5	3.0	
ADL-H 3-4	No Therapy	2.7	15.3	3.4	31.2	17.8	8.1	21.5	<.0001
	1st Quintile	2.4	14.3	3.4	40.1	13.7	8.8	17.3	
	2nd Quintile	2.8	13.0	2.6	48.3	11.5	9.2	12.5	
	3rd Quintile	3.6	12.2	2.3	52.5	9.9	8.8	10.7	
	4th Quintile	3.9	10.0	2.1	57.5	9.0	9.3	8.2	
	5th Quintile	4.5	12.7	2.1	57.2	6.6	10.4	6.5	
ADL-H 5-6	No Therapy	1.0	1.9	13.3	13.7	12.3	5.2	52.6	<.0001
	1st Quintile	1.3	2.5	17.1	19.8	11.7	7.8	39.8	
	2nd Quintile	1.5	3.4	18.1	24.3	11.6	8.9	32.2	
	3rd Quintile	1.5	4.0	19.8	29.3	10.4	10.4	24.6	
	4th Quintile	2.3	3.7	16.6	37.4	9.3	10.2	20.4	
	5th Quintile	2.0	5.0	18.6	37.4	9.0	9.5	18.4	

Multistate Transition Model

Table 4.13 presents the Type III Chi-square values and associated *P-values* for the complete list of variables included in the multistate transition model predicting state transitions following admission to CCC. Covariates were retained in the model if the effect was statistically significant for at least one state transition. Adjusted odds ratio estimates for effects in the model are presented across Table 4.14 to Table 4.18. Additional effects are also presented in Appendix C.1.3.

Table 4.13: Type III Chi-square Statistics for Variables in Multistate Transition Model

Initial State	ADL-H 0-2		ADL-H 3-4		ADL-H 5-6	
Variable	Wald Chi-Square	*P-Value*	Wald Chi-Square	*P-Value*	Wald Chi-Square	*P-Value*
Female	59.8	<.0001	47.0	<.0001	114.9	<.0001
Age Group	219.6	<.0001	173.1	<.0001	331.8	<.0001
Married	91.3	<.0001	102.6	<.0001	66.5	<.0001
Lived Alone Prior to Entry	10.5	0.1042	46.6	<.0001	61.6	<.0001
Support Person Positive Towards Discharge	330.2	<.0001	344.6	<.0001	875.3	<.0001
Desire to Return to Community	343.7	<.0001	284.7	<.0001	292.6	<.0001
Arthritis	15.4	0.0171	31.2	<.0001	40.8	<.0001
Cancer	442.9	<.0001	622.9	<.0001	1152.5	<.0001
Orthopedic Condition	53.9	<.0001	81.2	<.0001	124.8	<.0001
Spinal Cord Injury	5.1	0.5284	18.9	0.0044	73.6	<.0001
Other Medically Complex Condition	46.8	<.0001	74.0	<.0001	95.2	<.0001
Neurological Condition	31.9	<.0001	15.1	0.0195	67.4	<.0001
Traumatic Brain Injury	11.0	0.0893	23.3	0.0007	59.3	<.0001
Cardiac Condition	15.0	0.0203	27.9	<.0001	40.8	<.0001
Pulmonary Condition	11.8	0.0659	25.1	0.0003	13.1	0.0412
Stroke	15.3	0.0181	43.1	<.0001	89.5	<.0001
CHESS	485.5	<.0001	756.5	<.0001	1751.5	<.0001
Cognitive Performance Scale	327.5	<.0001	254.6	<.0001	173.8	<.0001
Pain Scale	75.5	<.0001	65.8	<.0001	193.0	<.0001
Depression Rating Scale	35.8	<.0001	40.9	<.0001	55.2	<.0001
Physical Therapy Intensity	327.0	<.0001	299.4	<.0001	385.8	<.0001
Occupational Therapy Intensity	134.8	<.0001	104.7	<.0001	95.9	<.0001
Rehabilitation Potential	95.5	<.0001	296.2	<.0001	330.1	<.0001
Uses Cane, Walker, or Crutch	54.2	<.0001	223.5	<.0001	383.7	<.0001
Uses Wheelchair	109.0	<.0001	63.0	<.0001	206.2	<.0001
Surgical Wounds	54.7	<.0001	62.4	<.0001	100.4	<.0001
Stage 2+ Pressure Ulcer	44.7	<.0001	75.2	<.0001	198.1	<.0001
Time Involved in Activities	53.2	<.0001	114.2	<.0001	241.3	<.0001
Rural Facility	23.6	0.0006	5.7	0.4594	5.1	0.5369
Facility Size	377.5	<.0001	410.2	<.0001	506.6	<.0001
LHIN	1075.0	<.0001	1291.7	<.0001	1251.8	<.0001

Among patients that began at the ADL-H 0-2 initial state, those with CHESS scores of 1-2 and 3+ had greater adjusted adjusted odds than patients with a CHESS score of 0 to worsen to the ADL-H 5-6 state and be discharged to a residential long-term care facility. Compared to patients with a CHESS score of 0, those with a CHESS score of 3+ had lower adjusted odds of community discharge, but greater adjusted odds of hospital discharge. Among patients that began at the ADL-H 3-4 initials state, patients with CHESS score of 1-2 and 3+ had greater adjusted odds of dying and discharge to a residential long-term care facility and acute care hospital. Patients with a CHESS score of 3+ were more likely to improve and decline than patients with a CHESS score of 0. Finally, for patients in the ADL-H 5-6 state at admission, CHESS scores of 1-2 and 3+ were associated with greater adjusted odds of residential long-term care and hospital discharge. Only patients with a CHESS score of 3+ were more likely to die and be discharged to the community. The adjusted odds of experiencing all other state transitions were not statistically significant when stratified by admission CHESS score (Table 4.14).

Across all three initial states, patients with CPS scores of 2-3 and 4-6 had lower adjusted odds of discharge to the community and to acute care hospitals than patients with a CPS score of 0-1. A similar effect was also observed for the adjusted odds of discharge to residential long-term care, except patients that began in the ADL-H 5-6 state with a CPS score of 2-3 were not more likely to be discharged to residential long-term care compared to the reference group. Across all three initial states, nearly all patients with moderate (CPS 2-3) and severe (CPS 4-6) cognitive impairment were more likely to have died prior to follow-up. However, this effect was not significant for patients in the ADL-H 5-6 initial state with a CPS score of 4-6. Among patients that were not discharged that had the potential to improve to a less impaired functional state, severe cognitive impairment was associated with lower adjusted odds of functional impairment. In the case of patients with that began at ADL-H 3-4, moderate cognitive impairment was also associated with lower adjusted odds of functional improvement (Table 4.15).

Across all three initial states, when either the patient or the care provider believed that patient had some capacity to regain some ADL function, the adjusted odds of discharge to a residential long-term care facility were lower than if neither party believed the person had rehabilitation potential. Among patients that began in the ADL-H 3-4 state, the adjusted odds of discharge to the community and the adjusted odds of functional improvement were only significantly greater when both the patient and the provider believed the patient had rehabilitation potential. For patients that began in the ADL 5-6 state, rehabilitation potential from either the provider or the provider and the patient's perspective was associated with greater adjusted odds of functional improvement. Finally, when both parties believed that person had rehabilitation potential the patient was more likely to be discharged to hospital, but less likely to die (Table 4.16).

Among patients in the ADL-H 0-2 initial state, compared to patients that did not receive any physical therapy, those that received physical therapy at the second to fifth quintile intensity were more likely to be discharged to the community and to an acute care hospital. Patients that received physical therapy at the first, second, and fourth quintile intensity were less likely to be discharged to residential long-term care. Patients that received physical therapy at the first and fifth therapy intensity quintile were less likely to have died within 105 days of admission. Among patients in the ADL-H 3-4 initial state, any amount of physical therapy was associated with a lower adjusted odds of discharge to a residential long-term care facility. Patients that received physical therapy at second to fifth therapy intensity quintile had greater adjusted odds of discharge to the community and hospital. Patients that received physical therapy at the second, third, and fifth intensity quintile were more likely to die. Except for patients that received physical therapy at the third intensity quintile, physical therapy was not associated with functional improvement or decline among patients remaining in hospital for 105 days or longer. Among patients that began in the ADL-H 5-6 state, provision of any amount of physical therapy was associated with lower adjusted odds of discharge to residential long-term care. Patients that received physical therapy at the third to fifth intensity quintile had greater adjusted odds of discharge to the community. For patients that remained in the CCC hospital at follow-up, provision of physical therapy at the second to fifth intensity was associated with greater likely of functional improvement to the ADL-H 0-2 state. Patients that received physical at the third and fourth intensity quintiles were more likely to improve to the ADL-H 3-4 state at follow-up (Table 4.17).

Among patients in the ADL-H 0-2 initial state, provision of any amount of occupational therapy was associated with greater adjusted odds of community discharge, but few other transitions.

Patients that received occupational therapy at the first intensity quintile were more likely to be discharged to residential long-term care, and those that received physical therapy at the fifth intensity quintile were less likely to die. Among patients that began in the ADL-H 3-4 initial state, provision of occupational therapy at the second to fourth therapy intensity quintile was also associated with greater adjusted odds of discharge to the community. Again, patients that received occupational therapy at the fifth therapy intensity quintile were less likely to die. Finally, patients in the ADL-H 5-6 initial state that received any amount of occupational therapy were less likely to die, but they did not have the same increased adjusted odds of discharged to the community as the previous states. In fact, the adjusted odds of discharge to the community decreased with greater occupational therapy intensity. Those that received occupational therapy at the fifth quintile intensity were less likely to be discharged to residential long-term care, and those were provided therapy at the third and fourth intensity quintile had lower adjusted odds of discharge to the community (Table 4.18).

Table 4.14: Adjusted Odds of State Transitions Within Complex Continuing Care by Changes in Health, End-Stage Disease, Signs, and Symptoms Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	CHESS 1-2 vs. 0		1.05	2.91*	0.94	2.17*	1.14	1.09
			(0.77-1.44)	(1.71-4.94)	(0.82-1.07)	(1.72-2.73)	(0.95-1.37)	(0.93-1.29)
	CHESS 3+ vs. 0		1.26	3.31*	0.77*	6.57*	1.51*	1.11
			(0.84-1.91)	(1.79-6.13)	(0.64-0.92)	(5.04-8.57)	(1.18-1.93)	(0.88-1.39)
ADL-H 3-4	CHESS 1-2 vs. 0	1.08		1.30	1.05	2.67*	1.42*	1.31*
		(0.86-1.36)		(0.99-1.71)	(0.93-1.19)	(2.09-3.40)	(1.20-1.69)	(1.10-1.55)
	CHESS 3+ vs. 0	1.34*		2.01*	1.16	10.73*	1.93*	1.52*
		(1.00-1.78)		(1.48-2.72)	(0.99-1.36)	(8.34-13.80)	(1.57-2.37)	(1.24-1.85)
ADL-H 5-6	CHESS 1-2 vs. 0	0.96	1.08		1.01	2.70*	1.27*	1.12
		(0.71-1.28)	(0.87-1.34)		(0.90-1.15)	(2.26-3.23)	(1.09-1.48)	(0.96-1.31)
	CHESS 3+ vs. 0	0.97	1.23		1.25*	11.83*	1.60*	1.39*
		(0.69-1.35)	(0.96-1.56)		(1.09-1.43)	(9.90-14.15)	(1.34-1.89)	(1.19-1.64)

* $P < 0.05$

Table 4.15: Adjusted Odds of State Transitions Within Complex Continuing Care by Cognitive Performance Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	CPS 2-3 vs. 0-1		1.17	1.17	0.63*	0.67*	0.65*	1.51*
			(0.87-1.57)	(0.80-1.70)	(0.56-0.71)	(0.57-0.80)	(0.55-0.77)	(1.30-1.77)
	CPS 4-6 vs. 0-1		1.36	1.12	0.47*	0.59*	0.56*	1.65*
			(0.88-2.10)	(0.61-2.04)	(0.38-0.58)	(0.44-0.80)	(0.41-0.78)	(1.28-2.12)
ADL-H 3-4	CPS 2-3 vs. 0-1	0.76*		0.91	0.66*	0.70*	0.63*	1.28*
		(0.63-0.92)		(0.73-1.14)	(0.60-0.74)	(0.61-0.81)	(0.55-0.73)	(1.11-1.47)
	CPS 4-6 vs. 0-1	0.54*		0.95	0.50*	0.48*	0.42*	1.16
		(0.39-0.75)		(0.71-1.26)	(0.42-0.58)	(0.40-0.59)	(0.33-0.52)	(0.96-1.41)
ADL-H 5-6	CPS 2-3 vs. 0-1	0.82	0.96		0.69*	1.00	0.84*	1.15*
		(0.65-1.03)	(0.80-1.15)		(0.63-0.77)	(0.90-1.11)	(0.74-0.95)	(1.02-1.30)
	CPS 4-6 vs. 0-1	0.38*	0.65*		0.64*	0.86*	0.72*	1.11
		(0.27-0.55)	(0.52-0.81)		(0.57-0.72)	(0.76-0.96)	(0.62-0.83)	(0.97-1.28)

* $P < 0.05$

Table 4.16: Adjusted Odds of State Transitions Within Complex Continuing Care by Subjective Appraisal of Rehabilitation Potential, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	Patient vs. Neither		0.66	1.06	0.98	0.71*	0.90	1.07
			(0.41-1.06)	(0.63-1.77)	(0.81-1.19)	(0.54-0.93)	(0.69-1.18)	(0.85-1.35)
	Provider vs. Neither		1.02	0.78	0.96	0.73*	1.29	1.04
			(0.66-1.58)	(0.41-1.48)	(0.78-1.19)	(0.54-0.99)	(0.97-1.71)	(0.81-1.35)
	Both vs. Neither		0.54*	0.42*	1.12	0.64*	1.05	0.97
			(0.38-0.76)	(0.26-0.67)	(0.97-1.28)	(0.52-0.78)	(0.87-1.27)	(0.81-1.15)
ADL-H 3-4	Patient vs. Neither	0.88		0.59*	0.90	0.75*	0.94	0.85
		(0.61-1.28)		(0.41-0.86)	(0.75-1.08)	(0.60-0.94)	(0.74-1.19)	(0.68-1.06)
	Provider vs. Neither	1.22		0.78	1.08	0.50*	1.07	0.88
		(0.91-1.63)		(0.59-1.04)	(0.93-1.26)	(0.41-0.62)	(0.88-1.31)	(0.73-1.05)
	Both vs. Neither	1.53*		0.55*	1.43*	0.51*	1.10	0.86
		(1.21-1.94)		(0.42-0.72)	(1.26-1.62)	(0.43-0.60)	(0.93-1.29)	(0.73-1.00)
ADL-H 5-6	Patient vs. Neither	1.44	1.21		1.03	0.79*	0.86	0.94
		(0.94-2.19)	(0.88-1.67)		(0.86-1.25)	(0.65-0.96)	(0.68-1.10)	(0.76-1.18)
	Provider vs. Neither	1.37*	1.46*		1.17*	0.50*	1.05	0.94
		(1.00-1.87)	(1.18-1.82)		(1.03-1.34)	(0.43-0.59)	(0.89-1.24)	(0.80-1.09)
	Both vs. Neither	1.88*	1.51*		1.55*	0.65*	1.23*	0.84*
		(1.42-2.49)	(1.22-1.87)		(1.37-1.75)	(0.56-0.76)	(1.05-1.44)	(0.72-0.98)

* $P < 0.05$

Table 4.17: Adjusted Odds of State Transitions within Complex Continuing Care by Physical Therapy Intensity Quintile, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	1st Quintile vs. No Therapy		1.18	0.57*	1.05	0.74*	1.07	0.76*
			(0.81-1.74)	(0.33-0.98)	(0.87-1.26)	(0.59-0.94)	(0.82-1.39)	(0.61-0.94)
	2nd Quintile vs. No Therapy		1.26	1.03	1.69*	0.64*	1.38*	0.96
			(0.78-2.04)	(0.56-1.88)	(1.36-2.09)	(0.47-0.86)	(1.02-1.87)	(0.74-1.25)
	3rd Quintile vs. No Therapy		1.06	1.36	2.02*	0.84	1.75*	0.98
			(0.64-1.76)	(0.75-2.47)	(1.64-2.50)	(0.62-1.12)	(1.30-2.34)	(0.76-1.27)
	4th Quintile vs. No Therapy		0.78	0.68	2.39*	0.73*	1.76*	0.86
			(0.46-1.35)	(0.34-1.37)	(1.94-2.96)	(0.53-0.99)	(1.31-2.36)	(0.66-1.12)
	5th Quintile vs. No Therapy		0.80	0.42	2.20*	0.81	1.83*	0.73*
			(0.44-1.46)	(0.18-1.03)	(1.76-2.75)	(0.58-1.13)	(1.35-2.48)	(0.54-0.97)
ADL-H 3-4	1st Quintile vs. No Therapy	0.92		1.27	1.19	0.77*	1.08	1.10
		(0.64-1.32)		(0.94-1.72)	(0.98-1.43)	(0.63-0.93)	(0.86-1.37)	(0.90-1.36)
	2nd Quintile vs. No Therapy	1.31		1.23	1.68*	0.60*	1.39*	1.30*
		(0.90-1.92)		(0.85-1.76)	(1.38-2.06)	(0.48-0.76)	(1.08-1.80)	(1.03-1.64)
	3rd Quintile vs. No Therapy	1.64*		1.33	1.90*	0.68*	1.32*	1.30*
		(1.14-2.36)		(0.93-1.91)	(1.56-2.33)	(0.54-0.85)	(1.03-1.71)	(1.03-1.64)
	4th Quintile vs. No Therapy	1.30		1.29	2.24*	0.61*	1.46*	1.03
		(0.89-1.90)		(0.88-1.90)	(1.83-2.75)	(0.48-0.78)	(1.13-1.90)	(0.81-1.31)
	5th Quintile vs. No Therapy	1.22		1.33	2.07*	0.54*	1.36*	1.32*
		(0.83-1.80)		(0.88-2.00)	(1.68-2.55)	(0.41-0.70)	(1.04-1.78)	(1.03-1.68)
ADL-H 5-6	1st Quintile vs. No Therapy	1.33	0.95		1.00	0.67*	1.05	1.14
		(0.93-1.90)	(0.75-1.22)		(0.88-1.15)	(0.60-0.75)	(0.90-1.23)	(1.00-1.31)
	2nd Quintile vs. No Therapy	1.58*	1.18		1.09	0.60*	1.00	0.94
		(1.05-2.37)	(0.89-1.56)		(0.93-1.28)	(0.51-0.69)	(0.82-1.21)	(0.78-1.12)
	3rd Quintile vs. No Therapy	1.61*	1.39*		1.20*	0.49*	1.06	0.99
		(1.06-2.43)	(1.05-1.85)		(1.02-1.41)	(0.42-0.58)	(0.87-1.29)	(0.83-1.19)
	4th Quintile vs. No Therapy	2.31*	1.69*		1.68*	0.50*	1.33*	1.03
		(1.51-3.54)	(1.25-2.29)		(1.41-2.01)	(0.42-0.61)	(1.07-1.65)	(0.84-1.26)
	5th Quintile vs. No Therapy	1.60*	1.33		1.67*	0.44*	1.30*	1.20
		(1.00-2.56)	(0.96-1.84)		(1.38-2.01)	(0.36-0.54)	(1.03-1.64)	(0.96-1.50)

* $P < 0.05$

Table 4.18: Adjusted Odds of State Transitions Within Complex Continuing Care by Occupational Therapy Intensity, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	1st Quintile vs. No Therapy		0.96	1.56	1.50*	1.32*	1.10	1.25
			(0.63-1.47)	(0.89-2.73)	(1.24-1.81)	(1.03-1.70)	(0.85-1.42)	(0.99-1.57)
	2nd Quintile vs. No Therapy		0.92	1.68	1.55*	1.03	1.08	1.21
			(0.59-1.41)	(0.96-2.95)	(1.28-1.88)	(0.79-1.34)	(0.83-1.40)	(0.95-1.53)
	3rd Quintile vs. No Therapy		0.70	1.36	1.57*	0.85	1.08	1.01
			(0.43-1.15)	(0.73-2.51)	(1.29-1.91)	(0.64-1.14)	(0.83-1.41)	(0.79-1.30)
	4th Quintile vs. No Therapy		1.01	1.43	1.71*	0.89	1.09	0.95
			(0.63-1.62)	(0.75-2.73)	(1.40-2.08)	(0.66-1.20)	(0.84-1.43)	(0.73-1.24)
	5th Quintile vs. No Therapy		0.60	1.20	1.38*	0.74	0.97	0.67*
			(0.33-1.08)	(0.57-2.55)	(1.12-1.70)	(0.53-1.03)	(0.73-1.28)	(0.50-0.90)
ADL-H 3-4	1st Quintile vs. No Therapy	0.88		0.93	1.18	1.09	1.02	1.05
		(0.63-1.23)		(0.69-1.25)	(1.00-1.40)	(0.89-1.32)	(0.82-1.26)	(0.86-1.27)
	2nd Quintile vs. No Therapy	0.93		0.80	1.34*	1.00	1.04	0.94
		(0.67-1.29)		(0.58-1.11)	(1.13-1.59)	(0.81-1.24)	(0.84-1.29)	(0.76-1.15)
	3rd Quintile vs. No Therapy	1.12		0.87	1.48*	1.16	1.02	1.01
		(0.82-1.54)		(0.62-1.22)	(1.25-1.75)	(0.94-1.45)	(0.81-1.27)	(0.82-1.24)
	4th Quintile vs. No Therapy	1.27		1.00	1.64*	1.12	1.15	1.12
		(0.92-1.74)		(0.70-1.41)	(1.38-1.96)	(0.88-1.41)	(0.92-1.45)	(0.90-1.40)
	5th Quintile vs. No Therapy	1.13		0.80	1.16	0.80	1.01	0.68*
		(0.82-1.55)		(0.56-1.14)	(0.97-1.38)	(0.62-1.02)	(0.80-1.27)	(0.54-0.86)
ADL-H 5-6	1st Quintile vs. No Therapy	0.85	0.80		0.89	1.00	1.02	0.80*
		(0.61-1.18)	(0.63-1.03)		(0.78-1.02)	(0.88-1.12)	(0.87-1.21)	(0.69-0.92)
	2nd Quintile vs. No Therapy	0.87	0.92		0.96	0.91	1.04	0.73*
		(0.62-1.23)	(0.72-1.18)		(0.83-1.10)	(0.79-1.04)	(0.88-1.23)	(0.62-0.85)
	3rd Quintile vs. No Therapy	0.64*	0.83		0.84*	0.89	1.03	0.61*
		(0.44-0.93)	(0.64-1.07)		(0.73-0.97)	(0.77-1.03)	(0.86-1.23)	(0.52-0.73)
	4th Quintile vs. No Therapy	0.98	0.78		0.99	0.97	1.06	0.59*
		(0.68-1.40)	(0.58-1.03)		(0.85-1.16)	(0.82-1.15)	(0.87-1.29)	(0.49-0.72)
	5th Quintile vs. No Therapy	0.86	0.98		0.79*	0.82*	0.90	0.55*
		(0.58-1.27)	(0.74-1.30)		(0.67-0.94)	(0.68-0.99)	(0.73-1.12)	(0.44-0.68)

* $P < 0.05$

4.4.2 Phase 2: Multistate Transitions Following Community Discharge from Complex Continuing Care

Sample Description

The clinical characteristics of the sample used in Phase 2 of this study are presented in Appendix C.2.1. These statistics are based on the first available RAI-HC assessment. More than two-thirds of the overall sample were 75 years and older, 61% were female, and 44% were married (Table C.25). The most commonly represented diagnosis groups included cardiac conditions, orthopedic conditions, arthritis, and stroke (Table C.26). While in CCC, 59% of the sample required at least extensive assistance to complete ADLs, 24% had moderate or worse cognitive impairment, and 19% had moderate or worse medical instability. Daily pain was experienced by 41% of the sample and 16% showed signs and symptoms of depression. Based on subjective appraisal, approximately 69% of the sample were thought to have some rehabilitation potential (Table C.27). Upon admission to home care, 27% of the sample required at least extensive assistance to complete ADLs, 10% had moderate or worse cognitive impairment, 21% had moderate or worse medical instability, and 61% had daily pain (Table C.28). Thirty-percent of the sample received at least one physical therapy visit in home care and 44% received at least one occupational therapy visit in home care (Table C.29). The time thresholds by provider that correspond to each therapy intensity quintile while the patient was in CCC are presented in Table 4.19.

Table 4.19: Therapy Intensity Quintiles Time Thresholds, Ontario Complex Continuing Care, 2010 - 2014, n = 12,824

Quintile	Physical Therapy	Occupational Therapy	SLP Therapy
1st Quintile	1-80 minutes	1-50 minutes	1-30 minutes
2nd Quintile	81-115 minutes	51-85 minutes	31-45 minutes
3rd Quintile	116-150 minutes	86-120 minutes	46-68 minutes
4th Quintile	151-200 minutes	121-175 minutes	69-120 minutes
5th Quintile	201+ minutes	176+ minutes	121+ minutes

Transition Rates After Discharge to Home Care from Complex Continuing Care

Markov chain transition rates within home care are presented in Table 4.20 for patients that were discharged from CCC. Compared to patients that began in the ADL-H 0-1 initial state, a greater percentage of patients in the ADL-H 2+ initial state had a subsequent transition to a residential long-term care facility, hospital or death state. More than two-thirds of patients that began in the ADL-H 0-1 initial state remained at that state at follow-up. Comparatively, a greater percentage of patients that began at the ADL-H 2+ state remained at the state at follow-up.

Table 4.20: Subsequent State Transition Rates After Discharge to the Community from Complex Continuing Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

Initial State	Next State						*P-value*
	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	
ADL-H 0-1	34.9	6.4	2.0	12.1	4.8	39.9	<0.0001
ADL-H 2+	6.0	46.6	7.8	13.2	7.5	19.0	

[1] Home care services discontinued

Across both initial states, female CCC patients that were discharged to community were slightly more likely to experience state transitions that resulted in admission to a residential long-term care facility and less likely to be readmitted to hospital or die. For both initial states, a lower percentage of married patients were admitted to residential long-term care facilities after community discharge. Most other transition rates were negligibly different when stratified by marital status. There was no difference in state transition rates for individuals in the ADL-H 0-1 initial state when stratified by the presence of a support person that was positive towards CCC discharge. However, patients that began in the ADL-H 2+ group that had a support person that is positive towards discharged were more likely to progress to a less impaired functional state and were less likely to be admitted to a residential long-term care facility and die (Table 4.21). For patients that began in the ADL-H 0-1 initial state, the percentage of patients that remained at their initial state increased with age; however, patients that were aged 85+ were also most likely to progress to the more functional impaired state. The percentage of patients in this initial state that transitioned to residential long-term care and death states generally increased with age. Among patients in the

ADL-H 2+ initial state, the percentage of patients that transitioned to a less impaired functional state, residential long-term care facility, hospital, and death state increased with age (Table 4.22).

Table 4.21: State Transition Rates After Community Discharge by Demographic Variables, Ontario Home Care Clients, 2010 - 2014, n = 12,824

			Next State						
Variable	Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+(%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
Female	ADL-H 0-1	No	32.0	7.0	1.4	14.2	6.2	39.2	<.0001
		Yes	36.6	6.0	2.3	10.9	4.0	40.2	
	ADL-H 2+	No	6.2	46.5	6.6	14.0	8.7	18.0	0.0005
		Yes	5.9	46.6	8.6	12.6	6.6	19.7	
Married	ADL-H 0-1	No	35.3	5.9	2.3	12.1	4.5	39.9	0.0438
		Yes	34.3	7.2	1.5	12.1	5.2	39.7	
	ADL-H 2+	No	5.6	44.0	9.9	13.8	8.1	18.6	<.0001
		Yes	6.3	48.9	5.8	12.7	6.9	19.4	
Support Person Positive Towards Discharge	ADL-H 0-1	No	36.8	5.5	2.7	14.5	4.8	35.7	0.1158
		Yes	34.2	6.3	1.9	12.3	4.8	40.5	
	ADL-H 2+	No	4.5	45.8	11.8	12.3	8.1	17.4	0.0013
		Yes	6.8	45.3	7.5	13.7	7.5	19.1	

[1] Home care services discontinued

Table 4.23 presents state transition rates for patients that began in the ADL-H 0-1 initial state. Patients with cancer, cardiac conditions, neurological conditions, and pulmonary conditions were more likely to be discharged to residential long-term care facilities than patients that were not in these diagnosis groups. Patients with cancer, cardiac conditions, other medically complex conditions, and pulmonary conditions were more likely to transition to the hospital and death states than patients without these conditions. Among patients that did not experience one of these absorbing state transitions, a greater percentage of patients with cancer, cardiac conditions, neurological conditions, orthopedic conditions, other medically complex conditions, pulmonary conditions, and stroke transitioned to the more functionally impaired state than patients without these conditions.

State transition rates for patients than began in the ADL-H 2+ initial state are presented in Table 4.24. Patients with orthopedic conditions were more likely to transition to the residential long-term care state than patients without orthopedic conditions. Patients with cancer, cardiac conditions, neurological conditions, other medically complex conditions and pulmonary conditions

Table 4.22: Discharge Destination and State Transition Rates by Age Group, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
ADL-H 0-1	Age 0-64	32.2	5.0	1.0	12.1	3.1	46.7	<.0001
	Age 65-74	33.1	5.8	0.8	14.3	4.3	41.6	
	Age 75-84	35.0	5.5	1.9	12.1	4.7	40.8	
	Age 85+	36.8	8.3	3.1	10.9	5.7	35.2	
ADL-H 2+	Age 0-64	5.8	54.7	3.2	12.4	4.4	19.5	<.0001
	Age 65-74	5.6	49.8	5.1	12.3	5.7	21.5	
	Age 75-84	6.2	46.1	8.1	13.5	7.0	19.1	
	Age 85+	6.1	41.4	11.1	13.8	10.5	17.2	

[1] Home care services discontinued

were more likely to transition to the hospital state than patients without these conditions. Patients in the cancer, cardiac conditions, other medically complex conditions, and pulmonary conditions diagnosis groups were also more likely to transition to the death state than patients that were not in these groups. Finally, a greater percentage of patients with orthopedic conditions, other medically complex conditions, and pulmonary conditions transitioned to the less functionally impaired state than patients without these conditions.

Across both initial states, the percentage of state transitions that ended in admission to a residential long-term care facility, acute care hospital, and death increased with severity of medical instability, as measured by CHESS. Conversely, the percentage of state transitions that ended in the home care discontinued state decreased with the severity of medical instability. Although the percentage of patients that remained in their initial state at follow-up did not differ substantially for patients that began in the ADL-H 0-1 state, the percentage of patients that remained in the ADL-H 2+ state decreased with the severity of medical instability (Table 4.25). When stratified by CPS score, the percentage of patients that transitioned to residential long-term care from either initial state increased with severity of cognitive impairment. For patients in the ADL-H 0-1 initial state, the percentage of patients that transitioned to a more impaired functional state or acute care hospital increased with level of cognitive impairment. These trends did not persist for patients that began in the ADL-H 2+ state (Table 4.26).

Table 4.23: State Transition Rates After Community Discharge by Diagnosis Group for Patients with ADL-Hierarchy Scale 0-1 Initial State, Ontario Home Care Clients, 2010 - 2014, n = 6,398

Disease		Next State ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
Amputation	No	35.0	6.3	2.0	12.2	4.7	39.8	0.6287
	Yes	33.5	8.5	1.8	8.5	5.5	42.1	
Arthritis	No	34.4	6.2	2.1	11.7	4.9	40.7	0.2592
	Yes	36.1	6.7	1.8	12.9	4.5	37.9	
Cancer	No	35.4	6.2	1.9	11.5	4.3	40.7	<.0001
	Yes	31.8	7.6	2.3	16.0	7.8	34.4	
Cardiac Conditions	No	36.0	6.2	1.8	10.1	3.6	42.3	<.0001
	Yes	33.7	6.6	2.1	14.3	6.0	37.2	
Neurological Conditions	No	34.9	6.1	1.9	12.1	4.8	40.2	0.0308
	Yes	35.4	9.8	2.7	12.1	4.3	35.6	
Orthopedic Conditions	No	34.8	6.2	2.0	13.4	5.4	38.2	<.0001
	Yes	35.2	6.7	1.9	9.4	3.4	43.3	
Other Medically Complex Conditions	No	35.5	6.2	2.0	11.1	4.4	40.8	<.0001
	Yes	31.8	7.7	1.7	17.2	6.8	34.8	
Pulmonary Conditions	No	35.8	6.1	2.0	11.0	4.1	41.0	<.0001
	Yes	31.6	7.3	2.1	16.1	7.4	35.5	
Spinal Cord Injury	No	35.0	6.4	2.0	12.1	4.7	39.8	0.4408
	Yes	24.2	12.1	0.0	12.1	9.1	42.4	
Stroke	No	34.5	6.0	2.1	12.3	4.9	40.2	0.0306
	Yes	37.0	8.0	1.6	10.9	4.1	38.4	
Traumatic Brain Injury	No	35.0	6.4	2.0	12.1	4.8	39.8	0.6837
	Yes	26.7	6.7	1.3	13.3	4.0	48.0	

[1] Home care services discontinued

For patients in the ADL-H 0-1 state, physical therapy intensity in CCC was not associated with differential state transitions after discharge to the community. Patients that began in the ADL-H 2+ state were less likely to transition to the death state as the intensity of physical therapy increased in CCC. Patients that did not receive any physical therapy were the most likely to transition to the residential long-term care facility and hospital states (Table 4.27). Similarly, state transition rates for patients in the ADL-H 0-1 initial state did not differ by the intensity of occupational therapy received in CCC. Patients in the ADL-H 2+ state that did not receive any occupational therapy were least likely to remain at their initial state and most likely to transition to the death state (Table 4.28). Across both initial states, although provision of physical and

Table 4.24: State Transition Rates After Community Discharge by Diagnosis Group for Patients with ADL-Hierarchy Scale 2+ Initial State, Ontario Home Care Clients, 2010 - 2014, n = 6,426

		Next State						
Disease		ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
Amputation	No	6.0	46.7	7.8	13.2	7.3	19.0	0.1813
	Yes	4.7	42.6	6.3	14.2	12.1	20.0	
Arthritis	No	5.7	47.7	7.5	12.9	7.4	18.8	0.0751
	Yes	6.7	43.6	8.5	14.0	7.7	19.4	
Cancer	No	6.1	47.2	7.8	12.8	6.7	19.4	<.0001
	Yes	5.1	42.4	7.6	16.2	12.5	16.2	
Cardiac Conditions	No	6.0	47.2	8.1	11.8	6.1	20.8	<.0001
	Yes	6.0	45.8	7.4	14.7	9.0	17.0	
Neurological Conditions	No	6.3	45.5	7.8	13.2	7.8	19.4	<.0001
	Yes	4.1	53.1	7.5	13.7	5.2	16.4	
Orthopedic Conditions	No	5.6	47.2	7.3	13.7	7.5	18.7	0.0109
	Yes	7.1	44.6	9.1	12.0	7.4	19.8	
Other Medically Complex Conditions	No	5.7	47.4	8.0	12.7	6.5	19.7	<.0001
	Yes	7.3	42.0	6.6	16.1	12.9	15.1	
Pulmonary Conditions	No	5.6	47.6	8.0	12.6	6.9	19.4	<.0001
	Yes	7.8	41.7	6.8	16.5	10.3	17.0	
Spinal Cord Injury	No	6.1	46.3	7.9	13.2	7.5	19.0	0.0070
	Yes	1.3	57.3	2.5	12.7	6.4	19.7	
Stroke	No	6.7	43.3	8.4	14.3	8.4	18.9	<.0001
	Yes	4.6	52.7	6.5	11.3	5.7	19.1	
Traumatic Brain Injury	No	6.0	46.5	7.8	13.3	7.5	18.8	0.1204
	Yes	3.4	48.3	6.0	10.3	4.3	27.6	

[1] Home care services discontinued

occupational in home care was associated with significantly different rates of transition to next states, these differences were negligible and were mainly isolated to the transitions to the home care discontinued state (Table 4.29). Bivariate state transition rates for the remainder of candidate variables that were considered in this phase of the study are presented in Appendix C.2.2.

Table 4.25: Subsequent State Transition Rates After Discharge to the Community from Complex Continuing Care by the Changes in Health, End-Stage Disease, Signs, and Symptoms Scale in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State						
Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
ADL-H 0-1	CHESS 0	35.3	5.4	0.9	8.9	3.5	45.9	<.0001
	CHESS 1-2	35.0	6.5	2.0	11.8	4.7	40.0	
	CHESS 3+	33.8	7.1	3.3	18.1	7.0	30.6	
ADL-H 2+	CHESS 0	5.1	55.6	4.5	9.8	4.3	20.7	<.0001
	CHESS 1-2	6.3	47.5	7.7	12.7	6.0	19.9	
	CHESS 3+	5.9	37.0	10.5	17.3	14.1	15.1	

[1] Home care services discontinued

Table 4.26: Subsequent State Transition Rates After Discharge to the Community from Complex Continuing Care by the Cognitive Performance Scale in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State						
Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
ADL-H 0-1	CPS 0	31.1	5.1	0.6	10.6	4.5	48.1	<.0001
	CPS 1	38.8	6.7	1.0	11.9	5.2	36.4	
	CPS 2+	37.1	7.8	4.3	14.0	4.9	31.9	
ADL-H 2+	CPS 0	8.1	43.5	3.4	12.5	7.7	24.9	<.0001
	CPS 1	8.1	44.1	5.9	15.0	7.8	19.1	
	CPS 2+	4.6	48.5	10.0	13.0	7.3	16.7	

[1] Home care services discontinued

Table 4.27: State Transition Rates After Community Discharge by Physical Therapy Intensity in Complex Continuing Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State						
Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
ADL-H 0-1	No Therapy	36.0	6.1	2.1	13.5	6.3	36.0	0.0682
	1st Quintile	35.4	6.6	2.5	11.8	5.7	38.0	
	2nd Quintile	35.4	6.1	1.6	14.2	4.8	37.9	
	3rd Quintile	35.5	6.9	2.6	10.8	4.8	39.5	
	4th Quintile	33.1	6.7	1.5	12.3	4.7	41.7	
	5th Quintile	34.6	5.7	1.5	11.3	3.4	43.4	
ADL-H 2+	No Therapy	6.1	39.1	10.2	15.4	11.3	17.9	0.0055
	1st Quintile	5.2	47.2	7.9	14.2	8.6	16.8	
	2nd Quintile	5.8	47.7	6.9	13.9	6.9	18.7	
	3rd Quintile	5.9	44.8	7.8	12.9	7.7	20.8	
	4th Quintile	6.6	48.1	8.6	11.9	6.8	18.0	
	5th Quintile	6.6	47.5	6.7	12.1	5.6	21.3	

[1] Home care services discontinued

Table 4.28: State Transition Rates After Community Discharge by Occupational Therapy Intensity in Complex Continuing Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State						
Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
ADL-H 0-1	No Therapy	35.4	7.0	2.6	12.1	5.4	37.4	0.3828
	1st Quintile	35.1	6.0	2.6	11.3	5.1	39.9	
	2nd Quintile	35.0	6.1	1.2	12.7	5.6	39.4	
	3rd Quintile	35.4	6.1	2.1	11.7	4.4	40.4	
	4th Quintile	36.0	6.9	1.4	11.7	4.3	39.6	
	5th Quintile	32.6	6.3	1.8	13.0	3.6	42.7	
ADL-H 2+	No Therapy	6.0	40.7	8.1	14.2	10.6	20.3	<.0001
	1st Quintile	4.5	43.9	8.8	15.1	7.8	19.8	
	2nd Quintile	5.7	44.8	8.4	14.0	7.8	19.2	
	3rd Quintile	6.7	51.0	6.7	12.1	6.2	17.5	
	4th Quintile	7.0	49.0	7.1	13.8	6.5	16.6	
	5th Quintile	6.3	49.7	7.4	10.4	6.0	20.3	

[1] Home care services discontinued

Table 4.29: State Transition Rates within Community Care by Therapy Receipt in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

			Next State						
Variable	Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+(%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
Physical Therapy	ADL-H 0-1	No	35.7	6.9	2.2	12.4	4.7	38.1	<.0001
		Yes	32.3	4.8	1.4	10.9	5.0	45.5	
	ADL-H 2+	No	5.5	47.1	8.0	12.7	7.9	18.9	0.0049
		Yes	7.4	45.1	7.2	14.6	6.4	19.3	
Occupational Therapy	ADL-H 0-1	No	36.8	6.5	2.0	12.1	4.9	37.7	<.0001
		Yes	30.5	6.1	2.0	12.0	4.5	44.9	
	ADL-H 2+	No	6.5	47.3	6.7	12.6	7.7	19.1	0.0004
		Yes	5.2	45.5	9.3	14.1	7.1	18.8	

[1] Home care services discontinued

Markov Multistate Transition Model

Table 4.30 presents the Type III Chi-square values and associated *P-values* for the complete list of variables included in the Markov chain multistate transition model predicting state transitions following community discharge from CCC. As with Phase 1, covariates were retained in the model if they were statistically significant for at least one state transition. Adjusted odds ratio estimates for effects in the model are presented across Table 4.32) to Table 4.35). Additional effects are also presented in Appendix C.2.3.

Table 4.30: Type III Chi-square Statistics for Variables in Markov Chain Multistate Transition Model

Initial State	ADL-H 0-1		ADL-H 2+	
Variable	Wald Chi-Square	*P-Value*	Wald Chi-Square	*P-Value*
Female	24.6503	0.0002	21.0323	0.0008
Age Group	64.5099	<.0001	66.5097	<.0001
Married	8.3266	0.1391	29.7196	<.0001
Cancer	39.9339	<.0001	36.6192	<.0001
Orthopedic Condition	24.9329	0.0001	8.9879	0.1095
Other Medically Complex Condition	32.5774	<.0001	39.8021	<.0001
Neurological Condition	20.7726	0.0009	16.7877	0.0049
Cardiac Condition	29.4052	<.0001	29.7796	<.0001
Stroke	16.0039	0.0068	24.8667	0.0001
Physical Therapy Intensity in CCC	25.6316	0.4275	28.5787	0.2819
Occupational Therapy Intensity in CCC	23.7974	0.5311	31.8332	0.1629
Cognitive Performance Scale in Home Care	135.9132	<.0001	104.3347	<.0001
CHESS in Home Care	77.2517	<.0001	122.1248	<.0001
Pain Scale in Home Care	56.1122	<.0001	23.182	0.2799
Receipt of Physical Therapy in Home Care	11.3744	0.0444	11.5343	0.0418
Receipt of Occupational Therapy in Home Care	5.4773	0.3604	29.1432	<.0001
LHIN	188.9406	<.0001	362.0858	<.0001
Assessment Pair	153.1203	<.0001	119.7956	<.0001

Adjusted odds ratio estimates for the effect of cognitive impairment, as measured by CPS, on state transitions after discharge from CCC are presented in Table 4.31). Among patients in the ADL-H 0-1 initial state, those with a CPS score of 2+ were more than five times more likely to transition to residential long-term care than patients with a CPS score of 0. Patients with any level of cognitive impairment were less likely to the transition to the home care discontinued state. Patients that began in the ADL-H 2+ initial state were more likely to transition to residential long-term care state if they showed any signs of cognitive impairment. Patients with a CPS score of 2+ were less likely to transition to the less impaired functional state, death state, and home care discontinued state. No other state transitions were significant for this effect.

Table 4.31: Adjusted Odds of State Transitions After Community Discharge by Cognitive Performance Scale in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Initial State	Level	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[1]
ADL-H 0-1	CPS 1 vs. 0		0.99 (0.74-1.32)	1.37 (0.66-2.86)	0.88 (0.70-1.11)	0.89 (0.65-1.22)	0.66* (0.56-0.77)
	CPS 2+ vs. 0		1.15 (0.89-1.48)	5.76* (3.31-10.03)	1.12 (0.92-1.37)	0.88 (0.66-1.17)	0.62* (0.54-0.72)
ADL-H 2+	CPS 1 vs. 0	1.06 (0.78-1.45)		1.76* (1.19-2.61)	1.22 (0.95-1.56)	0.91 (0.66-1.25)	0.83 (0.67-1.02)
	CPS 2+ vs. 0	0.56* (0.43-0.74)		2.52* (1.82-3.49)	0.93 (0.76-1.15)	0.69* (0.53-0.89)	0.66* (0.56-0.79)

[1] Home care services discontinued
* $P < 0.05$

Among patients in the ADL-H 0-1 initial state, CHESS scores of 1-2 and 3+ were associated with a greater adjusted odds of admission to a residential long-term care facility and lower adjusted odds of discharge to the home care discontinued state. Patients with a CHESS score of 1-2 and 3+ that were in the ADL-H 2+ initial state were more likely to transition to a residential long-term care facility or acute care hospital. A CHESS score of 3+ was strongly associated with transition to the death state; however, this effect was not significant for patients with a CHESS score of 1-2. CHESS was not significantly associated with transitions within functional states (Table 4.32).

After adjusting for patient characteristics, rehabilitation service utilization in home care, and health region, the effect of physical therapy intensity when the person was in CCC was only significant for a limited set of state transitions (Table 4.33). Due to the large number of statistical tests that were performed as part of this phase of the study, and given that these results were not adjusted for multiple comparisons, significant findings may be the result of Type I error. Compared to patients that received physical therapy at the first intensity quintile within CCC, patients in the ADL-H 0-1 initial state had lower adjusted odds of transitioning to the death state if they received physical therapy in the fifth intensity quintile. Similarly, patients in the ADL-H 2+ initial state

Table 4.32: Adjusted Odds of State Transition After Community Discharge by Changes in Health, End-Stage Disease, Signs, and Symptoms Scale in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Initial State	Level	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[1]
ADL-H 0-1	CHESS 1-2 vs. 0		1.21 (0.91-1.61)	2.45* (1.30-4.62)	1.18 (0.94-1.50)	1.20 (0.85-1.70)	0.75* (0.64-0.87)
	CHESS 3+ vs. 0		1.35 (0.93-1.98)	3.17* (1.55-6.49)	1.66* (1.24-2.21)	1.52 (0.99-2.32)	0.61* (0.49-0.76)
ADL-H 2+	CHESS 1-2 vs. 0	1.10 (0.80-1.53)		1.44* (1.03-2.01)	1.28* (1.00-1.63)	1.31 (0.93-1.85)	0.98 (0.81-1.18)
	CHESS 3+ vs. 0	1.32 (0.89-1.94)		2.09* (1.44-3.03)	2.06* (1.56-2.71)	3.61* (2.50-5.20)	0.99 (0.78-1.26)

[1] Home care services discontinued
* $P < 0.05$

were less likely to be admitted a residential long-term care facility if they received physical therapy at the fifth intensity quintile in CCC. Only a limited number of state transitions were significant for the effect of occupational therapy as well. Patients in the ADL-H 2+ initial state that received occupational therapy at the third and fourth intensity quintile levels in CCC had greater adjusted odds of transitioning to a less impaired functional state than patients in the first quintile reference group (Table 4.34). Finally, one or more physical therapy visits in home care was associated with lower adjusted adjusted odds of residential long-term care admission for patients in the ADL-H 2+ initial state. This effect was not statistically significant for any other state transitions. Patients that received one or more occupational therapy visits in home care that began in the ADL-H 0-1 state were more likely to transition to the home care discontinued state. For patients that began in the ADL-H 2+ state, receipt of occupational therapy in home care was associated with lower adjusted odds of transitioning to the less impaired functional state and the home care discontinued state (Table 4.35).

Table 4.33: Adjusted Odds of State Transition by Physical Therapy Intensity Quintile in Complex Continuing Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Initial State	Level[1]	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[2]
ADL-H 0-1	No Therapy		0.94	0.67	1.05	1.06	0.97
			(0.55-1.59)	(0.29-1.58)	(0.70-1.57)	(0.62-1.81)	(0.72-1.30)
	2nd Quintile		0.91	0.72	1.26	0.83	0.95
			(0.64-1.30)	(0.39-1.35)	(0.96-1.66)	(0.56-1.24)	(0.78-1.16)
	3rd Quintile		1.08	1.16	0.89	0.80	0.96
			(0.77-1.52)	(0.68-1.99)	(0.67-1.17)	(0.55-1.17)	(0.79-1.17)
	4th Quintile		1.10	0.65	1.10	0.84	1.05
			(0.76-1.59)	(0.33-1.25)	(0.82-1.47)	(0.55-1.26)	(0.85-1.29)
	5th Quintile		0.92	0.77	0.94	0.56*	0.96
			(0.63-1.34)	(0.40-1.47)	(0.70-1.26)	(0.36-0.88)	(0.78-1.17)
ADL-H 2+	No Therapy	1.24		1.47	1.26	1.36	1.12
		(0.72-2.13)		(0.93-2.33)	(0.87-1.83)	(0.88-2.10)	(0.79-1.59)
	2nd Quintile	1.05		0.88	1.03	0.92	1.14
		(0.73-1.50)		(0.64-1.21)	(0.81-1.32)	(0.67-1.26)	(0.91-1.42)
	3rd Quintile	1.10		0.95	1.00	1.03	1.36*
		(0.77-1.57)		(0.69-1.30)	(0.78-1.28)	(0.75-1.40)	(1.09-1.70)
	4th Quintile	1.10		0.88	0.86	0.80	1.07
		(0.76-1.59)		(0.63-1.23)	(0.65-1.12)	(0.57-1.12)	(0.84-1.36)
	5th Quintile	1.01		0.70*	0.90	0.72	1.19
		(0.69-1.48)		(0.49-1.00)	(0.68-1.19)	(0.50-1.04)	(0.94-1.52)

* $P < 0.05$
[1] Reference group is 1st Quintile
[2] Home care services discontinued

Table 4.34: Adjusted Odds of State Transition by Occupational Therapy Intensity Quintile in Complex Continuing Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Initial State	Level[1]	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[2]
ADL-H 0-1	No Therapy		1.27	1.06	1.00	1.00	0.90
			(0.87-1.85)	(0.60-1.90)	(0.74-1.35)	(0.66-1.52)	(0.73-1.11)
	2nd Quintile		1.04	0.50*	1.20	1.16	1.03
			(0.71-1.52)	(0.25-0.98)	(0.90-1.61)	(0.78-1.72)	(0.84-1.26)
	3rd Quintile		0.98	0.88	1.04	0.87	1.05
			(0.67-1.42)	(0.49-1.57)	(0.78-1.39)	(0.57-1.33)	(0.86-1.29)
	4th Quintile		1.16	0.56	1.12	0.89	1.00
			(0.79-1.72)	(0.28-1.13)	(0.83-1.53)	(0.57-1.39)	(0.81-1.24)
	5th Quintile		1.14	0.81	1.27	0.82	1.14
			(0.76-1.70)	(0.42-1.57)	(0.93-1.74)	(0.51-1.31)	(0.92-1.42)
ADL-H 2+	No Therapy	1.50		0.95	0.87	1.39	1.01
		(0.99-2.28)		(0.67-1.36)	(0.66-1.14)	(0.99-1.96)	(0.79-1.29)
	2nd Quintile	1.38		1.09	0.92	1.06	1.04
		(0.93-2.07)		(0.79-1.51)	(0.71-1.20)	(0.76-1.48)	(0.82-1.32)
	3rd Quintile	1.55*		0.99	0.81	0.81	0.86
		(1.05-2.29)		(0.71-1.39)	(0.62-1.05)	(0.57-1.15)	(0.68-1.09)
	4th Quintile	1.63*		0.91	0.97	0.94	0.80
		(1.08-2.46)		(0.63-1.32)	(0.73-1.28)	(0.64-1.37)	(0.62-1.04)
	5th Quintile	1.48		1.07	0.75	1.00	0.95
		(0.98-2.25)		(0.74-1.53)	(0.56-1.00)	(0.68-1.46)	(0.74-1.22)

* $P < 0.05$
[1] Reference group is 1st Quintile
[2] Home care services discontinued

Table 4.35: Adjusted Odds of State Transitions by Rehabilitation HC Utilization in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Variable	Initial State	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[1]
Home Care Physical Therapy	ADL-H 0-1		0.78	1.25	0.94	0.72	1.10
			(0.59-1.03)	(0.93-1.68)	(0.76-1.16)	(0.44-1.18)	(0.95-1.27)
	ADL-H 2+	1.20		0.78*	1.14	0.90	0.96
		(0.94-1.52)		(0.61-0.99)	(0.96-1.36)	(0.72-1.14)	(0.82-1.12)
Home Care Occupational Therapy	ADL-H 0-1		1.16	0.98	1.04	1.19	1.15*
			(0.90-1.50)	(0.74-1.31)	(0.85-1.26)	(0.77-1.84)	(1.01-1.32)
	ADL-H 2+	0.58*		0.85	1.03	1.10	0.81*
		(0.46-0.74)		(0.68-1.06)	(0.87-1.23)	(0.88-1.36)	(0.70-0.95)

[1] Home care services discontinued
* $P < 0.05$

4.5 Discussion

As an intermediary care setting along the continuum of care, a substantial proportion of patients that are admitted to Ontario CCC hospitals are expected to experience positive health state transitions that will enable them to return to the community and other less-intensive supportive care settings. However, given the clinical complexity of patients that are admitted to CCC, negative health state transitions including functional decline, readmission to an acute care hospital, and death may also be experienced. Using linked assessments from numerous health service settings along the continuum of care, this study succeeds in describing the patient, structure, and process factors that are associated with positive and negative health state transitions immediately following rehabilitation in CCC hospitals. Additionally, recognizing that the patient journey extends beyond CCC, this study also characterized the association of patient factors and rehabilitation service utilization in hospital on health state transitions following discharge to community care.

4.5.1 Health State Transitions within Complex Continuing Care

Phase 1 of this study identified patient characteristics and practice patterns that are associated with health state transitions within the first 105 days of admission to Ontario CCC hospitals. Recognizing that rehabilitative care may have a broader effect than functional change alone (Rehabilitative Care Alliance, 2014), the multistate model approach that was used in this study has advantageous over other single-outcome approaches, including the approach used in Chapter 3. This is because multistate models allow both positive and negative health state transitions to be examined in parallel. In the case of this study, it allowed for the identification of factors associated with competing risks such as discharge destination, change in functional status, and mortality (Cook et al., 2013). For example, while the provision of physical therapy in CCC was generally associated with greater adjusted odds of community discharge and lower adjusted odds of nursing home admission, the odds of discharge to an acute care hospital was greater for patients that received physical therapy at the second intensity quintile or above. This finding is in contrast with a study conducted by Kimball et al. (2018) in skilled nursing facilities and brings to light questions about the cause for acute hospital readmission among patients receiving rehabilitation in CCC hospitals. Given that patients with surgical wounds were also at significantly greater risk of hospital readmission (Table C.21), it is possible that post-surgical complications such as wound infection are responsible for this increased risk.

A second interesting finding from this phase of the study was the effect of medical instability, as measured by CHESS, on the adjusted odds of discharge to residential long-term care facilities. Depending on the initial functional state, the odds of discharge to a residential long-term care facility was between seven and twelve times as large compared to remaining at the initial state. Given that less than 10% of the Ontario nursing home population have this level of medical instability (Hirdes et al., 2011), it is unclear why this health state transition is more common than death, return to hospital, or remaining in CCC. However, it is also possible that the "Residential Care Service (24-hour nursing care)" option on the MDS 2.0 tracking form is being used for patients that are discharged to a hospice or other care setting offering palliative care. It is also possible that the underlying cause for medical instability was addressed in CCC and at discharge the patient resembled a prototypical nursing home patient with functional impairment. Future studies should make use of linked MDS 2.0 assessments in Ontario residential long-term care facilities to better understand changes in clinical status upon completion of a health state transition.

As previously discussed (Section 3.1), the outcome-based quality indicators for CCC hospitals that are reported by the Canadian Institute for Health Information (CIHI) rely on the availability of a 90-day MDS 2.0 re-assessment to measure change over time. However, the majority of CCC patients, especially patients admitted for rehabilitative care, are discharged before an MDS 2.0 re-assessment is completed. This results in substantial right-sided sample loss, such that quality indicators that are based on MDS 2.0 for the CCC health service setting are biased towards long-stay patients that represent a minority of patient admissions. As demonstrated by Norton et al. (2014), unit-level MDS 2.0 quality indicators in nursing homes often deviate from facility-level trends. Based on these findings, it is reasonable to hypothesize that quality indicator measures that are based on information solely from long-stay patients may not be an accurate reflection of overall quality for the facility at large. Not only may it be inappropriate to infer overall hospital quality based on this biased patient sample, the quality domains that are of greatest importance to medically complex and long-stay patients are likely to be different from short-stay rehabilitation patients.

By modelling condition severity-adjusted state changes using discharge and re-assessment information, Phase 1 of this study demonstrated that health state transitions within CCC are sensitive to process inputs such as physical and occupational therapy intensity. For this reason, health system administrators should consider adopting state transition rates to inform global decisions about the quality of care in CCC hospitals. Given that this methodology does not rely on the availability of a second MDS 2.0 assessment, but is able to to make use of this information when it is available, this approach represents a robust measure of quality that is representative for both long and short-stay patients. Using the current study as a basis, future studies should seek to develop a standardized approach to quality measurement that adjusts for risk of functional decline and adverse discharge outcomes. Doing so will allow for temporal, facility, and region-level comparisons of the quality of rehabilitative care in CCC hospitals.

4.5.2 Health State Transitions in Home Care After Discharge from Complex Continuing Care

Phase 2 of the current study examined the effect of rehabilitation in CCC and in home care on health state transitions following discharge to the community. Unlike in Phase 1, results from this phase provide little evidence that receipt of physical and occupational therapy in CCC is associated with health state transitions following community discharge. This suggests that rehabilitative care in post-acute care hospitals is beneficial for short-term health state transitions and may enable patients to return to the community; however, the effect of therapy in hospital is time-limited and does not persist after community discharge. Ongoing access to therapy in the community may be required to sustain benefits over time. Additionally, both the clinical profile and rate of adverse events experienced in the community suggest that the population of patients that transfer from CCC to home care are clinically complex and have remaining needs after discharge. These findings have implications for both clinical practice and future research.

Only one-third of patients that received physical therapy in CCC received physical therapy in home care after discharge. While this rate increased to 45% for the provision of occupational therapy in home care when it was also provided in CCC, it suggests that community-based service providers may not recognize the value of rehabilitative care for maintenance and recovery of function, but also to protect against negative health state transitions such as mortality. As previously discussed in the literature review, few studies have investigated the effect of therapy provided in home care following post-acute care discharge; however, there is some evidence to suggest that it may be as equally protective against mortality as facility-based care (Stolee et al., 2012).

Among patients that received physical and occupational therapy in home care, the intensity of rehabilitation that was provided was low compared to in CCC. For example, 84% of patients that received physical therapy were limited to a single therapist visit per week. In part, this may explain why physical and occupational therapy in home care was also generally not associated with state transitions after discharge. These results are in contrast to findings from Cook et al. (2013) who found that the provision of physical or occupational therapy for a broader population of home care clients with musculoskeletal conditions and any amount ADL impairment was associated with lower odds of residential long-term care admission, acute care hospitalization, and death. Given that the CPS and CHESS distributions were similar for both Cook et al. (2013) and the current study, it is possible that the difference in the response to community-based therapy was because the current study was not limited to patients with musculoskeletal conditions. Additionally, the majority of patients in the Cook et al. (2013) sample were not recently discharged from a CCC hospital and were likely to be community-dwelling or previously in acute care hospitals.

Together, these findings suggest that there are opportunities to extend the rehabilitative care that is provided in hospital to community-based settings (for example, through intensive home visits and outpatient clinics). Additional research that characterizes the association between health state transitions and therapy in home care, when stratified by diagnosis and impairment type, will provide further evidence to support its effectiveness after hospital discharge. As demonstrated by the current study, interRAI assessments deployed across the health system are well suited for observational research of this kind.

After discharge from CCC, 50% of patients that returned to the community were functionally impaired such that they required active assistance to complete at least one basic ADL. Given that functional status at discharge has been found to be an important predictor of unplanned hospital readmissions after community discharge (Dossa et al., 2011; Middleton et al., 2016; Fisher et al., 2016), the fact that nearly 30% of patients that began in the ADL-H 2+ state experienced an adverse event in home care is unsurprising. However, the rate of re-hospitalization in the current study did not differ substantially between initial functional states, and as suggested by Hakkarainen et al. (2016), the cause for hospital readmission may be related to preexisting medical conditions. Indeed, across both initial states, patients in the current study with cancer, cardiac conditions, and other medically complex conditions (i.e., renal failure and liver failure) had greater adjusted odds of hospital readmission. Only a small percentage of patients in the current study improved to the less impaired functional state after community discharge. While this statistic should be interpreted alongside other competing risks, including discontinuation of home care services, this finding implies that a large percentage of patients that are discharged from CCC will require support for prolonged periods of time after discharge to the community.

4.5.3 Limitations

Some limitations of the current study should be considered when interpreting the results. The multistate model used in Phase 2 to study state transitions after discharge to home care used community-based episodes of care that began with a RAI-HC assessment within 105 days of CCC discharge. This time period was selected as it was a reasonably proximate to the CCC discharge date and it provided a sufficient sample size to perform the multistate transition analysis. Although the median time to the initiation of home care services was fourteen days after CCC discharge, a quarter of the sample waited more than 30 days before receiving services. While this raises questions about the continuity of care after CCC discharge, it also means that there was potential for substantial time lag, as great as 6 months, between the last available MDS 2.0 assessment and the first available RAI-HC assessment. Also, although the Markov chain multistate model adjusted for the number of assessment pairs contributed towards the sample as a proxy for time since CCC discharge, RAI-HC assessments completed within one-year of CCC discharge were included in the sample as long as the initial episode of care began within 105 days of discharge. Altogether, this means that the association between CCC-based rehabilitation intensity and health states transitions in home care was likely attenuated by the amount of time that elapsed between assessments.

As with the studies described in Chapter 2 and Chapter 3, the sample in the current study was limited to patients that were assessed with both an MDS 2.0 assessment in CCC and a RAI-HC assessment in home care. This includes short-stay patients in CCC who were discharged within 15 days admission and patients that were not referred to home care services in the community. Perhaps more importantly though, the sample omitted patients that experienced an adverse event in the community before their initial RAI-HC assessment. Given that Middleton et al. (2016) found that the median time to rehospitalization was 14 days in a very large sample of patients discharge from inpatient rehabilitation, it is likely that a large percentage of CCC patients that experienced adverse events in home care did not remain in the community long enough to be assessed for home care services. Further, this means that the sample used in the current study was likely biased towards the least clinically complex patients.

Chapter 5

Overall Discussion

5.1 Summary

The purpose of this dissertation was to characterize rehabilitative care in Ontario Complex Continuing Care (CCC) hospitals and to examine the association of patient, structure, and process variables on functional outcomes and health state transitions following rehabilitative care. Through linkage of comprehensive health assessments and administrative health records across numerous health service settings in Ontario, this dissertation has overcome many long-standing policy-based limitations that have hindered our understanding of patient outcomes in CCC. This dissertation provides the first large-scale evidence for the effectiveness of rehabilitative care delivered in CCC hospitals.

Chapter 2 characterized the patient, facility, and system-level determinants for the receipt and intensity of rehabilitative care that is provided upon admission to Ontario CCC hospitals. A large majority of patients received at least one visit from a physical and occupational therapist during the seven-day assessment period; however, only 16% received speech-language pathology therapy. The zero-inflated negative binomial regression models showed that patient-level factors including age, diagnosis group, baseline functional and cognitive status, medical instability, and rehabilitation potential were predictive of both receipt and intensity of therapy across each provider type. These patient-level associations were stronger for the receipt-component than the intensity-component of each model. This suggests that providers take patient health status into account when determining eligibility for rehabilitation, but allocate therapy intensity based on ancillary factors such as facility-level practice patterns. After adjusting for patient characteristics, significant facility and region-level effects such as facility size, area population density, and health region were also detected. This suggests that there is rehabilitative care practice variation across Ontario CCC hospitals that is not only a function of differences in the patient populations served.

Chapter 3 examined the patient, practice, facility and system-level predictors of functional outcomes following care in an Ontario CCC hospital. Given that the majority of CCC patients are discharged before a follow-up Minimum Data Set 2.0 (MDS 2.0) assessment is completed, interRAI assessments in adjacent health service settings were used to measure functional change over time. The magnitude of functional change achieved was moderate across the entire sample; however, patients that were discharged to home care improved by more than one standard deviation on the 28-point Activities of Daily Living Long Form Scale (ADL-Long) scale. The multiple linear regression model predicting functional change in the ADL-Long scale explained 19% to 23% of the variance. Patient-level factors associated with functional outcomes included age, diagnosis group, cognitive status, and rehabilitation potential. After adjusting for patient-level factors, receipt of physical therapy was generally associated with functional gain; however, there was generally no difference in functional gain when comparing adjacent intensity quintiles. This suggests that small amounts of additional physical therapy does not provide additional benefit. Also, except for the least impaired patients at admission, additional physical therapy time beyond the third intensity quintile was not therapeutic in the populations considered here. For the least impaired patients, provision of occupational therapy was associated with functional gain; however, there was no evidence to indicate that more intensive therapy was beneficial.

Chapter 4 investigated patient, practice, facility and system-level factors on health state transitions within CCC and health state transitions after discharge from CCC to the community. After adjusting for patient, facility, and system-level factors, patients that received more intensive physical and occupational therapy were generally more likely to be discharged to community care, less likely to be discharged to residential long-term care, less likely to die, and more likely to transition to a less impaired functional state. However, provision of physical therapy was also associated with greater adjusted odds of discharge back to an acute care hospital, which raises questions about the capacity of CCC hospitals to manage complications during rehabilitative care. For patients that returned to the community from CCC, rehabilitation intensity in CCC was not associated with health state transitions in the community. Altogether, these findings suggest that the rehabilitative care that is provided in CCC hospitals is beneficial for short-term health state transitions and may enable patients to return to the community. However, the effect of therapy in hospital is time-limited and does not persist after community discharge.

5.2 Implications for Clinical Practice and Policy

Based on the findings from Chapter 3 and 4, there is evidence to suggest that the Low Tolerance Long Duration (LTLD) rehabilitation that is provided in Ontario CCC hospitals has therapeutic benefit, both in terms of functional outcomes and the positive health state transitions that patients experience in hospital. When comparing the relative effect of various therapy intensity levels, it is important to recognize that there was also evidence of an attenuation of the mean effect of physical therapy beyond the third intensity quintile. The results from this dissertation suggest that there would be no difference in functional outcomes if nearly 40% of patients received less intensive physical therapy and if only the least impaired one-third of patients received occupational therapy at the lowest quintile intensity. As discussed (see Chapter 3), there are several limitations to these findings including multiple forms of sample bias, the use of a single uni-dimensional functional outcome measure, and the application of broad inference to a heterogeneous population. Additionally, maintenance of function may also be a positive outcome for patients that are on a negative trajectory of recovery and was not accounted for in this work.

Given these limitations, the evidence that was generated through this dissertation is not sufficient to justify that service intensity maximums be placed on the rehabilitative care that is provided in CCC hospitals. Instead, Ontario CCC hospitals should be permitted to provide low and medium-intensity therapy without oversight; however, high-intensity therapy should be subject to critical examination by the Ontario Ministry of Health and Long-term Care. While this scrutiny may take on many forms; ultimately, documented justification for the provision of high-intensity therapy and evidence of functional outcomes should be available to the Ministry of Health and Long-term Care on an individual patient basis.

This dissertation should be used by Ontario health system decision-makers as a framework for understanding how interRAI assessments can be used as the basis for health services research to inform policy of this kind. Some of the limitations of this dissertation can be addressed through research that focuses on specific patient populations within CCC. However, without new ways of measuring rehabilitation outcomes in this care setting, future research in CCC will be limited to proxy measures from the subset of patients that transition to a health service setting that has implemented an interRAI assessment. More than 20 years after the "dawn of the information age" when the MDS 2.0 assessment was mandated for use in Ontario CCC hospitals (Hirdes et al., 2003b), it is time to consider how the next generation of interRAI assessments can be used to support patient care planning, hospital funding, policy development, and research in this care setting. Using results from this dissertation as a platform, the remainder of this discussion will explore opportunities to advance the collection and use of patient-level health information in Ontario CCC hospitals to better understand the rehabilitative care needs of patients.

In the United States, skilled nursing facilities are required to follow a Minimum Data Set (MDS) reassessment schedule for Medicare beneficiaries at the following intervals after the initial admission date: Days 5, 14, 30, 60 and 90. Additional documentation is also required when the intensity or type of therapy that a patient engages in changes in order to classify them into a different case-mix group. This allows for differential reimbursement as the patient's health status or participation in therapy changes over the episode of care. The adoption of a similar reassessment schedule in Ontario CCC hospitals would provide this benefit, and would also provide a means to measure the individual response to rehabilitative care. In order to justify the sustained delivery of high-intensity rehabilitation in CCC hospitals, evidence of functional gain from the previous assessment period could be required. While this would introduce additional complexity to both the assessment and the care planning processes, it has the potential to contain costs in CCC by reducing the unnecessary provision of therapy for patients with poor rehabilitation potential without the need to impose broad therapy intensity maximums.

A second, more passive, approach would involve reporting facility-level quality indicators that take into consideration the intensity of rehabilitation that is provided to patients. This approach would rely on the widespread adoption of a modern-day interRAI instrument with a mandated discharge assessment to measure change in patient status for all admissions. The interRAI Post-acute Care instrument is an example of such an instrument and it has numerous risk-adjusted quality indicators for outcomes such as change in early, mid, and late-loss Activities of Daily Living (ADLs), the ADL-Long Scale (as used in Chapter 3), walking, falls, gait, shortness of breath, and discharge to the community (Morris et al., 2018). By adjusting facility-level quality indicator performance by the percentage of patients that received high-intensity rehabilitation, facilities are discouraged from providing rehabilitation where it is not beneficial. A study by McArthur et al. (2018) illustrated a similar approach to evaluating rehabilitative care in Canadian nursing homes using interRAI assessment-based quality indicators. Using the proportion of patients in the facility that received various intensities of rehabilitation as model parameters, they were able to explain variation in quality indicator performance using facility-level rehabilitation practice patterns.

Finally, with measures of functional change available for all patients, it is also possible to adjust facility reimbursement rates based on performance. Currently, the Resource Utilization Groups Version III (RUG-III) case-mix system that is used in Ontario CCC hospitals classifies patients into the Special Rehabilitation category largely based on the intensity of therapy they receive (Fries et al., 1994). Because of this, the RUG-III algorithm acts as "fee-for-service" pass-through for the reimbursement of rehabilitative care. Through performance-adjusted reimbursement, there is an inventive for CCC hospitals to provide high quality rehabilitative care at the minimum intensity to achieve positive patient outcomes.

Beyond enabling resource-adjusted quality indicator performance measurement and results-based reimbursement, there are several other benefits to the adoption of the interRAI Post-acute Care (PAC) assessment for this service setting. As CCC hospitals continue to evolve from their chronic care origins (Ontario Health Services Restructuring Commission, 1998) into transition and recovery-focused facilities, there is a need for an assessment that collects more granular ADL performance and locomotion measures. Given that a large percentage of CCC patients are now discharged to community-based settings, there is also a need for Instrumental Activities of Daily Living (IADL) performance and capacity measures that may dictate self-sufficiency after discharge. The interRAI PAC assessment is substantially shorter than its MDS 2.0 predecessor, allowing it to be repeated at discharge with little net gain in assessment burden. As discussed previously, this discharge assessment would facilitate continuous outcome measurement for the CCC hospital sector and would address many of the information gaps regarding the use of CCC beds identified by the Auditor General of Ontario (2013). With patient status information available at discharge, it can also be used by residential and community-based care providers to determine eligibility for service without the need to complete a supplemental interRAI Home Care assessment in hospital, as is current practice. Finally, in partnership with the Rehabilitative Care Alliance, a new interRAI assessment for use in community-based rehabilitation clinics is in development (Rehabilitative Care Alliance, 2017). This assessment is composed of both patient and clinician-reported components, and can be used with the interRAI PAC assessment to track functional outcomes for patients that receive outpatient therapy as opposed to home care services after CCC discharge. Cross-setting linkage using these two forward-thinking assessments would provide system planners with information on a sub-population of CCC patients that could not be captured in this dissertation.

A contingent of Ontario health system administrators will argue that the Functional Independence Measure (FIM) instrument that is used in inpatient rehabilitation facilities addresses the MDS 2.0 shortcomings for CCC patients and should be considered in favour of the interRAI PAC assessment. While there is some appeal to a single-page assessment, Chapter 3 and 4 of this dissertation demonstrated that the CCC patient population has complex medical, psychological, and social needs that influence a patient's response to rehabilitative care and their outcomes at discharge. An assessment like the FIM that is focused solely on independence in motor and cognitive tasks fails to account for this complexity, limiting its utility for care planning and health system performance measurement. In addition, without contextual information, clinicians may not access the rich collection of interRAI outcome measures and Clinical Assessment Protocols (CAPs) that support care planning and improve quality of care (Boorsma et al., 2011). In fact, many of these same arguments also support the use of the interRAI PAC in lieu of the FIM for inpatient rehabilitation facilities. Finally, Chapter 2 of this dissertation demonstrated that there is a subset of CCC patients that do not receive rehabilitation and whose medical needs would be poorly addressed with the FIM assessment. While these long-stay patients may be assessed with the interRAI PAC assessment, the interRAI Long-term Care Facilities (LTCF) assessment is also applicable. Given that all interRAI assessments share a common language and a core set of items, facilities may choose to implement both assessments across different units with minimal additional staff training and information technology infrastructure. RUG-III case-mix groups, facility-level quality indicators, and patient outcome measures (e.g., CHESS, CPS) can also be pooled from both assessments. ,

5.3 Recommendations for interRAI

To support the adoption of the interRAI PAC assessment in Ontario CCC hospitals, it is critical that interRAI develop post-acute care planning protocols that can support clinical decision-making in this sector. Many of the CAPs that are available for the interRAI LTCF assessment would be broadly applicable to CCC patients including the Falls CAP, Pain CAP, Cardiorespiratory Conditions CAP, Appropriate Medications CAP, Urinary Incontinence CAP, and the Bowel Conditions CAP. As discussed in Chapter 2, refinements to the ADL CAP that remove process oriented variables (e.g., receipt of physical therapy) from the algorithm may enhance its utility to identify patients that may benefit from post-acute rehabilitation. In addition, other CAPs that address domains of health and well-being that are relevant to post-acute care patients such as discharge planning and self-sufficiency in IADLs should be developed to address the unique clinical needs of CCC patients.

This dissertation established a rudimentary crosswalk to the Rehabilitation Client Group (RCG) that are used in the Functional Independence Measure - Function Related Groups (FIM-FRG), and its Canadian derivative, the Rehabilitation Patient Groups (RPG) case-mix systems. While many RCG groups could be established using MDS 2.0 diagnosis items, there is no mechanism to identify a “most responsible diagnosis” to classify patients into mutually exclusive groups. The interRAI PAC assessment resolves this issue with its ability to identify a “primary diagnosis / diagnosis for current stay.” While there is ongoing debate about the merits the RUG-III and FIM-FRG case-mix systems for reimbursement with clinically complex post-acute care patients, interRAI should consider how its instruments interface with other functional measures commonly used in acute care settings to support new bundled hospital funding models such as Quality-based Procedures (Ontario Ministry of Health and Long-term Care, 2018). Following the example from Williams et al. (1997), interRAI-endorsed FIM “crosswalks” should be established to enable functional gain measurement across acute and post-acute care service settings.

The MDS 2.0 and the interRAI PAC assessments have two binary items related to physical function improvement potential from the patient and care provider’s perspective. In all three studies contained in this dissertation, these items were combined into a single four-level categorical variable based on the congruence of the patient and care provider’s responses. This composite rehabilitation potential variable differentiated patients by both therapy receipt and intensity (see Chapter 2), and it was an important predictor of functional outcomes (see Chapter 3) and health state transitions (see Chapter 4). As demonstrated by this composite variable, in addition to the provider’s appraisal, their is great value in obtaining a patient’s perspective of their own potential for recovery. There are several opportunities to extend this concept of patient and assessor ratings, both in terms of future research and for the development of interRAI assessments and decision-support tools. Future research in CCC should leverage these items to perform analyses of patients with strong and weak appraisals of rehabilitation potential to understand the facilitators and barriers of functional recovery among these patient sub-groups. Based on the success of the new assessment model used by interRAI Community Rehabilitation Assessment, where both patient self-report and clinician assessments are used in tandem, there may also be opportunities to develop patient-reported outcome measure supplements for the interRAI PAC. Following the approach that is used with the interRAI Quality of Life Survey instrument (Kehyayan et al., 2015), less than one-quarter of CCC patients would have difficulty completing a self-reported assessment based on their level of cognitive impairment.

Apart from identifying patients with perceived rehabilitation potential, this dissertation was unable to stratify the analyses by patient goals of care. This is because standardized health assessments often choose to omit items with a free-text response field, as responses are difficult to parse and categorize at a large-scale. However, given the heterogeneous patient population in CCC, this work may have benefited from the capacity to further stratify patients into broad goals of care categories such as “prevent decline”, “gain function”, and “reduce pain.” While the International Classification of Functioning, Disability and Health establishes some precedent for these goals of care (Stucki, 2005), the level of specificity of the ICF Core Sets may limit their utility as a stratification variable. Future versions of the interRAI PAC assessment should include a series of items that can be used to identify one or more standardized goals of care from both the patient and the provider’s perspective. This information would have utility for both research and health system performance monitoring, could foster meaningful patient-clinician conversations, and could be important variables in decision-support tools such as CAPs.

5.4 Future Research

This dissertation has addressed several knowledge gaps related to the rehabilitative care that is provided in CCC hospitals and the functional outcomes that patients achieve through participation in LTLD therapy. As the first study of this kind in CCC hospitals, a conscious decision was made to not constrain the analysis to a single impairment type (e.g., orthopedic patients, stroke patients). While this approach has merits, especially as a source of information for system-level decision-makers, the inferences that are drawn from this research may have limited applicability to specific CCC patient sub-populations. Future research should leverage the analytic approach that was used in this study to explore patient outcomes for commonly represented patient groups, including patients with multimorbidity and comorbid conditions, to better understand their unique needs and response to various modalities of LTLD therapy. Additionally, given that this dissertation relied on secondary data analysis of observational data, causal inference about the effectiveness of rehabilitation in CCC hospitals could not be made. While there is potential for experimental research that seeks to understand the causal relationship between various intensities of LTLD rehabilitation and functional outcomes; observational research that uses propensity score matching to account for therapy intensity selection bias is an evident intermediary step for future research.

As interRAI standardized health assessments continue to spread to new health service settings (e.g., acute care, primary care, outpatient rehabilitation) there is great potential to leverage longitudinal data linkages across care settings to conduct new types of health system research. Using patient health and service utilization data collected in both CCC hospitals and home care, Chapter 4 of this dissertation is exemplary of the type of research that is only possible with large and linked patient data holdings. Given the transitional nature of CCC hospitals, future research should seek to apply this analytic approach to understand the effect of broader hospital practice patterns on trajectories of recovery after discharge. While this dissertation focused on patients discharged to home care, future research may use linked longitudinal assessments collected in other care settings, such as residential long-term care, to explore outcomes for a different CCC sub-population. Additionally, for a subset of patients, admission to CCC hospital represents a midpoint in their course of illness. Linked longitudinal assessment data collected in community-based care settings may serve as a reliable source of pre-morbid data that can be used to better address the strengths, preferences, and needs of patients admitted to CCC hospitals.

5.5 Conclusion

As a health service setting responsible for the care of nearly 30,000 patients each year (Canadian Institute for Health Information, 2018), our understanding of the rehabilitative care that is provided in Ontario CCC hospitals is not limited by the availability of data, but rather, its use as a source of information for system-level decision-making. This dissertation represents the first large-scale and comprehensive study of rehabilitation service patterns and outcomes of patients admitted to Ontario CCC hospitals. Through the use of national administrative health databases with near census-level coverage, this dissertation answered a series of questions that could only be addressed using patient information collected across numerous health services settings. The models that were developed in this dissertation lend support for the quality of rehabilitative care in Ontario CCC hospitals; however, they suggest that there are opportunities to refine rehabilitation service patterns to better allocate therapy time for several patient sub-populations. While there are many avenues for future research, the evidence that was generated through this dissertation has advanced our understanding of post-acute rehabilitation, functional outcomes, and health state transitions for a complex patient population that may not tolerate conventional modalities of intensive rehabilitation.

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Appendix A

Additional Tables for Chapter 2

A.1 Descriptive Statistics for Sample Used in Phase 1 and Phase 2

Table A.1: Distribution of Demographic Variables, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
Female		57,334	56.9
Age Group	0-64	15,358	15.2
	65-74	17,940	17.8
	75-84	32,220	32.0
	85-94	31,578	31.3
	95+	3,682	3.6
Support Person Positive Towards Discharge		65,558	65.0

Table A.2: Distribution of Diagnostic Condition Variables, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Frequency	Percent (%)
Amputation	2,451	2.4
Arthritis	28,166	27.9
Cardiac Conditions	45,992	45.6
Cancer	28,352	28.1
Neurological Conditions	9,874	9.8
Orthopedic Conditions	24,375	24.2
Other Medically Complex Conditions	17,995	17.9
Pulmonary Conditions	20,242	20.1
Spinal Cord Injury	1,592	1.6
Stroke	19,588	19.4
Traumatic Brain Injury	1,569	1.6

Table A.3: Distribution of Clinical Condition Variables, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable	Frequency	Percent (%)
Aphasia	4,467	4.4
Hallucinations/Delusions	7,061	7.0
Stage 2+ Pressure Ulcer	18,907	18.8
Shortness of Breath	25,369	25.2
Unsteady Gait	51,362	51.0
Fluctuating Health Status	52,971	52.6
Acute Episode of Chronic Disease	39,633	39.3

Table A.4: Distribution for interRAI Outcome Measures, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
ADL-Hierarchy Scale	0	4,100	4.1
	1	5,190	5.2
	2	19,054	18.9
	3	16,799	16.7
	4	14,648	14.5
	5	30,485	30.2
	6	10,502	10.4
Cognitive Performance Scale	0	28,060	27.8
	1	18,092	17.9
	2	17,523	17.4
	3	19,755	19.6
	4	4,784	4.8
	5	7,250	7.2
	6	5,314	5.3
CHESS	0	16,450	16.3
	1	22,132	22.0
	2	24,379	24.2
	3	17,800	17.7
	4	11,710	11.6
	5	8,307	8.2
Pain Scale	0	27,433	27.2
	1	30,923	30.7
	2	35,427	35.1
	3	6,995	6.9
Depression Rating Scale	0-2	79,745	79.1
	3+	21,033	20.9

Table A.5: Distribution of ADL Self-performance Items, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
Bed Mobility	Independent	19,900	19.8
	Supervision	6,347	6.3
	Limited Assistance	25,260	25.1
	Extensive Assistance	29,948	29.7
	Total Dependence	19,235	19.1
	Did Not Occur	88	0.1
Transfer	Independent	9,823	9.8
	Supervision	8,503	8.4
	Limited Assistance	25,913	25.7
	Extensive Assistance	28,817	28.6
	Total Dependence	23,817	23.6
	Did Not Occur	3,905	3.9
Locomotion on Unit	Independent	15,753	15.6
	Supervision	10,548	10.5
	Limited Assistance	20,339	20.2
	Extensive Assistance	14,507	14.4
	Total Dependence	27,004	26.8
	Did Not Occur	12,627	12.5
Eating	Independent	38,384	38.1
	Supervision	21,962	21.8
	Limited Assistance	18,932	18.8
	Extensive Assistance	8,571	8.5
	Total Dependence	12,650	12.6
	Did Not Occur	279	0.3
Toilet Use	Independent	8,649	8.6
	Supervision	6,210	6.2
	Limited Assistance	22,640	22.5
	Extensive Assistance	30,830	30.6
	Total Dependence	32,206	32.0
	Did Not Occur	243	0.2
Bathing	Independent	3,177	3.1
	Supervision	4,204	4.2
	Transfer Help	9,290	9.2
	Bathing Help	41,380	41.1
	Total Dependence	40,881	40.6
	Did Not Occur	1,846	1.8

Table A.6: Distribution of Cognition Variables, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
Short-term Memory Problem		52,438	52.0
Decision-making Skills	Independent	33,878	33.6
	Modified Independence	29,615	29.4
	Moderately Impaired	24,721	24.5
	Severally Impaired	12,564	12.5
Expression	Understood	66,648	66.1
	Usually Understood	20,547	20.4
	Sometimes Understood	9,843	9.8
	Rarely or Never Understood	3,740	3.7
Speech Clarity	Clear	83,931	83.3
	Unclear	14,096	14.0
	No Speech	2,751	2.7
Comprehension	Understands	60,655	60.2
	Usually Understands	24,266	24.1
	Sometimes Understands	12,681	12.6
	Rarely or Never Understands	3,176	3.1

Table A.7: Distribution of Variables Related to Social Participation, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
Index of Social Engagement	0	15,105	15.0
	1	16,818	16.7
	2	12,904	12.8
	3	13,811	13.7
	4	17,011	16.9
	5	8,535	8.5
	6	16,594	16.5
Time Involved in Activities	Most	21,744	21.6
	Some	36,327	36.0
	Little	29,996	29.8
	None	12,711	12.6

Table A.8: Distribution of Variables Related to Clinical Change and Rehabilitation Potential, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
Change in ADL Function	No Change	27,281	27.1
	Improved	9,814	9.7
	Deteriorated	63,683	63.2
Change in Cognitive Status	No Change	65,355	64.8
	Improved	2,076	2.1
	Deteriorated	33,347	33.1
Change in Communication or Hearing	No Change	81,195	80.6
	Improved	1,130	1.1
	Deteriorated	18,453	18.3
Rehabilitation Potential	Neither Patient or Provider	51,145	50.8
	Only Patient	6,414	6.4
	Only Provider	9,609	9.5
	Both Patient and Provider	33,610	33.4

Table A.9: Distribution of Facility and Region-level Variables, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Variable		Frequency	Percent (%)
Facility Size	Small	20,049	19.9
	Medium	38,038	37.7
	Large	42,691	42.4
Facility Area	Urban Area	94,363	93.6
	Rural Area	6,415	6.4
LHIN	Central	4,156	4.1
	Central East	6,234	6.2
	Central West	2,056	2.0
	Champlain	7,149	7.1
	Erie St. Clair	5,204	5.2
	Hamilton Niagara Hal	19,508	19.4
	Mississauga Halton	5,714	5.7
	North East	4,522	4.5
	North Simcoe Muskoka	2,132	2.1
	North West	5,144	5.1
	South East	4,334	4.3
	South West	6,836	6.8
	Toronto Central	22,737	22.6
	Waterloo Wellington	5,052	5.0

A.2 Percentage of Patients Receiving Rehabilitation at RUG-III Special Rehabilitation Intensity Thresholds

Table A.10: Percentage of Patients Receiving Therapy at RUG-III Therapy Intensity Thresholds by Age Group, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Age Group	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0-64	75.2	52.5	18.2	2.7
	65-74	78.8	58.4	20.6	2.6
	75-84	80.7	61.3	21.4	2.2
	85-94	80.8	61.4	20.5	1.6
	95+	78.7	56.7	16.0	1.2
	Test Statistic[4]	240.2	427.4	108.6	95.8
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0-64	68.3	36.3	9.8	2.2
	65-74	69.5	36.6	9.6	1.7
	75-84	70.0	37.5	9.4	1.3
	85-94	69.1	36.6	8.6	1.0
	95+	65.1	31.7	6.7	0.8
	Test Statistic[4]	44.5	50.0	55.0	136.3
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0-64	18.0	5.6	1.0	0.2
	65-74	15.5	4.0	0.7	0.1
	75-84	14.6	3.3	0.5	0.1
	85-94	15.1	2.9	0.4	0.1
	95+	17.5	2.4	0.2	0.0
	Test Statistic[4]	108.6	263.0	98.2	22.2
	P-value	<.0001	<.0001	<.0001	0.0002

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.11: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Female Sex, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Female Sex	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No	78.0	56.9	19.5	2.3
	Yes	80.6	61.2	20.9	2.0
	Test Statistic[4]	108.2	190.4	26.3	10.1
	P-value	<.0001	<.0001	<.0001	0.0015
Occupational Therapy	No	68.4	36.0	9.1	1.6
	Yes	69.7	37.2	9.2	1.3
	Test Statistic[4]	21.0	15.8	0.4	18.4
	P-value	<.0001	<.0001	0.5097	<.0001
SLP Therapy	No	18.4	4.5	0.8	0.2
	Yes	13.4	3.0	0.4	0.1
	Test Statistic[4]	471.2	156.4	62.4	24.2
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.12: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by the Changes in Health, End-Stage Disease, Signs, and Symptoms Scale, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	CHESS	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0	83.4	63.8	21.8	2.5
	1	88.2	70.6	26.5	3.2
	2	87.5	68.0	24.1	2.7
	3	81.2	60.0	20.0	1.7
	4	66.4	41.8	11.5	0.8
	5	39.8	17.8	2.5	0.2
	Test Statistic[4]	11426.8	9511.6	2972.1	428.7
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0	71.9	37.5	8.0	1.5
	1	76.6	44.2	12.0	2.2
	2	76.0	43.0	11.3	1.7
	3	70.4	36.4	9.5	1.0
	4	57.9	25.7	5.7	0.4
	5	37.2	12.2	1.3	0.2
	Test Statistic[4]	5844.7	3711.8	1178.6	313.2
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0	12.2	2.7	0.4	0.1
	1	12.1	2.7	0.5	0.1
	2	16.7	4.8	0.8	0.2
	3	17.2	4.0	0.5	0.1
	4	19.8	4.3	0.5	0.1
	5	18.0	2.6	0.2	0.0
	Test Statistic[4]	598.7	251.4	57.1	16.2
	P-value	<.0001	<.0001	<.0001	0.0062

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.13: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by The Pain Scale, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Pain Scale	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0	80.6	61.1	22.2	2.7
	1	77.8	56.6	19.1	1.8
	2	81.4	62.2	20.7	2.1
	3	72.9	49.4	15.8	1.9
	Test Statistic[4]	340.2	541.7	176.0	60.6
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0	70.2	38.4	10.3	1.6
	1	67.3	34.0	7.9	1.1
	2	70.8	38.7	9.8	1.6
	3	65.1	31.1	6.7	0.9
	Test Statistic[4]	161.0	285.8	165.8	55.5
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0	18.5	5.1	0.8	0.2
	1	15.9	3.2	0.4	0.1
	2	13.3	3.0	0.5	0.1
	3	13.3	2.4	0.3	0.0
	Test Statistic[4]	355.3	259.2	49.3	26.0
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.14: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by the Index of Social Engagement, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	ISE	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0	63.9	40.2	11.6	1.4
	1	69.1	41.6	10.3	0.8
	2	78.6	57.4	18.3	1.5
	3	83.8	64.7	21.7	1.7
	4	87.3	68.9	24.9	2.7
	5	86.4	69.7	25.1	2.2
	6	89.7	76.4	31.4	4.5
	Test Statistic[4]	5498.3	7691.9	3401.9	695.8
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0	56.5	23.9	4.4	0.7
	1	61.8	26.0	4.9	0.7
	2	67.7	34.0	7.3	1.0
	3	72.4	38.9	9.4	1.4
	4	75.8	44.6	12.9	2.2
	5	75.0	44.8	11.2	1.0
	6	76.7	46.9	14.0	2.4
	Test Statistic[4]	2584.3	3393.8	1641.2	335.7
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0	19.6	3.9	0.5	0.1
	1	18.1	3.3	0.5	0.1
	2	17.8	4.1	0.5	0.1
	3	15.6	3.6	0.5	0.2
	4	14.8	3.7	0.5	0.1
	5	10.8	2.9	0.6	0.1
	6	10.5	3.6	0.7	0.2
	Test Statistic[4]	790.4	29.3	10.4	20.2
	P-value	<.0001	<.0001	0.1072	0.0026

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.15: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Depression Rating Scale, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	DRS	15+ Minutes (%)	45+ Minutes note1 (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	0-2	80.4	61.1	21.6	2.3
	3+	75.9	52.6	15.4	1.5
	Test Statistic[4]	208.7	499.0	398.9	55.6
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	0-2	70.0	38.0	9.7	1.5
	3+	66.0	31.4	7.1	0.9
	Test Statistic[4]	127.6	321.4	129.3	53.0
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	0-2	15.6	3.8	0.6	0.1
	3+	15.3	3.1	0.4	0.1
	Test Statistic[4]	0.9	22.3	11.3	9.2
	P-value	0.3536	<.0001	0.0008	0.0024

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.16: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Change in ADL Function in the Past 90 Days, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Change in ADL Function	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No Change	78.1	54.2	17.1	1.7
	Improved	93.4	77.7	26.8	2.6
	Deteriorated	77.9	58.6	20.7	2.3
	Test Statistic[4]	1293.1	1675.7	436.8	36.3
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No Change	67.2	32.0	6.4	1.4
	Improved	85.2	52.1	11.0	0.9
	Deteriorated	67.5	36.2	10.0	1.5
	Test Statistic[4]	1316.6	1263.7	355.8	20.2
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	No Change	14.9	2.7	0.3	0.1
	Improved	11.0	2.5	0.4	0.1
	Deteriorated	16.5	4.2	0.7	0.1
	Test Statistic[4]	205.8	161.0	46.8	5.5
	P-value	<.0001	<.0001	<.0001	0.0654

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.17: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Change in Cognitive Status in the Last 90 Days, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Change in Cognition	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No Change	84.4	65.1	23.6	2.6
	Improved	87.4	63.2	19.0	2.4
	Deteriorated	69.4	47.6	13.9	1.2
	Test Statistic[4]	3147.4	2820.1	1276.6	200.4
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No Change	73.4	40.1	10.3	1.7
	Improved	76.7	43.3	8.6	0.8
	Deteriorated	60.3	29.5	6.9	0.9
	Test Statistic[4]	1845.1	1110.0	314.7	97.6
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	No Change	13.1	2.8	0.4	0.1
	Improved	16.2	3.0	0.4	0.1
	Deteriorated	20.2	5.3	0.8	0.2
	Test Statistic[4]	837.0	412.2	61.2	5.0
	P-value	<.0001	<.0001	<.0001	0.0835

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.18: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Change in Communication or Hearing in the Past 90 Days, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Change in Communication	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No Change	82.4	62.7	22.2	2.3
	Improved	88.8	61.6	16.2	2.2
	Deteriorated	66.3	44.4	12.3	1.2
	Test Statistic[4]	2450.5	2081.8	925.0	88.4
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No Change	71.3	38.3	9.7	1.5
	Improved	79.1	41.9	6.9	1.2
	Deteriorated	58.9	29.2	6.9	1.1
	Test Statistic[4]	1139.8	541.9	143.3	13.0
	P-value	<.0001	<.0001	<.0001	0.0015
SLP Therapy	No Change	13.0	2.5	0.3	0.1
	Improved	22.7	6.1	1.0	0.4
	Deteriorated	26.3	8.3	1.5	0.3
	Test Statistic[4]	2083.9	1475.4	366.0	46.9
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.19: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Subjective Appraisal of Rehabilitation Potential, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Rehabilitation Potential	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Neither Patient or Provider	67.1	43.5	13.1	1.1
	Only Patient	84.1	64.1	20.6	1.7
	Only Provider	89.9	69.3	22.3	2.0
	Both Patient and Provider	94.4	79.6	30.6	3.8
	Test Statistic[4]	10098.3	11519.4	3887.5	735.0
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Neither Patient or Provider	57.4	26.4	5.7	0.7
	Only Patient	70.9	38.3	8.3	0.9
	Only Provider	76.8	37.9	9.5	1.2
	Both Patient and Provider	84.6	51.5	14.4	2.6
	Test Statistic[4]	7353.7	5538.2	1889.1	568.0
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	Neither Patient or Provider	16.6	3.2	0.4	0.1
	Only Patient	12.3	2.8	0.3	0.1
	Only Provider	15.0	3.2	0.5	0.1
	Both Patient and Provider	14.7	4.5	0.8	0.2
	Test Statistic[4]	114.8	112.5	92.8	20.2
	P-value	<.0001	<.0001	<.0001	0.0002

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.20: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by the Presence of Support Person that is Positive Towards Discharge, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Presence of Support Person	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No	59.4	34.9	7.7	0.6
	Yes	90.3	72.4	27.0	3.0
	Test Statistic[4]	13411.4	13314.9	5289.0	634.6
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No	52.2	21.3	3.9	0.5
	Yes	78.2	44.9	11.9	1.9
	Test Statistic[4]	7260.0	5495.5	1782.7	331.7
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	No	17.6	2.9	0.3	0.1
	Yes	14.4	4.0	0.7	0.2
	Test Statistic[4]	172.9	69.3	65.0	20.6
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.21: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Time Involved in Activities, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Time in Activities	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Most	83.1	66.6	26.8	4.3
	Some	86.8	67.9	24.3	2.0
	Little	77.7	55.8	16.4	1.4
	None	56.4	30.4	6.8	0.6
	Test Statistic[4]	5574.3	6148.0	2647.2	718.0
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Most	73.1	42.9	13.1	2.2
	Some	74.3	40.9	10.0	1.3
	Little	67.7	33.7	7.6	1.3
	None	51.3	20.7	3.5	0.5
	Test Statistic[4]	2536.3	2155.8	999.7	175.1
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	Most	12.8	3.2	0.6	0.2
	Some	15.1	3.7	0.6	0.1
	Little	17.3	3.8	0.5	0.1
	None	17.1	3.7	0.6	0.1
	Test Statistic[4]	214.9	16.2	3.7	4.8
	P-value	<.0001	0.0010	0.3002	0.1840

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.22: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Presence of a Chewing Problem, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Swallowing Problem	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No	82.5	63.6	22.5	2.4
	Yes	69.0	44.3	12.4	1.3
	Test Statistic[4]	1916.6	2659.9	1095.5	89.7
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No	71.1	38.4	9.8	1.5
	Yes	62.5	30.3	6.7	1.1
	Test Statistic[4]	596.9	491.8	207.3	13.7
	P-value	<.0001	<.0001	<.0001	0.0002
SLP Therapy	No	9.1	2.0	0.3	0.1
	Yes	37.9	9.3	1.4	0.3
	Test Statistic[4]	10988.7	2645.4	391.7	78.5
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.23: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Presence of a Swallowing Problem, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Swallowing Problem	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No	82.5	63.6	22.5	2.4
	Yes	69.0	44.3	12.4	1.3
	Test Statistic[4]	1916.6	2659.9	1095.5	89.7
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No	71.1	38.4	9.8	1.5
	Yes	62.5	30.3	6.7	1.1
	Test Statistic[4]	596.9	491.8	207.3	13.7
	P-value	<.0001	<.0001	<.0001	0.0002
SLP Therapy	No	9.1	2.0	0.3	0.1
	Yes	37.9	9.3	1.4	0.3
	Test Statistic[4]	10988.7	2645.4	391.7	78.5
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.24: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Need for a Feeding Tube, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Feeding Tube	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No	79.7	60.0	20.7	2.2
	Yes	74.5	44.4	10.8	1.2
	Test Statistic[4]	67.5	403.2	244.1	17.4
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No	69.2	36.9	9.2	1.4
	Yes	67.9	31.8	6.7	1.5
	Test Statistic[4]	3.5	44.3	30.7	0.2
	P-value	0.0604	<.0001	<.0001	0.6935
SLP Therapy	No	14.6	3.2	0.5	0.1
	Yes	37.4	11.9	2.3	0.6
	Test Statistic[4]	1610.9	877.7	246.1	88.2
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.25: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Need for a Mechanically Altered Diet, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Mechanically Altered Diet	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	No	81.3	61.8	21.7	2.3
	Yes	73.8	51.4	15.8	1.7
	Test Statistic[4]	638.5	830.5	401.1	35.4
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	No	70.1	37.6	9.4	1.5
	Yes	66.3	33.5	8.2	1.2
	Test Statistic[4]	124.6	136.0	34.4	7.9
	P-value	<.0001	<.0001	<.0001	0.0050
SLP Therapy	No	9.8	2.2	0.4	0.1
	Yes	33.6	8.0	1.1	0.2
	Test Statistic[4]	7958.1	1765.3	191.4	36.4
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.26: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Speech Clarity, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Speech Clarity	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Clear	81.8	62.5	21.9	2.2
	Unclear	69.8	45.5	12.9	1.9
	No Speech	59.9	33.4	7.7	0.9
	Test Statistic[4]	1729.0	2215.5	887.7	28.3
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Clear	70.9	37.9	9.6	1.4
	Unclear	61.4	31.2	7.3	1.5
	No Speech	55.3	25.5	4.7	1.1
	Test Statistic[4]	769.4	385.0	142.5	3.0
	P-value	<.0001	<.0001	<.0001	0.2230
SLP Therapy	Clear	12.4	2.5	0.3	0.1
	Unclear	30.6	8.9	1.4	0.3
	No Speech	34.5	11.2	2.1	0.4
	Test Statistic[4]	3842.5	1882.9	393.4	65.9
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.27: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Ability to Understand Others, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Ability to Understand Others	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Understands	83.3	64.8	24.0	2.5
	Usually Understands	77.7	56.4	17.4	1.7
	Sometimes Understands	70.7	46.6	12.3	1.5
	Rarely or Never Understands	55.1	27.7	4.7	1.0
	Test Statistic[4]	2338.8	3002.8	1613.0	114.2
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Understands	71.6	38.9	10.1	1.5
	Usually Understands	68.5	36.1	8.6	1.3
	Sometimes Understands	63.5	30.8	7.0	1.4
	Rarely or Never Understands	50.1	21.9	3.9	1.2
	Test Statistic[4]	908.1	612.7	245.6	6.1
	P-value	<.0001	<.0001	<.0001	0.1049
SLP Therapy	Understands	11.6	2.4	0.4	0.1
	Usually Understands	19.1	4.8	0.7	0.2
	Sometimes Understands	25.0	6.6	0.9	0.2
	Rarely or Never Understands	25.3	5.0	0.4	0.0
	Test Statistic[4]	2059.8	700.1	59.9	17.8
	P-value	<.0001	<.0001	<.0001	0.0005

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.28: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Ability to Make Self Understood, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Ability to Make Self Understood	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Understood	83.6	65.1	24.0	2.5
	Usually Understood	75.7	53.5	15.3	1.5
	Sometimes Understood	68.3	43.6	11.3	1.5
	Rarely or Never Understood	56.1	28.9	5.6	1.0
	Test Statistic[4]	2899.0	3657.0	1870.4	112.3
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Understood	71.8	38.9	10.1	1.4
	Usually Understood	68.0	35.0	8.2	1.2
	Sometimes Understood	60.7	29.9	6.4	1.4
	Rarely or Never Understood	50.4	23.3	4.7	1.7
	Test Statistic[4]	1187.3	646.0	274.7	8.2
	P-value	<.0001	<.0001	<.0001	0.0425
SLP Therapy	Understood	11.2	2.2	0.3	0.1
	Usually Understood	20.8	5.3	0.8	0.2
	Sometimes Understood	29.2	8.5	1.3	0.2
	Rarely or Never Understood	27.4	6.6	1.0	0.2
	Test Statistic[4]	3201.7	1336.4	197.9	30.0
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.29: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Geographic Area Density, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Facility Area	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Urban Area	79.8	59.3	20.4	2.2
	Rural Area	74.6	59.0	18.4	1.4
	Test Statistic[4]	101.2	0.2	14.5	17.8
	P-value	<.0001	0.6279	0.0001	<.0001
Occupational Therapy	Urban Area	71.5	38.2	9.6	1.5
	Rural Area	34.7	14.1	2.7	0.2
	Test Statistic[4]	3824.1	1501.4	340.2	73.0
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	Urban Area	16.3	3.8	0.6	0.1
	Rural Area	3.9	0.6	0.1	0.0
	Test Statistic[4]	705.5	179.4	23.7	3.2
	P-value	<.0001	<.0001	<.0001	0.0743

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.30: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Facility Size, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Facility Size	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Small	80.2	64.5	20.5	1.7
	Medium	78.5	61.8	24.3	2.3
	Large	80.0	54.6	16.6	2.2
	Test Statistic[4]	34.6	710.0	747.1	25.1
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Small	57.0	24.8	3.4	0.2
	Medium	67.7	37.2	10.4	0.9
	Large	76.2	41.7	10.7	2.4
	Test Statistic[4]	2414.1	1703.4	1007.0	568.6
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	Small	9.0	1.2	0.1	0.0
	Medium	14.8	3.6	0.6	0.1
	Large	19.2	4.7	0.7	0.2
	Test Statistic[4]	1087.7	492.8	84.7	38.4
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.31: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Quintile of Annual Income Per Person Equivalent, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	Income Quintile	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	1st Quintile	77.2	55.6	16.0	1.8
	2nd Quintile	77.8	58.0	19.4	3.4
	3rd Quintile	80.0	56.0	21.5	2.2
	4th Quintile	82.6	65.1	22.4	2.3
	5th Quintile	79.6	62.9	21.6	0.6
	Not Assigned	44.4	20.6	4.8	1.6
	Test Statistic[4]	262.9	632.3	308.3	387.2
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	1st Quintile	60.9	29.5	8.4	1.2
	2nd Quintile	66.7	35.9	9.0	2.2
	3rd Quintile	71.0	33.9	7.3	0.5
	4th Quintile	74.8	48.4	13.8	2.7
	5th Quintile	71.3	35.2	7.5	0.4
	Not Assigned	50.8	34.9	4.8	3.2
	Test Statistic[4]	972.2	1627.6	688.5	639.8
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	1st Quintile	12.8	2.1	0.1	0.0
	2nd Quintile	16.2	4.4	0.9	0.2
	3rd Quintile	14.5	2.1	0.2	0.0
	4th Quintile	23.4	8.1	1.3	0.4
	5th Quintile	9.9	1.1	0.1	0.0
	Not Assigned	34.9	6.3	0.0	0.0
	Test Statistic[4]	1490.7	1768.0	428.8	179.1
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square

Table A.32: Percentage of Patients Receiving Therapy at RUG-III Intensity Thresholds by Ontario Local Health Integration Network, Ontario Complex Continuing Care, 2011 - 2016, n = 100,788

Therapy	LHIN	15+ Minutes (%)	45+ Minutes[1] (%)	150+ Minutes[2] (%)	325+ Minutes[3] (%)
Physical Therapy	Central	71.7	58.0	26.2	1.3
	Central East	75.8	52.9	11.5	0.5
	Central West	71.4	56.2	27.5	5.0
	Champlain	75.2	51.4	8.0	0.2
	Erie St. Clair	71.5	38.8	9.4	0.5
	HNHB*	91.3	74.9	31.0	4.9
	Mississauga Halton	80.3	71.5	21.1	3.6
	North East	70.5	63.9	38.7	0.6
	North Simcoe Muskoka	79.0	60.3	24.1	8.4
	North West	86.2	64.2	28.0	1.6
	South East	80.7	64.3	24.1	2.0
	South West	69.6	48.9	14.2	1.2
	Waterloo Wellington	81.1	52.0	4.3	0.1
	Toronto Central	78.2	54.0	16.8	1.3
	Test Statistic[4]	3048.4	4331.3	5219.2	1773.9
	P-value	<.0001	<.0001	<.0001	<.0001
Occupational Therapy	Central	64.4	49.7	21.8	1.2
	Central East	66.3	27.9	4.3	0.1
	Central West	57.3	33.4	6.0	0.2
	Champlain	54.8	13.6	1.2	0.3
	Erie St. Clair	56.2	20.3	4.2	0.6
	HNHB*	83.2	46.0	14.1	3.1
	Mississauga Halton	69.7	53.0	6.0	0.3
	North East	44.5	20.7	5.7	0.3
	North Simcoe Muskoka	33.1	16.1	4.3	0.3
	North West	82.4	49.3	15.5	1.3
	South East	66.9	28.1	3.7	0.6
	South West	53.9	22.6	3.8	0.2
	Waterloo Wellington	70.9	26.3	1.3	0.0
	Toronto Central	77.1	46.2	12.7	2.4
	Test Statistic[4]	7542.7	7209.0	3821.7	1023.2
	P-value	<.0001	<.0001	<.0001	<.0001
SLP Therapy	Central	10.3	3.8	1.0	0.0
	Central East	8.5	1.2	0.1	0.0
	Central West	12.5	3.1	0.8	0.0
	Champlain	8.6	0.9	0.0	0.0
	Erie St. Clair	9.4	1.7	0.3	0.0
	HNHB*	20.8	4.8	0.8	0.2
	Mississauga Halton	11.0	1.8	0.1	0.0
	North East	4.1	1.3	0.2	0.0
	North Simcoe Muskoka	9.6	2.3	0.3	0.3
	North West	12.6	2.1	0.2	0.1
	South East	6.6	2.2	0.4	0.1
	South West	8.9	1.7	0.1	0.0
	Waterloo Wellington	10.3	0.7	0.1	0.0
	Toronto Central	27.2	7.4	1.1	0.3
	Test Statistic[4]	4750.0	1733.0	312.1	102.0
	P-value	<.0001	<.0001	<.0001	<.0001

[1] 45+ minutes across 3+ days
[2] 150+ minutes across 5+ days
[3] 325+ minutes across 5+ days
[4] Wald Chi-square
* Hamilton Niagara Haldimand Brant

A.3 Change in Rehabilitation Intensity Over the Episode of Care

Table A.33: Change in Mean Rehabilitation Intensity Between MDS 2.0 and CAN-STRIVE Staff Time Measurement, Ontario Complex Continuing Care, 2007 - 2009, n = 1,502

Temporal Order	Time Difference	Physical Therapy (SD)	Occupational Therapy (SD)	SLP Therapy (SD)	Sum of Therapies (SD)
STM[1] after MDS 2.0	Overall	-2.79 (77.26)	-23.12 (78.26)*	-0.89 (29.92)	-26.80 (125.30)*
	0-6 days	6.12 (64.44)	-20.60 (72.42)*	-5.84 (25.43)*	-20.32 (105.80)*
	7-14 days	9.65 (66.39)	-18.47 (59.78)*	-0.41 (19.23)	-9.22 (105.50)
	15-30 days	-11.25 (96.13)	-26.07 (80.12)*	-0.83 (38.09)	-38.14 (138.60)*
	31-60 days	-8.15 (65.34)	-21.89 (84.94)*	1.53 (29.08)	-28.51 (127.40)*
MDS 2.0 after STM[1]	Overall	-0.35 (62.34)	14.42 (65.20)*	0.46 (33.17)	14.52 (116.90)*
	0-6 days	-1.46 (59.60)	17.19 (65.57)*	-3.17 (30.80)	12.55 (99.11)
	7-14 days	-4.24 (71.98)	26.80 (83.78)*	1.98 (46.20)	24.54 (159.50)*
	15-30 days	-1.29 (48.60)	1.86 (48.97)	2.30 (19.47)	2.86 (82.34)
	31-60 days	7.40 (62.50)	6.50 (40.92)	0.36 (21.87)	14.26 (85.80)*

[1] Staff Time Measurement
* $P < 0.05$

Table A.34: RUG-III Special Rehabilitation Group Classification Agreement Between MDS 2.0 and CAN-STRIVE Staff Time Measurement, Ontario Complex Continuing Care, 2007 - 2009, n = 810

		Second Classification					
Temporal Order	First Classification	DNQ[1] (%)	Low (%)	Medium (%)	High (%)	Very High (%)	Ultra High (%)
MDS 2.0 before STM[2] (n = 810)	DNQ[1]	86.12	8.47	4.94	0.47	0.00	0.00
	Low	50.31	39.75	9.32	0.62	0.00	0.00
	Medium	38.54	20.83	36.98	3.65	0.00	0.00
	High	19.05	23.81	38.10	14.29	4.76	0.00
	Very High	36.36	45.45	9.09	9.09	0.00	0.00
	Ultra High	0.00	0.00	0.00	0.00	0.00	0.00
STM[2] before MDS 2.0 (n = 692)	DNQ[1]	89.43	6.44	4.12	0.00	0.00	0.00
	Low	52.98	38.10	8.93	0.00	0.00	0.00
	Medium	26.27	33.05	33.05	5.08	2.54	0.00
	High	42.86	7.14	35.71	7.14	0.00	7.14
	Very High	0.00	0.00	75.00	0.00	25.00	0.00
	Ultra High	0.00	0.00	0.00	0.00	0.00	0.00

[1] Did not qualify for Special Rehabilitation
[2] Staff Time Measurement

Table A.35: Kappa Statistics for RUG-III Special Rehabilitation Group Classification Agreement Between Usual RAI MDS 2.0 and CAN-STRIVE Staff-time Measurement, Ontario Complex Continuing Care, 2007 - 2009, n = 1,502

Time Difference	MDS 2.0 First (95% CI)	STM First (95% CI)
Overall	0.44 (0.38-0.51)	0.54 (0.47-0.61)
0-6 days	0.53 (0.39-0.67)	0.66 (0.55-0.76)
7-14 days	0.48 (0.33-0.63)	0.51 (0.38-0.63)
15-30 days	0.41 (0.29-0.52)	0.40 (0.22-0.57)
31-60 days	0.41 (0.30-0.52)	0.43 (0.28-0.58)

Appendix B

Additional Tables for Chapter 3

B.1 Descriptive Statistics for Sample Used in Phase 1 and Phase 2

Table B.1: Distribution of Demographic Variables Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Female		22,203	59.2	7,398	51.7	5,472	64.2	9,333	63.7
Age Group	0-64	4,602	12.3	2,826	19.7	487	5.7	1,289	8.8
	65-74	5,439	14.5	2,387	16.7	942	11.0	2,110	14.4
	75-84	12,627	33.7	4,437	31.0	2,895	34.0	5,295	36.2
	85-94	13,341	35.6	4,219	29.5	3,704	43.4	5,418	37.0
	95+	1,477	3.9	449	3.1	497	5.8	531	3.6
Support Person Positive Towards Discharge		26,226	70.0	7,612	53.2	5,819	68.3	12,795	87.4

Table B.2: Distribution of Diagnostic Condition Variables Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Amputation	597	1.9	286	2.5	96	1.3	215	1.8
Arthritis	9,438	30.5	2,958	26.2	2,421	32.2	4,059	33.5
Cardiac Conditions	14,582	47.2	4,926	43.7	3,671	48.8	5,985	49.3
Cancer	5,210	16.8	2,490	22.1	1,020	13.6	1,700	14.0
Neurological Conditions	3,422	11.1	1,396	12.4	792	10.5	1,234	10.2
Other Medically Complex Conditions	4,642	15.0	1,785	15.8	937	12.5	1,920	15.8
Orthopedic Conditions	8,091	26.2	2,335	20.7	1,856	24.7	3,900	32.2
Pulmonary Conditions	5,868	19.0	1,988	17.6	1,341	17.8	2,539	20.9
Spinal Cord Injury	488	1.6	354	3.1	48	0.6	86	0.7
Stroke	7,359	23.8	3,057	27.1	1,778	23.7	2,524	20.8
Traumatic Brain Injury	510	1.6	295	2.6	85	1.1	130	1.1

Table B.3: Distribution of Health Conditions Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Aphasia	1,783	5.8	1,081	9.6	340	4.5	362	3.0
Hallucinations/Delusions	2,151	7.0	926	8.2	718	9.6	507	4.2
Stage 2+ Pressure Ulcer	5,009	16.2	2,248	19.9	1,027	13.7	1,734	14.3
Shortness of Breath	5,660	18.3	2,078	18.4	1,356	18.0	2,226	18.4
Unsteady Gait	15,972	51.6	5,077	45.0	4,177	55.6	6,718	55.4
Fluctuating Health Status	15,774	51.0	6,207	55.0	4,429	58.9	5,138	42.4
Acute Episode of Chronic Disease	10,719	34.7	3,548	31.5	2,757	36.7	4,414	36.4

Table B.4: Distribution of Outcome Measures Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
ADL-Hierarchy Scale	0	1,097	3.5	304	2.7	245	3.3	548	4.5
	1	1,669	5.4	331	2.9	372	5.0	966	8.0
	2	6,122	19.8	1,401	12.4	1,265	16.8	3,456	28.5
	3	5,762	18.6	2,092	18.5	1,292	17.2	2,378	19.6
	4	4,662	15.1	1,624	14.4	1,151	15.3	1,887	15.6
	5	9,146	29.6	4,068	36.1	2,405	32.0	2,673	22.0
	6	2,466	8.0	1,459	12.9	785	10.4	222	1.8
Cognitive Performance Scale	0	7,498	24.2	2,302	20.4	1,159	15.4	4,037	33.3
	1	5,234	16.9	1,717	15.2	1,057	14.1	2,460	20.3
	2	5,586	18.1	1,974	17.5	1,205	16.0	2,407	19.8
	3	6,971	22.5	2,561	22.7	2,244	29.9	2,166	17.9
	4	1,568	5.1	802	7.1	447	5.9	319	2.6
	5	2,706	8.8	1,104	9.8	963	12.8	639	5.3
	6	1,361	4.4	819	7.3	440	5.9	102	0.8
CHESS	0	5,866	19.0	2,269	20.1	1,260	16.8	2,337	19.3
	1	7,687	24.9	2,591	23.0	1,582	21.1	3,514	29.0
	2	8,970	29.0	3,111	27.6	2,236	29.8	3,623	29.9
	3	5,595	18.1	1,956	17.3	1,602	21.3	2,037	16.8
	4	2,421	7.8	1,058	9.4	778	10.4	585	4.8
	5	385	1.2	294	2.6	57	0.8	34	0.3
Pain Scale	0	10,021	32.4	3,728	33.1	2,843	37.8	3,450	28.4
	1	9,382	30.3	3,552	31.5	2,133	28.4	3,697	30.5
	2	10,020	32.4	3,361	29.8	2,258	30.0	4,401	36.3
	3	1,501	4.9	638	5.7	281	3.7	582	4.8
Depression Rating Scale	0-2	24,656	79.7	8,631	76.5	5,817	77.4	10,208	84.2
	3+	6,268	20.3	2,648	23.5	1,698	22.6	1,922	15.8

Table B.5: Distribution of Cognition Variables Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Short-term Memory Problem		17,778	57.5	7,048	62.5	5,225	69.5	5,505	45.4
Decision-making Skills	Independent	9,336	30.2	2,990	26.5	1,499	19.9	4,847	40.0
	Modified Independence	8,890	28.7	2,992	26.5	1,881	25.0	4,017	33.1
	Moderately Impaired	8,631	27.9	3,374	29.9	2,732	36.4	2,525	20.8
	Severally Impaired	4,067	13.2	1,923	17.0	1,403	18.7	741	6.1
Expression	Understood	20,176	65.2	6,380	56.6	4,601	61.2	9,195	75.8
	Usually Understood	6,600	21.3	2,701	23.9	1,737	23.1	2,162	17.8
	Sometimes Understood	3,132	10.1	1,566	13.9	910	12.1	656	5.4
	Rarely or Never Understood	1,016	3.3	632	5.6	267	3.6	117	1.0
Speech Clarity	Clear	25,943	83.9	8,686	77.0	6,238	83.0	11,019	90.8
	Unclear	4,219	13.6	2,108	18.7	1,104	14.7	1,007	8.3
	No Speech	762	2.5	485	4.3	173	2.3	104	0.9
Comprehension	Understands	18,025	58.3	5,805	51.5	3,899	51.9	8,321	68.6
	Usually Understands	7,891	25.5	3,107	27.5	2,028	27.0	2,756	22.7
	Sometimes Understands	4,185	13.5	1,884	16.7	1,324	17.6	977	8.1
	Rarely or Never Understands	823	2.7	483	4.3	264	3.5	76	0.6

Table B.6: Distribution of Variables Related to Social Participation Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Index of Social Engagement	0	4,214	13.6	1,782	15.8	1,422	18.9	1,010	8.3
	1	4,807	15.5	2,068	18.3	1,409	18.7	1,330	11.0
	2	4,162	13.5	1,644	14.6	992	13.2	1,526	12.6
	3	4,675	15.1	1,766	15.7	960	12.8	1,949	16.1
	4	4,934	16.0	1,655	14.7	1,049	14.0	2,230	18.4
	5	2,630	8.5	836	7.4	583	7.8	1,211	10.0
	6	5,502	17.8	1,528	13.5	1,100	14.6	2,874	23.7
Time Involved in Activities	Most	7,567	24.5	2,672	23.7	1,505	20.0	3,390	27.9
	Some	11,905	38.5	4,034	35.8	2,677	35.6	5,194	42.8
	Little	8,724	28.2	3,314	29.4	2,543	33.8	2,867	23.6
	None	2,728	8.8	1,259	11.2	790	10.5	679	5.6

Table B.7: Distribution of Variables Related to Clinical Change and Rehabilitation Potential Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Change in ADL Function	No Change	9,469	30.6	4,340	38.5	2,136	28.4	2,993	24.7
	Improved	2,872	9.3	594	5.3	437	5.8	1,841	15.2
	Deteriorated	18,583	60.1	6,345	56.3	4,942	65.8	7,296	60.1
Change in Cognitive Status	No Change	20,765	67.1	7,455	66.1	4,232	56.3	9,078	74.8
	Improved	725	2.3	208	1.8	162	2.2	355	2.9
	Deteriorated	9,434	30.5	3,616	32.1	3,121	41.5	2,697	22.2
Change in Communication or Hearing	No Change	25,592	82.8	8,979	79.6	5,925	78.8	10,688	88.1
	Improved	403	1.3	132	1.2	91	1.2	180	1.5
	Deteriorated	4,929	15.9	2,168	19.2	1,499	19.9	1,262	10.4
Rehabilitation Potential	Neither Patient or Provider	14,320	46.3	6,281	55.7	4,119	54.8	3,920	32.3
	Only Patient	2,282	7.4	798	7.1	558	7.4	926	7.6
	Only Provider	3,859	12.5	1,325	11.7	980	13.0	1,554	12.8
	Both Patient and Provider	10,463	33.8	2,875	25.5	1,858	24.7	5,730	47.2

Table B.8: Distribution of Therapy Intensity Variables Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Physical Therapy Quintile	No Therapy	4,632	15.0	2,333	20.7	1,700	22.6	599	4.9
	1st Quintile	6,499	21.0	2,856	25.3	2,016	26.8	1,627	13.4
	2nd Quintile	4,250	13.7	1,577	14.0	1,044	13.9	1,629	13.4
	3rd Quintile	5,034	16.3	1,647	14.6	1,032	13.7	2,355	19.4
	4th Quintile	5,346	17.3	1,425	12.6	893	11.9	3,028	25.0
	5th Quintile	5,163	16.7	1,441	12.8	830	11.0	2,892	23.8
Occupational Therapy Quintile	No Therapy	8,817	28.5	3,581	31.7	3,129	41.6	2,107	17.4
	1st Quintile	4,866	15.7	1,868	16.6	1,302	17.3	1,696	14.0
	2nd Quintile	4,173	13.5	1,479	13.1	967	12.9	1,727	14.2
	3rd Quintile	4,448	14.4	1,536	13.6	842	11.2	2,070	17.1
	4th Quintile	4,235	13.7	1,302	11.5	686	9.1	2,247	18.5
	5th Quintile	4,385	14.2	1,513	13.4	589	7.8	2,283	18.8
Speech-language Pathology Therapy Quintile	No Therapy	25,871	83.7	8,815	78.2	6,579	87.5	10,477	86.4
	1st Quintile	1,757	5.7	788	7.0	347	4.6	622	5.1
	2nd Quintile	640	2.1	299	2.7	143	1.9	198	1.6
	3rd Quintile	795	2.6	384	3.4	166	2.2	245	2.0
	4th Quintile	872	2.8	450	4.0	157	2.1	265	2.2
	5th Quintile	989	3.2	543	4.8	123	1.6	323	2.7
Special Rehabilitation Intensity	Did Not Qualify	9,382	30.3	4,281	38.0	3,341	44.5	1,760	14.5
	Low Intensity (RL*)	5,035	16.3	1,927	17.1	1,422	18.9	1,686	13.9
	Medium Intensity (RM*)	12,311	39.8	3,847	34.1	2,171	28.9	6,293	51.9
	High Intensity (RH*)	2,749	8.9	660	5.9	403	5.4	1,686	13.9
	Very High Intensity (RV*)	1,098	3.6	398	3.5	139	1.8	561	4.6
	Ultra High Intensity (RU*)	349	1.1	166	1.5	39	0.5	144	1.2

Table B.9: Distribution of Facility and Region Variables Among Overall Sample, Long-stay CCC Sub-sample, LTC Discharge Sub-sample, and Home Care Discharge Sub-sample, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		Overall Sample		CCC Sub-sample		LTC Sub-sample		HC Sub-sample	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Facility Size	Small	6,314	20.4	1,515	13.4	2,512	33.4	2,287	18.9
	Medium	12,674	41.0	3,584	31.8	3,491	46.5	5,599	46.2
	Large	11,936	38.6	6,180	54.8	1,512	20.1	4,244	35.0
Facility Area	Urban Area	26,973	88.2	10,078	90.5	6,145	82.6	10,750	89.5
	Rural Area	3,539	11.6	1,027	9.2	1,285	17.3	1,227	10.2
	Not Assigned	78	0.3	31	0.3	11	0.1	36	0.3
LHIN	Central	1,286	4.2	242	2.1	449	6.0	595	4.9
	Central East	2,391	7.7	701	6.2	838	11.2	852	7.0
	Central West	899	2.9	198	1.8	504	6.7	197	1.6
	Champlain	1,591	5.1	827	7.3	348	4.6	416	3.4
	Erie St. Clair	1,945	6.3	944	8.4	834	11.1	167	1.4
	Hamilton Niagara Hal	5,880	19.0	1,711	15.2	957	12.7	3,212	26.5
	Mississauga Halton	1,651	5.3	592	5.2	324	4.3	735	6.1
	North East	1,628	5.3	620	5.5	487	6.5	521	4.3
	North Simcoe Muskoka	822	2.7	281	2.5	163	2.2	378	3.1
	North West	1,145	3.7	518	4.6	161	2.1	466	3.8
	South East	1,197	3.9	309	2.7	259	3.4	629	5.2
	South West	2,330	7.5	620	5.5	1,036	13.8	674	5.6
	Toronto Central	6,627	21.4	3,345	29.7	845	11.2	2,437	20.1
	Waterloo Wellington	1,532	5.0	371	3.3	310	4.1	851	7.0

B.2 Level of ADL Self-performance at Admission and Follow-up

Table B.10: Level of ADL Self-performance at Admission and Follow-up, Long-stay CCC Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 14,319

		ADL Self-performance					
ADL	Time	Independent	Supervision	Limited Assistance	Extensive Assistance	Total Dependence	*P-value*
Bed Mobility	Admission	16.5	4.4	21.9	31.4	25.7	<0.0001
	Follow-up	20.7	4.8	21.4	26.4	26.7	
Transfer	Admission	8.8	5.3	18.3	28.2	39.3	<0.0001
	Follow-up	12.5	6.8	19.8	22.3	38.5	
Locomotion	Admission	15.7	7.8	15.3	14.1	47.1	<0.0001
	Follow-up	21.5	10.2	14.2	11.5	42.6	
Eating	Admission	32.6	20.3	19.6	9.3	18.3	<0.0001
	Follow-up	34.5	19.6	17.7	9.4	18.7	
Toilet Use	Admission	16.5	4.4	21.9	31.4	25.7	<0.0001
	Follow-up	20.7	4.8	21.4	26.4	26.7	
Personal Hygiene	Admission	5.5	4.5	21.3	32.1	36.6	<0.0001
	Follow-up	7.9	5.2	21.3	27.8	37.8	
Bathing	Admission	1.9	2.4	4.9	35.7	55.2	<0.0001
	Follow-up	2.0	3.3	6.3	34.8	53.5	

Table B.11: Level of ADL Self-performance at Admission and Follow-up, Home Care Discharge Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 14,638

		ADL Self-performance					
ADL	Time	Independent	Supervision	Limited Assistance	Extensive Assistance	Total Dependence	*P-value*
Bed Mobility	Admission	25.1	9.1	34.6	25.0	6.1	<0.0001
	Follow-up	77.9	4.6	8.5	6.5	2.5	
Transfer	Admission	10.5	12.2	37.6	29.1	10.6	<0.0001
	Follow-up	58.1	10.5	13.7	14.0	3.7	
Locomotion	Admission	19.2	15.2	27.4	15.5	22.7	<0.0001
	Follow-up	57.2	17.4	10.4	9.1	5.9	
Eating	Admission	49.4	25.7	17.4	4.4	3.1	<0.0001
	Follow-up	84.2	7.9	4.5	2.1	1.4	
Toilet Use	Admission	25.1	9.1	34.6	25.0	6.1	<0.0001
	Follow-up	77.9	4.6	8.5	6.5	2.5	
Personal Hygiene	Admission	11.4	10.9	38.4	29.8	9.5	<0.0001
	Follow-up	50.0	11.1	22.9	12.7	3.3	
Bathing	Admission	3.2	5.4	13.1	53.2	25.1	<0.0001
	Follow-up	8.2	4.7	30.0	47.2	9.9	

Table B.12: Level of ADL Self-performance at Admission and Follow-up, Long-term Care Facility Discharge Strata, Ontario Complex Continuing Care, 2010 - 2015, n = 8,525

		ADL Self-performance					
ADL	Time	Independent	Supervision	Limited Assistance	Extensive Assistance	Total Dependence	*P-value*
Bed Mobility	Admission	22.8	5.7	23.9	27.1	20.5	<0.0001
	Follow-up	20.4	7.4	16.4	44.1	11.8	
Transfer	Admission	11.4	7.6	23.8	28.8	28.4	<0.0001
	Follow-up	11.7	8.3	17.0	41.8	21.2	
Locomotion	Admission	13.3	11.0	19.2	14.9	41.7	<0.0001
	Follow-up	17.2	13.9	13.6	22.7	32.6	
Eating	Admission	31.3	24.2	21.3	9.7	13.5	<0.0001
	Follow-up	31.4	40.5	11.2	9.3	7.6	
Toilet Use	Admission	22.8	5.7	23.9	27.1	20.5	<0.0001
	Follow-up	20.4	7.4	16.4	44.1	11.8	
Personal Hygiene	Admission	6.4	7.0	24.6	31.3	30.7	<0.0001
	Follow-up	5.4	5.2	17.8	52.1	19.4	
Bathing	Admission	1.7	3.6	7.6	37.4	49.7	<0.0001
	Follow-up	0.6	1.6	4.8	52.7	40.4	

B.3 Raw and Time-adjusted Marginal Means for the ADL-Long Scale

Table B.13: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Health Conditions, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time Adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Aphasia	No (Ref)	-3.3 (0.0)			-3.3 (0.0)		
	Yes	-1.6 (0.2)	1.7 (1.4, 2.0)	<.0001	-2.2 (0.2)	1.1 (0.7, 1.4)	<.0001
Hallucinations or Delusions	No (Ref)	-3.3 (0.0)			-3.3 (0.0)		
	Yes	-2.0 (0.1)	1.3 (1.0, 1.6)	<.0001	-2.2 (0.1)	1.1 (0.8, 1.4)	<.0001
Unsteady Gait	No (Ref)	-2.8 (0.1)			-2.9 (0.1)		
	Yes	-3.6 (0.1)	-0.9 (-1.0, -0.7)	<.0001	-3.5 (0.1)	-0.6 (-0.8, -0.5)	<.0001
Uses Cane, Walker or Crutch	No (Ref)	-2.6 (0.1)			-2.9 (0.1)		
	Yes	-3.8 (0.1)	-1.2 (-1.3, -1.0)	<.0001	-3.5 (0.1)	-0.5 (-0.7, -0.4)	<.0001
Uses Wheelchair	No (Ref)	-2.3 (0.1)			-1.9 (0.1)		
	Yes	-3.7 (0.0)	-1.5 (-1.6, -1.3)	<.0001	-3.9 (0.1)	-1.9 (-2.1, -1.8)	<.0001
Shortness of Breath	No (Ref)	-3.1 (0.0)			-3.2 (0.0)		
	Yes	-3.6 (0.1)	-0.4 (-0.6, -0.2)	<.0001	-3.5 (0.1)	-0.3 (-0.5, -0.2)	0.0004
Stage 2+ Ulcer	No (Ref)	-3.2 (0.0)			-3.1 (0.0)		
	Yes	-3.4 (0.1)	-0.2 (-0.5, -0.0)	0.0171	-3.7 (0.1)	-0.5 (-0.7, -0.3)	<.0001
Surgical Wounds	No (Ref)	-2.8 (0.0)			-2.8 (0.0)		
	Yes	-5.0 (0.1)	-2.2 (-2.4, -2.0)	<.0001	-5.0 (0.1)	-2.2 (-2.4, -2.0)	<.0001
Fluctuating Health Status	No (Ref)	-3.5 (0.1)			-3.5 (0.1)		
	Yes	-2.9 (0.1)	0.6 (0.4, 0.7)	<.0001	-3.0 (0.1)	0.5 (0.3, 0.6)	<.0001
Acute Episode of Chronic Condition	No (Ref)	-2.9 (0.0)			-3.0 (0.1)		
	Yes	-3.9 (0.1)	-1.0 (-1.1, -0.8)	<.0001	-3.7 (0.1)	-0.8 (-0.9, -0.6)	<.0001

Negative values indicate that the comparison group improved more than the reference group

Table B.14: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Change in Health Status and Rehabilitation Potential, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time Adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Change in ADL Function	No Change (Ref)	-1.7 (0.1)			-1.9 (0.1)		
	Improved	-3.6 (0.1)	-1.9 (-2.2, -1.6)	<.0001	-3.4 (0.1)	-1.4 (-1.7, -1.1)	<.0001
	Deteriorated	-3.9 (0.0)	-2.2 (-2.4, -2.0)	<.0001	-3.9 (0.1)	-1.9 (-2.1, -1.7)	<.0001
Change in Cognition	No Change (Ref)	-3.4 (0.0)			-3.4 (0.1)		
	Improved	-3.1 (0.2)	0.3 (-0.3, 0.9)	0.4232	-3.0 (0.2)	0.4 (-0.2, 0.9)	0.2556
	Deteriorated	-2.8 (0.1)	0.6 (0.4, 0.7)	<.0001	-2.9 (0.1)	0.5 (0.3, 0.7)	<.0001
Rehabilitation Potential	Neither Patient or Provider (Ref)	-2.0 (0.1)			-2.2 (0.1)		
	Only Patient	-2.5 (0.1)	-0.4 (-0.8, -0.1)	0.0090	-2.5 (0.1)	-0.3 (-0.7, 0.1)	0.1119
	Only Provider	-3.8 (0.1)	-1.7 (-2.0, -1.4)	<.0001	-3.8 (0.1)	-1.6 (-1.9, -1.3)	<.0001
	Both Patient and Provider	-4.8 (0.1)	-2.8 (-3.0, -2.6)	<.0001	-4.6 (0.1)	-2.5 (-2.7, -2.3)	<.0001

Negative values indicate that the comparison group improved more than the reference group

Table B.15: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Social Engagement Variables, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time Adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Index of Social Engagement	0 (Ref)	-2.7 (0.1)			-2.9 (0.1)		
	1	-2.3 (0.1)	0.4 (0.0, 0.8)	0.0188	-2.4 (0.1)	0.4 (0.1, 0.8)	0.0166
	2	-3.0 (0.1)	-0.3 (-0.7, 0.1)	0.2432	-3.1 (0.1)	-0.3 (-0.6, 0.1)	0.2811
	3	-3.3 (0.1)	-0.6 (-1.0, -0.2)	0.0002	-3.4 (0.1)	-0.5 (-0.9, -0.2)	0.0009
	4	-3.7 (0.1)	-1.0 (-1.4, -0.6)	<.0001	-3.7 (0.1)	-0.8 (-1.2, -0.5)	<.0001
	5	-3.5 (0.1)	-0.8 (-1.2, -0.4)	<.0001	-3.4 (0.1)	-0.6 (-1.0, -0.2)	0.0020
	6	-3.8 (0.1)	-1.1 (-1.5, -0.8)	<.0001	-3.6 (0.1)	-0.8 (-1.1, -0.4)	<.0001
Time Involved in Activities	Most (Ref)	-3.1 (0.1)			-3.1 (0.1)		
	Some	-3.8 (0.1)	-0.7 (-0.9, -0.5)	<.0001	-3.7 (0.1)	-0.7 (-0.9, -0.5)	<.0001
	Little	-2.8 (0.1)	0.3 (0.1, 0.6)	0.0106	-2.8 (0.1)	0.2 (0.0, 0.5)	0.0411
	None	-2.4 (0.1)	0.6 (0.3, 1.0)	<.0001	-2.7 (0.1)	0.4 (0.1, 0.8)	0.0152

Negative values indicate that the comparison group improved more than the reference group

Table B.16: Raw and Time-adjusted Marginal Means for Difference in ADL-long Scale Between Admission and Follow-up Stratified by Facility and Region Variables, Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

		ADL-long Scale			ADL-long Scale (Time Adjusted)		
Variable		Mean Change	Difference from Ref	*P-Value*	Mean Change	Difference from Ref	*P-Value*
Facility Size	Small (Ref)	-3.0 (0.1)			-2.6 (0.1)		
	Medium	-3.5 (0.1)	-0.4 (-0.7, -0.2)	<.0001	-3.3 (0.1)	-0.7 (-0.9, -0.5)	<.0001
	Large	-3.1 (0.1)	-0.1 (-0.3, 0.2)	0.8233	-3.5 (0.1)	-0.9 (-1.1, -0.7)	<.0001
Facility Location	Urban Area (Ref)	-3.3 (0.0)			-3.3 (0.0)		
	Rural Area	-2.8 (0.1)	0.5 (0.2, 0.7)	0.0002	-2.5 (0.1)	0.8 (0.5, 1.0)	<.0001
	Not Assigned	-2.3 (0.8)	1.0 (-0.7, 2.7)	0.3452	-2.5 (0.8)	0.8 (-0.8, 2.5)	0.4559
Facility Area Income Quintile	1st Quintile (Ref)	-3.2 (0.1)			-3.2 (0.1)		
	2nd Quintile	-3.2 (0.1)	0.0 (-0.3, 0.3)	1.0000	-3.2 (0.1)	0.0 (-0.3, 0.3)	1.0000
	3rd Quintile	-3.3 (0.1)	-0.1 (-0.4, 0.1)	0.6240	-3.3 (0.1)	-0.1 (-0.4, 0.2)	0.7381
	4th Quintile	-3.3 (0.1)	-0.2 (-0.5, 0.1)	0.4572	-3.3 (0.1)	-0.1 (-0.4, 0.2)	0.7954
	5th Quintile	-3.2 (0.1)	-0.0 (-0.3, 0.3)	1.0000	-3.2 (0.1)	-0.0 (-0.3, 0.3)	1.0000
	Not Assigned	-2.5 (0.3)	0.6 (-0.2, 1.4)	0.1778	-2.8 (0.3)	0.4 (-0.4, 1.1)	0.6745
LHIN	Toronto Central (Ref)	-3.2 (0.1)			-3.5 (0.1)		
	Central	-3.8 (0.2)	-0.6 (-1.1, 0.0)	0.0665	-3.4 (0.2)	0.1 (-0.4, 0.7)	0.9993
	Central East	-1.7 (0.1)	1.5 (1.1, 2.0)	<.0001	-1.5 (0.1)	2.1 (1.6, 2.5)	<.0001
	Central West	-5.4 (0.2)	-2.2 (-2.9, -1.6)	<.0001	-4.9 (0.2)	-1.4 (-2.0, -0.7)	<.0001
	Champlain	-2.0 (0.2)	1.2 (0.6, 1.7)	<.0001	-2.3 (0.2)	1.2 (0.7, 1.7)	<.0001
	Erie St. Clair	-1.6 (0.2)	1.6 (1.1, 2.1)	<.0001	-1.9 (0.1)	1.7 (1.2, 2.2)	<.0001
	HNHB*	-4.2 (0.1)	-1.0 (-1.4, -0.7)	<.0001	-4.1 (0.1)	-0.5 (-0.8, -0.2)	0.0003
	Mississauga Halton	-3.7 (0.2)	-0.5 (-1.0, 0.0)	0.0744	-3.8 (0.2)	-0.3 (-0.8, 0.2)	0.7431
	North East	-1.8 (0.2)	1.4 (0.9, 1.9)	<.0001	-2.0 (0.2)	1.6 (1.1, 2.1)	<.0001
	North Simcoe Muskoka	-4.3 (0.2)	-1.1 (-1.8, -0.4)	<.0001	-4.6 (0.2)	-1.0 (-1.7, -0.3)	0.0005
	North West	-3.9 (0.2)	-0.7 (-1.3, -0.1)	0.0087	-4.1 (0.2)	-0.5 (-1.1, 0.1)	0.1671
	South East	-4.1 (0.2)	-0.9 (-1.5, -0.3)	0.0004	-3.7 (0.2)	-0.1 (-0.8, 0.4)	0.9993
	South West	-2.7 (0.1)	0.5 (0.0, 0.9)	0.0416	-2.3 (0.1)	1.3 (0.8, 1.8)	<.0001
	Waterloo Wellington	-3.2 (0.2)	-0.0 (-0.6, 0.5)	1.0000	-3.1 (0.2)	0.4 (-0.1, 0.9)	0.2900

Negative values indicate that the comparison group improved more than the reference group
* Hamilton Niagara Haldimand Brant

B.4 Pairwise Comparison Matrices for ADL-Long Scale Mean Differences

Table B.17: Pairwise Comparison Matrix of ADL-long Scale Mean Differences by Physical Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	No Therapy	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile
1st Quintile	-1.51 (-1.15,-1.87), <.0001				
2nd Quintile	-2.49 (-2.10,-2.89), <.0001	-0.98 (-0.61,-1.35), <.0001			
3rd Quintile	-3.44 (-3.06,-3.82), <.0001	-1.93 (-1.58,-2.28), <.0001	-0.95 (-0.56,-1.34), <.0001		
4th Quintile	-4.20 (-3.83,-4.58), <.0001	-2.69 (-2.35,-3.03), <.0001	-1.71 (-1.33,-2.09), <.0001	-0.76 (-0.39,-1.12), <.0001	
5th Quintile	-4.69 (-4.31,-5.06), <.0001	-3.17 (-2.83,-3.52), <.0001	-2.20 (-1.81,-2.58), <.0001	-1.24 (-0.87,-1.61), <.0001	-0.48 (-0.12,-0.85), 0.0020

Table B.18: Pairwise Comparison Matrix of ADL-long Scale Efficiency Mean Differences by Physical Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	No Therapy	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile
1st Quintile	-0.03 (-0.02,-0.04), <.0001				
2nd Quintile	-0.05 (-0.04,-0.05), <.0001	-0.01 (-0.01,-0.02), <.0001			
3rd Quintile	-0.07 (-0.06,-0.08), <.0001	-0.04 (-0.03,-0.05), <.0001	-0.03 (-0.02,-0.03), <.0001		
4th Quintile	-0.09 (-0.08,-0.10), <.0001	-0.06 (-0.05,-0.06), <.0001	-0.04 (-0.03,-0.05), <.0001	-0.02 (-0.01,-0.03), <.0001	
5th Quintile	-0.10 (-0.09,-0.11), <.0001	-0.07 (-0.06,-0.08), <.0001	-0.05 (-0.05,-0.06), <.0001	-0.03 (-0.02,-0.04), <.0001	-0.01 (-0.00,-0.02), 0.0011

Table B.19: Pairwise Comparison Matrix of ADL-long Scale Mean Differences by Occupational Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	No Therapy	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile
1st Quintile	-1.20 (-0.86,-1.54), <.0001				
2nd Quintile	-1.38 (-1.03,-1.74), <.0001	-0.18 (0.22,-0.58), 0.7804			
3rd Quintile	-1.90 (-1.55,-2.25), <.0001	-0.70 (-0.31,-1.09), <.0001	-0.52 (-0.11,-0.93), 0.0043		
4th Quintile	-2.59 (-2.23,-2.94), <.0001	-1.39 (-0.99,-1.79), <.0001	-1.20 (-0.79,-1.62), <.0001	-0.69 (-0.28,-1.09), <.0001	
5th Quintile	-2.72 (-2.37,-3.07), <.0001	-1.53 (-1.13,-1.92), <.0001	-1.34 (-0.93,-1.75), <.0001	-0.82 (-0.42,-1.23), <.0001	-0.14 (0.27,-0.55), 0.9316

Table B.20: Pairwise Comparison Matrix of ADL-long Scale Efficiency Mean Differences by Occupational Rehabilitation Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	No Therapy	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile
1st Quintile	-0.02 (-0.02,-0.03), <.0001				
2nd Quintile	-0.03 (-0.02,-0.04), <.0001	-0.01 (0.00,-0.01), 0.3195			
3rd Quintile	-0.04 (-0.03,-0.04), <.0001	-0.01 (-0.00,-0.02), 0.0005	-0.01 (0.00,-0.01), 0.3621		
4th Quintile	-0.05 (-0.04,-0.06), <.0001	-0.02 (-0.01,-0.03), <.0001	-0.02 (-0.01,-0.03), <.0001	-0.01 (-0.00,-0.02), 0.0051	
5th Quintile	-0.06 (-0.05,-0.07), <.0001	-0.03 (-0.02,-0.04), <.0001	-0.03 (-0.02,-0.04), <.0001	-0.02 (-0.01,-0.03), <.0001	-0.01 (-0.00,-0.02), 0.0163

Table B.21: Pairwise Comparison Matrix of ADL-long Scale Mean Differences by Speech-language Pathology Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	No Therapy	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile
1st Quintile	0.14 (0.61,-0.33), 0.9579				
2nd Quintile	0.59 (1.36,-0.18), 0.2444	0.45 (1.33,-0.44), 0.7024			
3rd Quintile	0.44 (1.13,-0.25), 0.4545	0.30 (1.12,-0.52), 0.9043	-0.15 (0.87,-1.17), 0.9984		
4th Quintile	0.37 (1.03,-0.29), 0.5890	0.23 (1.03,-0.56), 0.9609	-0.21 (0.78,-1.21), 0.9902	-0.07 (0.87,-1.01), 1.0000	
5th Quintile	-0.06 (0.56,-0.68), 0.9998	-0.20 (0.56,-0.96), 0.9765	-0.65 (0.33,-1.62), 0.4063	-0.50 (0.42,-1.41), 0.6290	-0.43 (0.46,-1.32), 0.7383

Table B.22: Pairwise Comparison Matrix of ADL-long Scale Efficiency Mean Differences by Speech-language Pathology Therapy Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	No Therapy	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile
1st Quintile	0.02 (0.03,0.01), <.0001				
2nd Quintile	0.02 (0.04,-0.01), 0.3516	-0.00 (0.03,-0.03), 1.0000			
3rd Quintile	0.02 (0.03,0.01), <.0001	0.00 (0.02,-0.01), 0.9963	0.00 (0.03,-0.03), 0.9993		
4th Quintile	0.02 (0.04,0.01), <.0001	0.00 (0.02,-0.01), 0.9906	0.00 (0.03,-0.02), 0.9981	0.00 (0.02,-0.02), 1.0000	
5th Quintile	0.02 (0.04,0.01), <.0001	0.00 (0.02,-0.01), 0.9762	0.01 (0.03,-0.02), 0.9960	0.00 (0.02,-0.02), 0.9999	0.00 (0.02,-0.02), 1.0000

Table B.23: Pairwise Comparison Matrix of ADL-long Scale Mean Differences by RUG-III Rehabilitation Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	Did Not Qualify	Low Intensity (RL*)	Medium Intensity (RM*)	High Intensity (RH*)	Very High Intensity (RU*)
Low Intensity (RL*)	-1.75 (-1.42,-2.07), <.0001				
Medium Intensity (RM*)	-2.90 (-2.65,-3.16), <.0001	-1.16 (-0.84,-1.47), <.0001			
High Intensity (RH*)	-4.03 (-3.62,-4.44), <.0001	-2.28 (-1.84,-2.73), <.0001	-1.13 (-0.73,-1.52), <.0001		
Very High Intensity (RV*)	-3.67 (-3.07,-4.26), <.0001	-1.92 (-1.30,-2.54), <.0001	-0.76 (-0.17,-1.35), 0.0032	0.36 (1.03,-0.31), 0.6368	
Ultra High Intensity (RU*)	-2.61 (-1.58,-3.63), <.0001	-0.86 (0.18,-1.90), 0.1714	0.30 (1.32,-0.72), 0.9614	1.42 (2.49,0.36), 0.0020	1.06 (2.21,-0.09), 0.0919

Table B.24: Pairwise Comparison Matrix of ADL-long Scale Efficiency Mean Differences by RUG-III Rehabilitation Intensity (Tukey Adjustment), Ontario Complex Continuing Care, 2010 - 2015, n = 30,924

	Did Not Qualify	Low Intensity (RL*)	Medium Intensity (RM*)	High Intensity (RH*)	Very High Intensity (RU*)
Low Intensity (RL*)	-0.04 (-0.03,-0.04), <.0001				
Medium Intensity (RM*)	-0.06 (-0.05,-0.06), <.0001	-0.02 (-0.01,-0.03), <.0001			
High Intensity (RH*)	-0.08 (-0.07,-0.09), <.0001	-0.05 (-0.04,-0.06), <.0001	-0.03 (-0.02,-0.03), <.0001		
Very High Intensity (RV*)	-0.08 (-0.07,-0.09), <.0001	-0.04 (-0.03,-0.06), <.0001	-0.02 (-0.01,-0.04), <.0001	0.00 (0.02,-0.01), 0.9943	
Ultra High Intensity (RU*)	-0.04 (-0.02,-0.06), <.0001	-0.00 (0.02,-0.03), 0.9960	0.02 (0.04,-0.00), 0.2278	0.04 (0.07,0.02), <.0001	0.04 (0.07,0.02), <.0001

B.5 Multiple Linear Regression Models for Change in the ADL-Long Scale

Table B.25: Multiple Linear Regression Model Predicting Change in ADL-long Scale, First ADL-long Scale Tertile, Ontario Complex Continuing Care, 2010 - 2015, n = 10,980

Variable	Estimate (SE)	*t-statistic*	*P-value*
Intercept	2.32 (0.39)	5.91	<.0001
Age Group (Ref = 0-64)			
65-74	0.29 (0.22)	1.33	0.1851
75-84	0.25 (0.19)	1.33	0.1839
85-94	0.54 (0.20)	2.68	0.0074
95+	0.80 (0.37)	2.16	0.0307
Assessment Gap (Days)	0.02 (0.00)	7.48	<.0001
Cognitive Performance Scale (Ref = 0)			
1	0.01 (0.16)	0.05	0.9627
2	0.46 (0.16)	2.82	0.0048
3	1.33 (0.18)	7.44	<.0001
4	1.33 (0.39)	3.44	0.0006
5	1.51 (0.27)	5.57	<.0001
6	-1.47 (4.12)	-0.36	0.7220
Change in ADL Function (Ref = No Change)			
Improved	-0.15 (0.18)	-0.85	0.3962
Deteriorated	-0.89 (0.14)	-6.47	<.0001
Uses Cane, Walker or Crutch	-0.45 (0.14)	-3.22	0.0013
Cancer	0.56 (0.16)	3.46	0.0005
Pulmonary Condition	-0.10 (0.14)	-0.73	0.4682
Neurological Condition	0.74 (0.21)	3.57	0.0004
Orthopedic Condition	-0.74 (0.14)	-5.24	<.0001
Spinal Cord Injury	-1.07 (0.83)	-1.29	0.1970
Traumatic Brain Injury	0.46 (0.53)	0.88	0.3790
Stroke	0.31 (0.15)	2.06	0.0393
Bowel Continence (Ref = Continent)			
Usually Continent	-0.44 (0.20)	-2.21	0.0272
Occasionally Incontinent	0.33 (0.25)	1.31	0.1901
Frequently Incontinent	0.33 (0.32)	1.04	0.2992
Incontinent	0.35 (0.39)	0.90	0.3675
Bladder Continence (Ref = Continent)			
Usually Continent	-0.01 (0.18)	-0.07	0.9428
Occasionally Incontinent	-0.18 (0.20)	-0.93	0.3528
Frequently Incontinent	-0.05 (0.22)	-0.24	0.8136
Incontinent	1.27 (0.31)	4.05	<.0001
Surgical Wounds	-1.18 (0.16)	-7.35	<.0001
Fluctuating Health Status	0.24 (0.12)	1.94	0.0523
End-stage Condition	3.19 (0.34)	9.40	<.0001
Community Return Desired	-0.91 (0.19)	-4.85	<.0001
Support Person Positive Towards Discharge	-0.66 (0.16)	-4.09	<.0001
Rehabilitation Potential (Ref = Neither Patient or Provider)			
Only Patient	-0.47 (0.20)	-2.34	0.0195
Only Provider	-0.91 (0.21)	-4.31	<.0001

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Table B.25 – continued from previous page

Variable	Estimate (SE)	*t-statistic*	*P-value*
Both Patient and Provider	-1.14 (0.15)	-7.74	<.0001
Time Involved in Activities (Ref = Most)			
Some	-0.32 (0.14)	-2.35	0.0189
Little	-0.10 (0.16)	-0.61	0.5388
None	0.06 (0.26)	0.22	0.8273
Physical Therapy Quintile (Ref = No Therapy)			
1st Quintile	-0.50 (0.21)	-2.38	0.0175
2nd Quintile	-1.11 (0.23)	-4.78	<.0001
3rd Quintile	-1.47 (0.23)	-6.43	<.0001
4th Quintile	-1.89 (0.23)	-8.28	<.0001
5th Quintile	-2.08 (0.24)	-8.56	<.0001
Occupational Therapy Quintile (Ref = No Therapy)			
1st Quintile	-0.57 (0.19)	-2.93	0.0034
2nd Quintile	-0.66 (0.20)	-3.24	0.0012
3rd Quintile	-0.72 (0.20)	-3.56	0.0004
4th Quintile	-1.00 (0.21)	-4.84	<.0001
5th Quintile	-1.02 (0.22)	-4.63	<.0001
Walking Training	-0.60 (0.13)	-4.51	<.0001
Eating or Swallowing Training	0.03 (0.16)	0.17	0.8638
Facility Size (Ref = Small)			
Medium	-0.86 (0.16)	-5.29	<.0001
Large	-0.76 (0.20)	-3.78	0.0002
LHIN (Ref = Toronto Central)			
Central	0.22 (0.38)	0.58	0.5649
Central East	1.19 (0.25)	4.75	<.0001
Central West	0.03 (0.64)	0.05	0.9591
Champlain	0.01 (0.31)	0.02	0.9837
Erie St. Clair	0.74 (0.32)	2.30	0.0216
HNHB	-0.64 (0.20)	-3.16	0.0016
Mississauga Halton	-0.37 (0.34)	-1.08	0.2801
North East	-0.95 (0.28)	-3.39	0.0007
North Simcoe Muskoka	-1.20 (0.42)	-2.89	0.0039
North West	-0.79 (0.32)	-2.46	0.0139
South East	-0.41 (0.34)	-1.19	0.2356
South West	0.20 (0.27)	0.74	0.4608
Waterloo Wellington	-0.74 (0.27)	-2.78	0.0055

Table B.26: Multiple Linear Regression Model Predicting Change in ADL-long Scale, Third ADL-long Scale Tertile, Ontario Complex Continuing Care, 2010 - 2015, n = 9,446

Variable	Estimate (SE)	*t-statistic*	*P-value*
Intercept	-8.15 (0.44)	-18.69	<.0001
Age Group (Ref = 0-64)			
65-74	0.22 (0.23)	0.97	0.3342
75-84	0.62 (0.20)	3.07	0.0022
85-94	1.06 (0.20)	5.17	<.0001
95+	1.54 (0.32)	4.81	<.0001

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Table B.26 – continued from previous page

Variable	Estimate (SE)	*t-statistic*	*P-value*
Assessment Gap (Days)	0.04 (0.00)	20.69	<.0001
Cognitive Performance Scale (Ref = 0)			
1	0.37 (0.23)	1.61	0.1081
2	0.70 (0.23)	3.03	0.0025
3	0.85 (0.21)	4.06	<.0001
4	1.26 (0.26)	4.79	<.0001
5	1.57 (0.25)	6.24	<.0001
6	1.02 (0.25)	4.01	<.0001
Change in ADL Function (Ref = No Change)			
Improved	-0.87 (0.39)	-2.25	0.0245
Deteriorated	-0.64 (0.14)	-4.62	<.0001
Uses Cane, Walker or Crutch	-1.02 (0.15)	-6.59	<.0001
Cancer	0.28 (0.16)	1.73	0.0832
Pulmonary Condition	-0.30 (0.15)	-1.93	0.0534
Neurological Condition	0.96 (0.16)	5.83	<.0001
Orthopedic Condition	-0.68 (0.14)	-4.72	<.0001
Spinal Cord Injury	1.39 (0.32)	4.36	<.0001
Traumatic Brain Injury	-0.26 (0.35)	-0.73	0.4642
Stroke	0.21 (0.13)	1.59	0.1117
Bowel Continence (Ref = Continent)			
Usually Continent	0.73 (0.25)	2.89	0.0038
Occasionally Incontinent	1.08 (0.24)	4.57	<.0001
Frequently Incontinent	1.60 (0.22)	7.26	<.0001
Incontinent	1.53 (0.19)	7.98	<.0001
Bladder Continence (Ref = Continent)			
Usually Continent	-0.52 (0.29)	-1.80	0.0720
Occasionally Incontinent	-0.02 (0.25)	-0.07	0.9467
Frequently Incontinent	0.30 (0.20)	1.51	0.1318
Incontinent	0.33 (0.15)	2.22	0.0267
Surgical Wounds	-0.45 (0.16)	-2.87	0.0041
Fluctuating Health Status	0.37 (0.12)	3.01	0.0026
End-stage Condition	0.64 (0.23)	2.84	0.0045
Community Return Desired	-1.07 (0.16)	-6.88	<.0001
Support Person Positive Towards Discharge	-0.52 (0.15)	-3.43	0.0006
Rehabilitation Potential (Ref = Neither Patient or Provider)			
Only Patient	0.38 (0.27)	1.43	0.1526
Only Provider	-0.49 (0.18)	-2.69	0.0072
Both Patient and Provider	-1.27 (0.18)	-6.89	<.0001
Time Involved in Activities (Ref = Most)			
Some	0.12 (0.18)	0.67	0.5024
Little	0.27 (0.18)	1.54	0.1236
None	-0.34 (0.21)	-1.57	0.1167
Physical Therapy Quintile (Ref = No Therapy)			
1st Quintile	-0.22 (0.18)	-1.24	0.2153
2nd Quintile	-0.52 (0.22)	-2.39	0.0168
3rd Quintile	-0.91 (0.22)	-4.13	<.0001
4th Quintile	-1.61 (0.24)	-6.64	<.0001
5th Quintile	-1.31 (0.25)	-5.18	<.0001
Occupational Therapy Quintile (Ref = No Therapy)			
1st Quintile	-0.43 (0.17)	-2.44	0.0147
2nd Quintile	-0.16 (0.20)	-0.82	0.4138

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Table B.26 – continued from previous page

Variable	Estimate (SE)	*t-statistic*	*P-value*
3rd Quintile	-0.07 (0.20)	-0.34	0.7349
4th Quintile	-0.44 (0.22)	-1.97	0.0488
5th Quintile	0.23 (0.24)	0.96	0.3371
Walking Training	-0.62 (0.17)	-3.59	0.0003
Eating or Swallowing Training	-0.04 (0.13)	-0.33	0.7447
Facility Size (Ref = Small)			
Medium	-0.51 (0.18)	-2.86	0.0042
Large	-0.43 (0.19)	-2.24	0.0254
LHIN (Ref = Toronto Central)			
Central	0.52 (0.34)	1.54	0.1238
Central East	1.11 (0.26)	4.24	<.0001
Central West	-0.10 (0.32)	-0.32	0.7515
Champlain	0.31 (0.28)	1.09	0.2756
Erie St. Clair	0.84 (0.23)	3.61	0.0003
HNHB	0.36 (0.21)	1.70	0.0884
Mississauga Halton	-0.06 (0.25)	-0.23	0.8205
North East	0.88 (0.41)	2.14	0.0322
North Simcoe Muskoka	-1.72 (0.42)	-4.10	<.0001
North West	-0.03 (0.35)	-0.08	0.9399
South East	1.25 (0.39)	3.24	0.0012
South West	1.15 (0.26)	4.37	<.0001
Waterloo Wellington	-0.78 (0.36)	-2.18	0.0294

Appendix C

Additional Tables for Chapter 4

C.1 Phase 1: Multistate Transitions Within Complex Continuing Care

C.1.1 Descriptive Statistics for Sample Used in Phase 1

Table C.1: Distribution of Demographic Variables Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Female		43,875	57.6	13,446	59.4	12,280	56.4	18,149	57.2
Age Group	0-64	11,166	14.7	3,748	16.6	2,775	12.8	4,643	14.6
	65-74	12,889	16.9	4,072	18.0	3,536	16.3	5,281	16.6
	75-84	25,220	33.1	7,799	34.5	7,328	33.7	10,093	31.8
	85-94	24,275	31.9	6,491	28.7	7,358	33.8	10,426	32.9
	95+	2,581	3.4	527	2.3	762	3.5	1,292	4.1
Married		30,059	39.5	7,880	34.8	8,651	39.8	13,528	42.6
Support Person Positive Towards Discharge		49,533	65.1	17,901	79.1	15,725	72.3	15,907	50.1

Table C.2: Distribution of Diagnostic Condition Variables Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

	Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Amputation	1,652	2.2	483	2.1	576	2.6	593	1.9
Arthritis	21,224	27.9	6,263	27.7	7,016	32.2	7,945	25.0
Cardiac Conditions	34,886	45.8	9,941	43.9	10,688	49.1	14,257	44.9
Cancer	20,899	27.5	4,481	19.8	4,822	22.2	11,596	36.5
Neurological	7,613	10.0	1,631	7.2	2,255	10.4	3,727	11.7
Other Medically Complex Conditions	12,559	16.5	3,217	14.2	3,758	17.3	5,584	17.6
Orthopedic	17,838	23.4	5,391	23.8	6,068	27.9	6,379	20.1
Pulmonary Conditions	15,456	20.3	4,914	21.7	4,541	20.9	6,001	18.9
Spinal Cord Injury	1,295	1.7	61	0.3	329	1.5	905	2.9
Stroke	14,988	19.7	3,593	15.9	4,502	20.7	6,893	21.7
Traumatic Brain Injury	1,101	1.4	249	1.1	267	1.2	585	1.8

Table C.3: Distribution of Health Conditions Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

	Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Aphasia	3,490	4.6	455	2.0	825	3.8	2,210	7.0
Hallucinations/Delusions	5,062	6.6	759	3.4	1,435	6.6	2,868	9.0
Stage 2+ Pressure Ulcer	13,786	18.1	2,250	9.9	3,869	17.8	7,667	24.2
Shortness of Breath	18,983	24.9	3,960	17.5	4,950	22.7	10,073	31.7
Unsteady Gait	37,816	49.7	12,062	53.3	12,709	58.4	13,045	41.1
Fluctuating Health Status	39,180	51.5	8,620	38.1	12,050	55.4	18,510	58.3
Acute Episode of Chronic Disease	29,147	38.3	7,888	34.8	8,711	40.0	12,548	39.5

Table C.4: Distribution of Outcome Measures in Complex Continuing Care Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
ADL-Hierarchy Scale	0	3,546	4.7	3,546	15.7	0	0.0	0	0.0
	1	4,584	6.0	4,584	20.3	0	0.0	0	0.0
	2	14,507	19.1	14,507	64.1	0	0.0	0	0.0
	3	11,887	15.6	0	0.0	11,887	54.6	0	0.0
	4	9,873	13.0	0	0.0	9,873	45.4	0	0.0
	5	22,846	30.0	0	0.0	0	0.0	22,846	72.0
	6	8,889	11.7	0	0.0	0	0.0	8,889	28.0
Cognitive Performance Scale	0	21,105	27.7	10,003	44.2	5,646	25.9	5,456	17.2
	1	13,273	17.4	4,337	19.2	4,107	18.9	4,829	15.2
	2	13,351	17.5	4,220	18.6	4,494	20.7	4,637	14.6
	3	15,153	19.9	2,896	12.8	4,989	22.9	7,268	22.9
	4	3,592	4.7	302	1.3	820	3.8	2,470	7.8
	5	5,218	6.9	879	3.9	1,704	7.8	2,635	8.3
	6	4,440	5.8	0	0.0	0	0.0	4,440	14.0
CHESS	0	12,094	15.9	6,018	26.6	3,111	14.3	2,965	9.3
	1	16,705	21.9	7,010	31.0	5,190	23.9	4,505	14.2
	2	18,983	24.9	5,803	25.6	6,482	29.8	6,698	21.1
	3	13,875	18.2	2,770	12.2	4,278	19.7	6,827	21.5
	4	8,906	11.7	866	3.8	2,060	9.5	5,980	18.8
	5	5,569	7.3	170	0.8	639	2.9	4,760	15.0
Pain Scale	0	20,857	27.4	7,085	31.3	6,140	28.2	7,632	24.0
	1	22,661	29.8	6,394	28.2	6,440	29.6	9,827	31.0
	2	27,093	35.6	7,989	35.3	7,833	36.0	11,271	35.5
	3	5,521	7.3	1,169	5.2	1,347	6.2	3,005	9.5
Depression Rating Scale	0-2	60,924	80.0	19,714	87.1	16,863	77.5	24,347	76.7
	3+	15,208	20.0	2,923	12.9	4,897	22.5	7,388	23.3

Table C.5: Distribution of Cognition Variables Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Decision-making Skills	Independent	25,377	33.3	11,613	51.3	6,779	31.2	6,985	22.0
	Modified Independence	22,077	29.0	6,815	30.1	7,358	33.8	7,904	24.9
	Moderately Impaired	19,020	25.0	3,330	14.7	5,919	27.2	9,771	30.8
	Severally Impaired	9,658	12.7	879	3.9	1,704	7.8	7,075	22.3
Expression	Understood	50,616	66.5	19,032	84.1	15,110	69.4	16,474	51.9
	Usually Understood	15,231	20.0	2,870	12.7	4,841	22.2	7,520	23.7
	Sometimes Understood	7,391	9.7	663	2.9	1,532	7.0	5,196	16.4
	Rarely or Never Understood	2,894	3.8	72	0.3	277	1.3	2,545	8.0
Speech Clarity	Clear	63,447	83.3	21,313	94.2	19,223	88.3	22,911	72.2
	Unclear	10,507	13.8	1,236	5.5	2,348	10.8	6,923	21.8
	No Speech	2,178	2.9	88	0.4	189	0.9	1,901	6.0
Comprehension	Understands	45,834	60.2	17,425	77.0	13,376	61.5	15,033	47.4
	Usually Understands	18,159	23.9	4,096	18.1	5,787	26.6	8,276	26.1
	Sometimes Understands	9,679	12.7	1,067	4.7	2,354	10.8	6,258	19.7
	Rarely or Never Understands	2,460	3.2	49	0.2	243	1.1	2,168	6.8

Table C.6: Distribution of Variables Related to Social Participation Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Index of Social Engagement	0	11,386	15.0	1,155	5.1	2,457	11.3	7,774	24.5
	1	12,796	16.8	2,180	9.6	3,038	14.0	7,578	23.9
	2	10,013	13.2	2,367	10.5	3,069	14.1	4,577	14.4
	3	10,931	14.4	3,319	14.7	3,629	16.7	3,983	12.6
	4	12,084	15.9	4,188	18.5	3,926	18.0	3,970	12.5
	5	5,931	7.8	2,513	11.1	1,827	8.4	1,591	5.0
	6	12,991	17.1	6,915	30.5	3,814	17.5	2,262	7.1
Time Involved in Activities	Most	17,188	22.6	7,760	34.3	4,627	21.3	4,801	15.1
	Some	27,207	35.7	9,078	40.1	8,951	41.1	9,178	28.9
	Little	22,379	29.4	4,621	20.4	6,516	29.9	11,242	35.4
	None	9,358	12.3	1,178	5.2	1,666	7.7	6,514	20.5

Table C.7: Distribution of Variables Related to Clinical Change and Rehabilitation Potential Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Change in ADL Function	No Change	20,598	27.1	7,801	34.5	5,456	25.1	7,341	23.1
	Improved	6,785	8.9	3,745	16.5	2,058	9.5	982	3.1
	Deteriorated	48,749	64.0	11,091	49.0	14,246	65.5	23,412	73.8
Change in Cognitive Status	No Change	49,316	64.8	18,064	79.8	14,906	68.5	16,346	51.5
	Improved	1,566	2.1	662	2.9	420	1.9	484	1.5
	Deteriorated	25,250	33.2	3,911	17.3	6,434	29.6	14,905	47.0
Change in Communication or Hearing	No Change	61,399	80.6	20,886	92.3	18,442	84.8	22,071	69.5
	Improved	810	1.1	298	1.3	239	1.1	273	0.9
	Deteriorated	13,923	18.3	1,453	6.4	3,079	14.1	9,391	29.6
Rehabilitation Potential	Neither Patient or Provider	39,623	52.0	8,263	36.5	8,924	41.0	22,436	70.7
	Only Patient	4,994	6.6	2,048	9.0	1,527	7.0	1,419	4.5
	Only Provider	7,384	9.7	1,639	7.2	2,643	12.1	3,102	9.8
	Both Patient and Provider	24,131	31.7	10,687	47.2	8,666	39.8	4,778	15.1

Table C.8: Distribution of Therapy Intensity Variables Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Physical Therapy Quintile	No Therapy	16,067	21.1	3,158	14.0	2,602	12.0	10,307	32.5
	1st Quintile	15,889	20.9	3,811	16.8	3,909	18.0	8,169	25.7
	2nd Quintile	9,216	12.1	2,843	12.6	2,846	13.1	3,527	11.1
	3rd Quintile	11,203	14.7	3,833	16.9	3,758	17.3	3,612	11.4
	4th Quintile	11,994	15.8	4,524	20.0	4,279	19.7	3,191	10.1
	5th Quintile	11,763	15.5	4,468	19.7	4,366	20.1	2,929	9.2
Occupational Therapy Quintile	No Therapy	24,673	32.4	5,885	26.0	5,390	24.8	13,398	42.2
	1st Quintile	10,747	14.1	2,930	12.9	2,852	13.1	4,965	15.6
	2nd Quintile	10,190	13.4	3,191	14.1	3,022	13.9	3,977	12.5
	3rd Quintile	10,041	13.2	3,405	15.0	3,186	14.6	3,450	10.9
	4th Quintile	10,368	13.6	3,776	16.7	3,526	16.2	3,066	9.7
	5th Quintile	10,113	13.3	3,450	15.2	3,784	17.4	2,879	9.1
Speech-language Pathology Therapy Quintile	No Therapy	64,263	84.4	20,396	90.1	18,521	85.1	25,346	79.9
	1st Quintile	4,434	5.8	731	3.2	1,129	5.2	2,574	8.1
	2nd Quintile	606	0.8	114	0.5	146	0.7	346	1.1
	3rd Quintile	2,809	3.7	512	2.3	749	3.4	1,548	4.9
	4th Quintile	1,699	2.2	324	1.4	508	2.3	867	2.7
	5th Quintile	2,321	3.0	560	2.5	707	3.2	1,054	3.3
Special Rehabilitation Intensity	Did Not Qualify	27,357	35.9	6,175	27.3	5,197	23.9	15,985	50.4
	Low Intensity (RL*)	11,732	15.4	3,010	13.3	3,725	17.1	4,997	15.7
	Medium Intensity (RM*)	27,563	36.2	9,952	44.0	9,280	42.6	8,331	26.3
	High Intensity (RH*)	6,407	8.4	2,326	10.3	2,488	11.4	1,593	5.0
	Very High Intensity (RV*)	2,412	3.2	947	4.2	810	3.7	655	2.1
	Ultra High Intensity (RU*)	661	0.9	227	1.0	260	1.2	174	0.5

Table C.9: Distribution of Facility and Region Variables Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-2)		State 2 (ADL-H 3-4)		State 3 (ADL-H 5-6)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Facility Size	Small	14,910	19.6	4,979	22.0	4,375	20.1	5,556	17.5
	Medium	29,804	39.1	9,237	40.8	8,170	37.5	12,397	39.1
	Large	31,418	41.3	8,421	37.2	9,215	42.3	13,782	43.4
Facility Area	Urban Area	67,404	89.4	19,512	87.1	19,067	88.5	28,825	91.7
	Rural Area	7,784	10.3	2,838	12.7	2,428	11.3	2,518	8.0
	Not Assigned	184	0.2	48	0.2	48	0.2	88	0.3
LHIN	Central	2,963	3.9	422	1.9	656	3.0	1,885	5.9
	Central East	5,117	6.7	1,883	8.3	1,301	6.0	1,933	6.1
	Central West	1,796	2.4	198	0.9	807	3.7	791	2.5
	Champlain	3,757	4.9	1,158	5.1	1,021	4.7	1,578	5.0
	Erie St. Clair	4,540	6.0	653	2.9	570	2.6	3,317	10.5
	HNHB*	14,570	19.1	5,128	22.7	4,362	20.0	5,080	16.0
	Mississauga Halton	4,333	5.7	781	3.5	1,328	6.1	2,224	7.0
	North East	3,296	4.3	1,675	7.4	859	3.9	762	2.4
	North Simcoe Muskoka	1,841	2.4	541	2.4	631	2.9	669	2.1
	North West	3,618	4.8	1,162	5.1	1,310	6.0	1,146	3.6
	South East	3,652	4.8	1,121	5.0	1,143	5.3	1,388	4.4
	South West	5,466	7.2	1,693	7.5	1,481	6.8	2,292	7.2
	Toronto Central	17,247	22.7	4,693	20.7	5,066	23.3	7,488	23.6
	Waterloo Wellington	3,936	5.2	1,529	6.8	1,225	5.6	1,182	3.7

* Hamilton Niagara Haldimand Brant

C.1.2 Transition Rates Within CCC at Discharge or Re-assessment

Table C.10: Discharge Destination and State Transition Rates by Health Condition, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

			Next State							
Variable	Initial State		ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
Stage 2+ Ulcer	ADL-H 0-2	No	7.8	1.3	0.7	68.0	9.6	5.8	6.8	<.0001
		Yes	8.1	0.7	0.8	65.9	5.8	9.8	9.0	
	ADL-H 3-4	No	3.3	13.0	2.6	47.6	12.5	8.1	13.0	<.0001
		Yes	3.6	13.6	3.1	42.4	8.9	13.2	15.2	
	ADL-H 5-6	No	1.5	2.8	15.5	24.2	12.1	6.6	37.2	<.0001
		Yes	1.0	3.1	17.5	15.7	8.8	10.2	43.7	
Surgical Wounds	ADL-H 0-2	No	8.4	1.4	0.8	65.5	10.4	5.8	7.7	<.0001
		Yes	5.5	0.7	0.4	77.5	4.1	7.9	4.0	
	ADL-H 3-4	No	3.2	14.1	2.9	44.3	12.7	8.3	14.4	<.0001
		Yes	3.6	9.2	1.8	55.9	8.5	11.9	9.1	
	ADL-H 5-6	No	1.3	2.8	15.9	20.7	11.8	6.6	40.9	<.0001
		Yes	1.6	3.4	16.6	29.1	9.0	11.9	28.4	
Uses Cane, Walker, or Crutch	ADL-H 0-2	No	12.0	1.8	0.9	59.1	10.0	8.0	8.1	<.0001
		Yes	6.5	1.1	0.7	70.4	8.9	5.7	6.7	
	ADL-H 3-4	No	3.9	19.0	3.6	37.0	10.9	11.0	14.6	<.0001
		Yes	2.9	9.1	2.1	53.1	12.5	7.7	12.5	
	ADL-H 5-6	No	1.1	3.1	18.5	15.2	9.9	7.6	44.6	<.0001
		Yes	1.9	2.4	9.8	39.3	14.8	7.2	24.5	
Uses Wheelchair	ADL-H 0-2	No	7.5	1.2	0.7	67.0	11.0	5.1	7.5	<.0001
		Yes	8.4	1.3	0.8	69.0	6.3	8.0	6.2	
	ADL-H 3-4	No	2.9	10.6	2.5	47.9	13.9	7.1	15.1	<.0001
		Yes	3.5	14.0	2.8	46.2	11.1	9.7	12.7	
	ADL-H 5-6	No	1.1	1.3	10.2	16.1	9.0	4.6	57.6	<.0001
		Yes	1.5	3.6	18.7	24.9	12.4	8.8	30.1	

Table C.11: Discharge Destination and State Transition Rates by Health Status, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Variable	Initial State		Next State							*P-value*
			ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	
Change in ADL Function	ADL-H 0-2	No Change	10.9	1.8	1.0	61.7	11.0	6.2	7.4	<.0001
		Improved	4.3	0.7	0.2	81.0	5.7	5.5	2.7	
		Deteriorated	6.8	1.1	0.7	67.6	9.1	6.5	8.2	
	ADL-H 3-4	No Change	3.3	21.1	3.7	39.8	11.6	10.5	10.1	<.0001
		Improved	3.1	8.2	1.3	67.4	8.2	7.6	4.2	
		Deteriorated	3.4	10.7	2.5	46.3	12.5	8.7	15.9	
	ADL-H 5-6	No Change	1.7	4.1	28.5	21.2	11.1	11.3	22.1	<.0001
		Improved	2.6	4.8	12.5	54.3	8.0	10.0	7.7	
		Deteriorated	1.2	2.4	12.2	21.1	11.5	6.2	45.4	
Change in Cognition	ADL-H 0-2	No Change	7.4	1.1	0.6	71.1	7.3	6.2	6.2	<.0001
		Improved	6.0	1.7	0.6	70.2	9.5	6.8	5.1	
		Deteriorated	10.2	1.9	1.2	52.0	17.7	6.1	10.9	
	ADL-H 3-4	No Change	3.5	13.2	2.5	51.2	10.0	9.7	9.8	<.0001
		Improved	3.3	12.6	1.9	52.6	11.2	8.8	9.5	
		Deteriorated	2.8	12.7	3.3	35.9	16.1	7.4	21.7	
	ADL-H 5-6	No Change	1.7	3.5	19.5	28.7	11.6	9.5	25.4	<.0001
		Improved	1.9	4.1	14.5	36.2	8.9	10.7	23.8	
		Deteriorated	1.0	2.1	12.2	14.5	11.1	5.2	54.0	
Fluctuating Health Status	ADL-H 0-2	No	7.1	1.0	0.6	72.1	7.6	5.9	5.7	<.0001
		Yes	9.0	1.6	1.0	60.7	11.8	6.8	9.2	
	ADL-H 3-4	No	4.0	12.0	2.2	52.8	9.2	9.7	10.1	<.0001
		Yes	2.8	13.9	3.1	41.8	14.0	8.5	16.0	
	ADL-H 5-6	No	1.6	3.2	16.1	26.3	11.1	7.4	34.4	<.0001
		Yes	1.2	2.7	16.0	19.2	11.5	7.6	42.0	
End-stage Condition	ADL-H 0-2	No	7.7	1.2	0.5	70.9	9.6	6.4	3.6	<.0001
		Yes	8.8	2.6	3.5	25.5	4.1	3.4	52.0	
	ADL-H 3-4	No	3.5	13.6	2.5	50.6	12.9	9.7	7.1	<.0001
		Yes	1.3	7.9	5.0	9.6	2.2	2.3	71.6	
	ADL-H 5-6	No	1.8	4.0	20.3	30.8	15.9	10.6	16.6	<.0001
		Yes	0.4	0.7	7.3	4.5	1.9	1.2	84.1	

Table C.12: Discharge Destination and State Transition Rates by Depression Rating Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	0-2	7.3	1.2	0.7	69.1	8.7	6.2	6.7	<.0001
	3+	11.0	2.1	0.7	58.8	12.4	6.2	8.9	
ADL-H 3-4	0-2	3.5	12.4	2.4	49.0	11.2	9.3	12.2	<.0001
	3+	2.9	15.3	3.7	38.6	14.2	8.2	17.3	
ADL-H 5-6	0-2	1.4	2.8	15.7	22.9	11.6	7.5	38.2	<.0001
	3+	1.4	3.2	17.0	19.5	10.4	7.5	40.9	

Table C.13: Discharge Destination and State Transition Rates by Pain Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	0	9.7	1.9	0.8	64.2	12.6	5.5	5.4	<.0001
	1	7.6	1.2	0.6	67.7	9.6	6.2	7.1	
	2	6.6	0.9	0.7	71.5	6.5	6.6	7.2	
	3	6.0	0.9	0.9	64.2	4.5	8.1	15.2	
ADL-H 3-4	0	3.0	15.6	2.7	45.2	15.7	7.7	10.2	<.0001
	1	3.7	14.5	3.0	44.0	10.5	9.9	14.4	
	2	3.4	10.3	2.4	50.8	10.6	9.2	13.2	
	3	3.0	11.3	2.5	42.6	7.7	9.8	23.1	
ADL-H 5-6	0	1.4	3.2	21.7	23.7	15.4	7.8	26.8	<.0001
	1	1.4	3.4	16.3	23.1	11.7	7.6	36.7	
	2	1.4	2.4	13.4	22.6	9.8	7.3	43.1	
	3	1.2	2.2	10.6	13.5	5.1	7.1	60.2	

Table C.14: Discharge Destination and State Transition Rates by Time Spent in Facility Activities, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State							
Initial State	Level	ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	Most	7.9	1.0	0.6	71.1	8.4	5.7	5.1	<.0001
	Some	7.8	1.1	0.7	69.4	8.8	6.2	5.8	
	Little	7.7	1.8	1.0	61.5	11.3	6.8	10.0	
	None	8.0	1.9	0.8	57.2	8.6	7.0	16.6	
ADL-H 3-4	Most	4.2	16.5	2.7	49.6	9.5	8.9	8.5	<.0001
	Some	3.6	11.8	2.3	52.2	11.1	9.0	10.0	
	Little	2.6	12.7	3.1	39.3	14.8	9.0	18.5	
	None	2.1	11.7	3.7	37.5	11.2	9.2	24.7	
ADL-H 5-6	Most	1.9	4.5	20.2	31.1	9.9	9.0	23.4	<.0001
	Some	2.0	3.6	16.9	31.2	13.0	8.3	25.1	
	Little	1.1	2.4	15.0	17.7	12.3	7.5	44.1	
	None	0.7	1.5	13.5	10.5	8.2	5.3	60.3	

Table C.15: Discharge Destination and State Transition Rates by Facility Size, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State							
Initial State	Level	ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	Large	9.8	1.6	1.0	68.2	3.8	7.6	8.1	<.0001
	Medium	6.0	0.8	0.6	70.3	10.2	5.9	6.2	
	Small	7.9	1.5	0.5	62.5	16.4	4.6	6.7	
ADL-H 3-4	Large	4.9	18.3	3.4	44.4	5.2	10.6	13.2	<.0001
	Medium	2.4	9.7	2.5	48.5	13.7	8.7	14.3	
	Small	1.6	8.4	1.6	48.0	22.4	6.2	11.7	
ADL-H 5-6	Large	1.5	3.7	20.9	19.1	5.8	8.5	40.6	<.0001
	Medium	1.3	2.6	12.9	25.9	14.2	7.3	35.6	
	Small	1.2	1.5	10.8	21.3	18.5	5.3	41.3	

Table C.16: Discharge Destination and State Transition Rates by Facility Location, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	Urban Area	7.3	1.3	0.7	68.9	8.2	6.4	7.3	<.0001
	Rural Area	11.2	1.3	0.6	59.7	16.3	5.4	5.5	
	Not Assigned	10.4	2.1	0.0	75.0	8.3	4.2	0.0	
ADL-H 3-4	Urban Area	3.4	13.4	2.8	47.0	10.5	9.2	13.6	<.0001
	Rural Area	2.7	10.2	1.6	43.6	22.8	7.9	11.2	
	Not Assigned	0.0	6.2	2.1	66.7	4.2	12.5	8.3	
ADL-H 5-6	Urban Area	1.3	2.9	16.2	21.9	10.8	7.4	39.5	<.0001
	Rural Area	1.6	2.7	13.1	25.0	17.9	8.5	31.2	
	Not Assigned	1.1	2.3	28.4	31.8	5.7	9.1	21.6	

Table C.17: Discharge Destination and State Transition Rates by Local Health Integration Network, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

Initial State	Level	Next State: ADL-H 0-2 (%)	ADL-H 3-4 (%)	ADL-H 5-6 (%)	Community (%)	LTC (%)	Hospital (%)	Death (%)	*P-value*
ADL-H 0-2	Erie St. Clair	15.3	1.2	0.9	40.3	29.9	7.7	4.7	<.0001
	South West	5.1	1.0	1.0	56.8	22.0	5.2	8.8	
	Waterloo Wellington	4.8	0.9	0.3	75.3	4.1	7.2	7.5	
	HNHB*	5.4	0.8	0.6	75.8	5.2	5.0	7.1	
	Central West	7.1	0.0	0.5	67.7	16.2	7.6	1.0	
	Mississauga Halton	4.4	1.7	1.0	70.9	6.7	5.0	10.4	
	Toronto Central	10.7	1.4	0.8	66.9	5.0	7.8	7.4	
	Central	2.1	0.5	0.0	58.8	16.6	6.6	15.4	
	Central East	7.8	3.2	1.3	62.2	14.7	4.2	6.6	
	South East	4.0	0.2	0.4	76.8	6.8	4.9	7.0	
	Champlain	11.7	1.6	0.8	62.4	7.9	9.4	6.1	
	North Simcoe Muskoka	7.8	1.1	0.2	72.5	8.3	4.1	6.1	
	North East	14.0	1.6	0.5	57.3	15.0	7.0	4.6	
	North West	6.2	1.3	0.5	76.8	4.4	6.4	4.5	
ADL-H 3-4	Erie St. Clair	3.7	21.8	6.8	23.0	28.6	8.2	7.9	<.0001
	South West	1.6	9.5	2.4	34.2	34.2	5.9	12.2	
	Waterloo Wellington	1.7	10.9	1.3	54.9	9.3	9.5	12.4	
	HNHB*	2.3	11.2	2.8	53.0	9.4	6.7	14.6	
	Central West	0.9	6.7	0.6	53.4	25.9	6.2	6.3	
	Mississauga Halton	1.8	11.1	2.1	53.9	8.3	8.7	14.1	
	Toronto Central	6.1	17.9	2.8	43.1	4.5	12.1	13.5	
	Central	1.7	3.5	1.5	45.7	17.7	9.9	20.0	
	Central East	2.2	10.4	6.5	40.4	20.8	7.7	12.1	
	South East	1.5	8.8	2.0	53.1	6.9	6.6	21.0	
	Champlain	3.7	23.3	2.3	36.8	10.8	11.2	11.9	
	North Simcoe Muskoka	5.7	10.0	1.7	51.2	11.3	8.6	11.6	
	North East	4.2	17.0	1.2	39.1	15.9	13.0	9.5	
	North West	3.5	11.3	3.1	56.4	4.4	8.9	12.4	
ADL-H 5-6	Erie St. Clair	1.3	2.0	20.1	15.2	15.1	7.5	38.9	<.0001
	South West	1.0	2.3	13.4	20.3	22.6	5.9	34.5	
	Waterloo Wellington	0.6	2.4	11.2	23.1	5.7	9.4	47.7	
	HNHB*	1.2	3.2	14.0	27.2	7.2	6.0	41.1	
	Central West	0.9	2.5	13.8	18.0	39.8	6.1	19.0	
	Mississauga Halton	0.7	1.7	16.0	20.1	5.5	6.1	49.9	
	Toronto Central	1.7	3.2	19.6	21.0	7.1	8.6	38.7	
	Central	0.6	1.5	7.9	31.1	15.3	5.8	37.7	
	Central East	1.6	3.4	13.4	20.8	20.0	6.8	34.1	
	South East	1.3	1.8	9.0	30.5	8.6	10.2	38.5	
	Champlain	1.6	4.1	23.4	18.5	9.1	10.6	32.8	
	North Simcoe Muskoka	2.8	5.2	13.0	19.0	10.5	4.5	45.0	
	North East	2.8	3.8	21.3	17.3	15.1	9.3	30.4	
	North West	1.9	5.1	15.6	24.2	3.6	8.6	41.0	

* Hamilton Niagara Haldimand Brant

C.1.3 Multistate Transition Model

Table C.18: Adjusted Odds of State Transitions Within Complex Continuing Care by Demographic Variables, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Variable	Initial State	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
Female	ADL-H 0-2		0.73* (0.55-0.96)	1.19 (0.83-1.69)	1.24* (1.11-1.39)	0.90 (0.77-1.06)	1.08 (0.92-1.26)	1.44* (1.24-1.67)
	ADL-H 3-4	1.08 (0.90-1.30)		1.20 (0.98-1.46)	1.28* (1.15-1.41)	1.01 (0.89-1.15)	1.06 (0.93-1.21)	1.38* (1.21-1.56)
	ADL-H 5-6	1.10 (0.89-1.38)	0.68* (0.58-0.80)		1.24* (1.13-1.35)	0.89* (0.82-0.96)	0.85* (0.76-0.95)	1.17* (1.06-1.29)
Married	ADL-H 0-2		1.36* (1.02-1.81)	1.60* (1.10-2.33)	1.61* (1.42-1.83)	1.54* (1.29-1.83)	1.46* (1.23-1.72)	1.04 (0.89-1.23)
	ADL-H 3-4	0.82* (0.68-0.99)		1.28* (1.05-1.56)	1.15* (1.04-1.27)	1.05 (0.92-1.19)	1.03 (0.90-1.17)	0.68* (0.60-0.78)
	ADL-H 5-6	0.74* (0.59-0.92)	0.95 (0.81-1.11)		1.10* (1.00-1.20)	1.08 (0.99-1.17)	1.06 (0.95-1.18)	0.77* (0.70-0.86)
Lived Alone Prior to Entry	ADL-H 0-2		0.98 (0.92-1.03)	1.00 (0.94-1.07)	1.01 (0.98-1.03)	1.02 (0.99-1.05)	1.03* (1.00-1.06)	0.99 (0.96-1.02)
	ADL-H 3-4	1.02 (0.99-1.05)		1.02 (0.98-1.05)	0.96* (0.94-0.98)	0.99 (0.97-1.02)	1.00 (0.98-1.02)	0.95* (0.93-0.98)
	ADL-H 5-6	1.03 (0.99-1.06)	1.01 (0.98-1.04)		0.97* (0.95-0.99)	1.02* (1.01-1.04)	1.01 (0.99-1.03)	0.96* (0.94-0.98)
Support Person Positive Towards Discharge	ADL-H 0-2		0.98 (0.70-1.36)	0.67 (0.42-1.05)	2.71* (2.35-3.12)	0.98 (0.80-1.21)	1.89* (1.54-2.32)	1.39* (1.16-1.65)
	ADL-H 3-4	1.29* (1.02-1.63)		1.08 (0.85-1.37)	2.80* (2.46-3.18)	1.13 (0.96-1.33)	2.18* (1.83-2.58)	1.68* (1.44-1.96)
	ADL-H 5-6	1.15 (0.87-1.52)	0.94 (0.78-1.15)		3.60* (3.21-4.05)	0.80* (0.72-0.89)	1.54* (1.34-1.77)	2.30* (2.03-2.61)
Desire to Return to Community	ADL-H 0-2		0.85 (0.61-1.20)	0.79 (0.50-1.25)	2.87* (2.44-3.38)	0.70* (0.56-0.87)	1.74* (1.37-2.21)	1.26* (1.05-1.53)
	ADL-H 3-4	1.68* (1.27-2.23)		0.79 (0.61-1.01)	2.53* (2.19-2.93)	0.79* (0.67-0.94)	1.49* (1.23-1.81)	1.32* (1.12-1.55)
	ADL-H 5-6	1.74* (1.29-2.36)	1.77* (1.44-2.17)		2.17* (1.93-2.44)	0.88* (0.79-0.99)	1.57* (1.36-1.82)	1.36* (1.19-1.54)

* $P < 0.05$

Table C.19: Adjusted Odds of State Transitions Within Complex Continuing Care by Age Group, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	65-74 vs. 0-64		1.63*	0.93	1.33*	1.34*	1.08	2.64*
			(1.00-2.63)	(0.53-1.63)	(1.11-1.59)	(1.05-1.72)	(0.86-1.37)	(2.01-3.47)
	75-84 vs. 0-64		2.01*	1.11	1.25*	1.21	0.91	3.11*
			(1.31-3.09)	(0.68-1.82)	(1.07-1.47)	(0.96-1.53)	(0.74-1.13)	(2.43-3.99)
	85-94 vs. 0-64		2.21*	0.92	1.16	1.39*	0.83	3.91*
			(1.40-3.47)	(0.53-1.59)	(0.97-1.37)	(1.09-1.79)	(0.66-1.05)	(3.02-5.07)
	95+ vs. 0-64		3.46*	1.75	0.85	2.05*	0.47*	3.94*
			(1.61-7.44)	(0.61-5.00)	(0.59-1.22)	(1.23-3.43)	(0.26-0.85)	(2.53-6.13)
ADL-H 3-4	65-74 vs. 0-64	0.82		1.14	1.17	1.24	1.00	1.75*
		(0.61-1.10)		(0.81-1.61)	(0.99-1.39)	(0.99-1.55)	(0.81-1.23)	(1.36-2.27)
	75-84 vs. 0-64	0.86		1.27	1.14	1.25*	0.87	2.47*
		(0.66-1.12)		(0.92-1.74)	(0.97-1.33)	(1.01-1.53)	(0.72-1.05)	(1.96-3.12)
	85-94 vs. 0-64	0.66*		1.25	0.96	1.15	0.68*	2.48*
		(0.50-0.87)		(0.90-1.73)	(0.82-1.13)	(0.93-1.42)	(0.56-0.84)	(1.95-3.14)
	95+ vs. 0-64	0.34*		1.53	1.06	1.27	0.56*	2.97*
		(0.17-0.66)		(0.88-2.69)	(0.80-1.43)	(0.87-1.86)	(0.38-0.85)	(2.07-4.26)
ADL-H 5-6	65-74 vs. 0-64	0.93	0.87		1.07	1.25*	0.98	1.70*
		(0.67-1.30)	(0.68-1.13)		(0.92-1.24)	(1.09-1.45)	(0.83-1.16)	(1.38-2.09)
	75-84 vs. 0-64	0.76	0.94		1.06	1.16*	0.76*	2.25*
		(0.56-1.03)	(0.75-1.19)		(0.93-1.22)	(1.02-1.32)	(0.65-0.89)	(1.86-2.71)
	85-94 vs. 0-64	0.73	0.94		1.21*	1.38*	0.66*	3.20*
		(0.52-1.01)	(0.74-1.19)		(1.05-1.40)	(1.21-1.58)	(0.56-0.79)	(2.65-3.87)
	95+ vs. 0-64	0.31*	0.79		1.09	1.36*	0.40*	2.87*
		(0.15-0.68)	(0.51-1.22)		(0.86-1.38)	(1.09-1.71)	(0.28-0.56)	(2.19-3.77)

* $P < 0.05$

Table C.20: Adjusted Odds of State Transitions Within Complex Continuing Care by Diagnosis Group, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Variable	Initial State	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
Cancer	ADL-H 0-2		1.21 (0.88-1.66)	2.70* (1.84-3.96)	0.92 (0.79-1.06)	3.70* (3.09-4.43)	0.94 (0.78-1.15)	0.75* (0.63-0.91)
	ADL-H 3-4	0.84 (0.66-1.06)		1.68* (1.35-2.09)	0.98 (0.86-1.11)	3.64* (3.17-4.19)	1.05 (0.90-1.24)	0.87 (0.74-1.02)
	ADL-H 5-6	0.92 (0.70-1.19)	0.85 (0.70-1.03)		1.00 (0.90-1.11)	3.08* (2.81-3.38)	0.86* (0.75-0.98)	0.76* (0.67-0.86)
Cardiac Conditions	ADL-H 0-2		1.30 (0.99-1.71)	0.91 (0.63-1.31)	1.06 (0.94-1.19)	1.26* (1.06-1.48)	1.21* (1.03-1.41)	1.09 (0.95-1.26)
	ADL-H 3-4	0.90 (0.75-1.07)		0.97 (0.80-1.18)	1.06 (0.96-1.17)	1.25* (1.10-1.42)	1.23* (1.08-1.40)	1.01 (0.90-1.15)
	ADL-H 5-6	0.81 (0.65-1.00)	1.16 (1.00-1.36)		0.99 (0.91-1.08)	1.12* (1.03-1.22)	1.30* (1.16-1.45)	1.03 (0.93-1.14)
Neurological Conditions	ADL-H 0-2		1.60* (1.08-2.37)	1.37 (0.78-2.41)	0.80* (0.66-0.96)	0.67* (0.49-0.93)	0.75* (0.57-0.99)	1.11 (0.87-1.42)
	ADL-H 3-4	0.70* (0.52-0.93)		1.05 (0.80-1.40)	0.94 (0.81-1.08)	0.76* (0.62-0.94)	0.86 (0.70-1.04)	1.01 (0.84-1.22)
	ADL-H 5-6	0.57* (0.40-0.82)	0.73* (0.58-0.92)		1.06 (0.94-1.20)	0.74* (0.65-0.83)	0.85* (0.73-0.99)	1.16* (1.01-1.33)
Orthopedic Conditions	ADL-H 0-2		0.88 (0.60-1.29)	0.80 (0.47-1.37)	1.18* (1.02-1.36)	0.57* (0.45-0.74)	0.93 (0.77-1.13)	1.13 (0.93-1.36)
	ADL-H 3-4	1.44* (1.18-1.76)		0.81 (0.63-1.04)	1.30* (1.16-1.47)	0.78* (0.66-0.92)	1.04 (0.89-1.20)	1.00 (0.86-1.16)
	ADL-H 5-6	1.21 (0.94-1.55)	1.44* (1.20-1.72)		1.45* (1.30-1.61)	0.82* (0.74-0.92)	1.08 (0.94-1.23)	1.21* (1.07-1.36)
Other Medically Complex Conditions	ADL-H 0-2		1.18 (0.82-1.69)	0.90 (0.55-1.48)	0.96 (0.82-1.12)	1.52* (1.24-1.87)	1.29* (1.05-1.58)	0.88 (0.72-1.09)
	ADL-H 3-4	1.04 (0.83-1.32)		0.80 (0.61-1.04)	0.92 (0.81-1.04)	1.37* (1.17-1.60)	1.33* (1.14-1.55)	0.84* (0.71-0.99)
	ADL-H 5-6	0.92 (0.70-1.22)	0.78* (0.63-0.96)		0.86* (0.76-0.96)	1.29* (1.16-1.43)	1.11 (0.97-1.27)	0.78* (0.68-0.89)
Pulmonary Conditions	ADL-H 0-2		0.86 (0.62-1.21)	1.28 (0.86-1.90)	1.08 (0.94-1.24)	1.21* (1.01-1.46)	1.16 (0.97-1.39)	0.95 (0.80-1.13)

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Table C.20 – continued from previous page

Variable	Initial State	Next State						
		ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
	ADL-H 3-4	0.74*		0.96	1.11	1.25*	1.13	1.03
		(0.59-0.94)		(0.75-1.22)	(0.98-1.25)	(1.08-1.45)	(0.97-1.32)	(0.89-1.20)
	ADL-H 5-6	1.27	0.90		1.08	1.15*	1.12	1.07
		(0.99-1.63)	(0.74-1.10)		(0.97-1.20)	(1.03-1.27)	(0.98-1.28)	(0.94-1.21)
Spinal Cord Injury	ADL-H 0-2		0.92	1.23	0.49*	NA	0.62	0.38
			(0.12-7.35)	(0.15-10.03)	(0.25-0.97)	(NA-NA)	(0.25-1.51)	(0.08-1.80)
	ADL-H 3-4	0.22*		1.33	0.70*	0.56*	0.80	0.81
		(0.09-0.55)		(0.74-2.38)	(0.51-0.97)	(0.34-0.94)	(0.54-1.17)	(0.47-1.39)
	ADL-H 5-6	0.28*	0.48*		0.65*	0.45*	0.85	0.40*
		(0.13-0.62)	(0.32-0.72)		(0.52-0.81)	(0.36-0.57)	(0.68-1.06)	(0.27-0.57)
Stroke	ADL-H 0-2		1.08	0.95	0.89	0.66*	0.98	0.90
			(0.78-1.50)	(0.60-1.52)	(0.77-1.02)	(0.52-0.84)	(0.80-1.19)	(0.75-1.08)
	ADL-H 3-4	0.99		1.06	0.78*	0.66*	0.87	0.90
		(0.80-1.21)		(0.86-1.32)	(0.70-0.88)	(0.57-0.78)	(0.75-1.01)	(0.78-1.04)
	ADL-H 5-6	0.88	1.09		0.77*	0.71*	0.98	0.98
		(0.68-1.13)	(0.93-1.29)		(0.69-0.84)	(0.64-0.78)	(0.87-1.11)	(0.88-1.09)
Taumatic Brain Injury	ADL-H 0-2		1.56	1.21	1.06	0.30*	1.07	0.63
			(0.71-3.46)	(0.35-4.20)	(0.70-1.63)	(0.10-0.84)	(0.59-1.95)	(0.33-1.21)
	ADL-H 3-4	1.20		0.38*	0.65*	0.26*	0.92	0.58*
		(0.69-2.10)		(0.15-0.96)	(0.46-0.92)	(0.12-0.55)	(0.59-1.44)	(0.35-0.96)
	ADL-H 5-6	0.66	0.71		0.58*	0.35*	0.98	0.53*
		(0.32-1.38)	(0.45-1.13)		(0.45-0.76)	(0.26-0.48)	(0.74-1.28)	(0.38-0.75)

* $P < 0.05$

Table C.21: Adjusted Odds of State Transitions Within Complex Continuing Care by Health Condition, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Variable	Initial State	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
Surgical Wounds	ADL-H 0-2		0.99	0.63	1.26*	0.84	1.47*	0.79*
			(0.64-1.53)	(0.34-1.16)	(1.07-1.48)	(0.66-1.07)	(1.21-1.80)	(0.63-1.00)
	ADL-H 3-4	1.22		0.99	1.21*	0.87	1.54*	0.95
		(0.98-1.52)		(0.75-1.30)	(1.06-1.38)	(0.73-1.04)	(1.32-1.81)	(0.80-1.12)
	ADL-H 5-6	0.94	0.96		0.94	0.81*	1.43*	0.76*
		(0.72-1.22)	(0.80-1.17)		(0.85-1.05)	(0.73-0.91)	(1.26-1.62)	(0.66-0.86)
Depression Rating Scale 3+	ADL-H 0-2		0.96	0.49*	0.67*	0.65*	0.65*	0.75*
			(0.68-1.35)	(0.30-0.81)	(0.57-0.78)	(0.52-0.80)	(0.53-0.81)	(0.62-0.91)
	ADL-H 3-4	0.93		1.11	0.73*	0.89	0.84*	0.84*
		(0.75-1.16)		(0.90-1.37)	(0.65-0.82)	(0.77-1.02)	(0.72-0.98)	(0.73-0.97)
	ADL-H 5-6	1.00	1.11		0.83*	0.73*	0.85*	0.86*
		(0.78-1.28)	(0.94-1.32)		(0.75-0.92)	(0.67-0.80)	(0.75-0.96)	(0.77-0.97)
Stage 2+ Pressure Ulcer	ADL-H 0-2		0.56*	1.25	0.84	1.30*	1.25	0.80
			(0.32-0.99)	(0.72-2.17)	(0.70-1.00)	(1.02-1.66)	(1.00-1.57)	(0.62-1.03)
	ADL-H 3-4	0.98		1.19	0.81*	1.17*	1.24*	0.77*
		(0.79-1.22)		(0.94-1.51)	(0.72-0.92)	(1.00-1.37)	(1.07-1.44)	(0.65-0.91)
	ADL-H 5-6	0.64*	1.00		0.66*	1.17*	1.27*	0.78*
		(0.50-0.84)	(0.84-1.18)		(0.60-0.73)	(1.06-1.28)	(1.13-1.42)	(0.70-0.88)
Uses Cane, Walker, or Crutch	ADL-H 0-2		1.08	1.18	1.50*	1.31*	1.11	1.22*
			(0.80-1.46)	(0.79-1.74)	(1.32-1.70)	(1.09-1.57)	(0.94-1.32)	(1.03-1.43)
	ADL-H 3-4	1.48*		1.12	2.01*	1.45*	1.27*	1.29*
		(1.23-1.78)		(0.92-1.37)	(1.82-2.23)	(1.27-1.66)	(1.11-1.45)	(1.14-1.47)
	ADL-H 5-6	1.90*	1.02		2.42*	1.25*	1.44*	1.64*
		(1.51-2.39)	(0.84-1.22)		(2.19-2.68)	(1.13-1.39)	(1.27-1.64)	(1.46-1.84)
Uses Wheelchair	ADL-H 0-2		1.21	1.28	0.68*	0.99	1.05	0.69*
			(0.91-1.61)	(0.89-1.83)	(0.60-0.77)	(0.84-1.18)	(0.89-1.23)	(0.59-0.80)
	ADL-H 3-4	0.75*		0.96	0.64*	0.82*	0.84*	0.72*
		(0.61-0.94)		(0.76-1.20)	(0.57-0.73)	(0.70-0.94)	(0.71-0.98)	(0.63-0.84)
	ADL-H 5-6	0.77*	1.27*		0.78*	0.57*	1.01	0.80*
		(0.60-0.98)	(1.03-1.57)		(0.70-0.87)	(0.52-0.62)	(0.88-1.15)	(0.72-0.90)

* $P < 0.05$

Table C.22: Adjusted Odds of State Transitions Within Complex Continuing Care by the Pain Scale, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	Level	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	Pain 1 vs. 0		0.86	0.90	1.12	1.40*	1.21	1.00
			(0.62-1.18)	(0.58-1.39)	(0.97-1.28)	(1.14-1.71)	(1.00-1.47)	(0.85-1.19)
	Pain 2 vs. 0		0.85	1.11	1.17*	1.65*	1.29*	0.86
			(0.60-1.19)	(0.72-1.69)	(1.02-1.34)	(1.35-2.02)	(1.06-1.56)	(0.72-1.03)
	Pain 3 vs. 0		1.07	1.36	1.56*	2.49*	2.12*	1.02
			(0.52-2.20)	(0.63-2.93)	(1.17-2.09)	(1.74-3.55)	(1.48-3.04)	(0.68-1.52)
ADL-H 3-4	Pain 1 vs. 0	1.14		1.10	0.97	1.25*	1.20*	0.86*
		(0.91-1.43)		(0.87-1.40)	(0.86-1.09)	(1.06-1.47)	(1.02-1.41)	(0.74-1.00)
	Pain 2 vs. 0	1.23		1.21	1.19*	1.48*	1.28*	0.98
		(0.98-1.55)		(0.95-1.55)	(1.05-1.35)	(1.25-1.74)	(1.09-1.51)	(0.84-1.14)
	Pain 3 vs. 0	1.09		0.97	0.96	1.64*	1.18	0.81
		(0.73-1.64)		(0.62-1.51)	(0.77-1.20)	(1.27-2.13)	(0.90-1.56)	(0.60-1.08)
ADL-H 5-6	Pain 1 vs. 0	1.03	1.24*		1.14*	1.33*	1.12	1.18*
		(0.78-1.36)	(1.03-1.50)		(1.02-1.27)	(1.20-1.48)	(0.98-1.28)	(1.04-1.33)
	Pain 2 vs. 0	1.12	0.96		1.16*	1.66*	1.17*	1.06
		(0.85-1.48)	(0.78-1.18)		(1.03-1.29)	(1.49-1.86)	(1.02-1.35)	(0.94-1.21)
	Pain 3 vs. 0	1.26	1.15		1.01	2.14*	1.49*	0.94
		(0.83-1.92)	(0.84-1.58)		(0.84-1.21)	(1.82-2.52)	(1.20-1.84)	(0.75-1.18)

* $P < 0.05$

Table C.23: Adjusted Odds of State Transitions Within Complex Continuing Care for Patients in Rural Facilities (Reference = Urban Facility), Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

	Next State						
Initial State	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2		0.90 (0.69-1.19)	0.91 (0.60-1.38)	0.81* (0.74-0.89)	0.74* (0.60-0.91)	0.81* (0.69-0.94)	0.87* (0.77-0.98)
ADL-H 3-4	1.01 (0.81-1.27)		1.01 (0.79-1.30)	1.12 (1.00-1.26)	1.14 (0.99-1.32)	1.12 (0.98-1.29)	1.12 (0.98-1.28)
ADL-H 5-6	0.89 (0.72-1.11)	0.93 (0.80-1.09)		0.98 (0.91-1.06)	0.93 (0.86-1.01)	0.99 (0.91-1.09)	0.94 (0.86-1.02)

* $P < 0.05$

Table C.24: Adjusted Odds of State Transitions Within Complex Continuing Care by Local Health Integration Network, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Next State						
Initial State	LHIN[1]	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
ADL-H 0-2	Erie St. Clair		0.49	0.83	0.44*	0.46*	0.67	1.68*
			(0.22-1.10)	(0.32-2.13)	(0.33-0.60)	(0.28-0.74)	(0.45-1.01)	(1.20-2.35)
	South West		1.13	2.87*	1.53*	2.64*	1.38	3.76*
			(0.60-2.15)	(1.43-5.75)	(1.17-2.01)	(1.86-3.77)	(0.96-1.99)	(2.72-5.19)
	Waterloo Wellington		0.98	1.06	4.16*	4.05*	2.99*	1.98*
			(0.49-1.98)	(0.35-3.18)	(3.14-5.53)	(2.77-5.92)	(2.09-4.27)	(1.33-2.94)
	HNHB		0.78	1.52	1.26*	1.57*	0.86	0.57*
			(0.47-1.29)	(0.85-2.72)	(1.04-1.54)	(1.19-2.07)	(0.66-1.13)	(0.43-0.76)
	Central West		NA	1.36	0.85	0.25	0.82	1.53
			(NA-NA)	(0.16-11.31)	(0.47-1.55)	(0.05-1.13)	(0.37-1.80)	(0.77-3.07)
	Mississauga Halton		2.06*	2.51	2.25*	2.60*	1.58	1.14
			(1.00-4.24)	(1.00-6.31)	(1.53-3.31)	(1.62-4.16)	(0.95-2.62)	(0.69-1.86)
	Central		1.21	NA	2.18*	2.90*	2.10	6.47*
			(0.24-6.03)	(NA-NA)	(1.08-4.42)	(1.34-6.27)	(0.94-4.68)	(3.07-13.63)
	Central East		2.44*	2.15*	0.87	1.21	0.62*	1.42*
			(1.57-3.78)	(1.18-3.92)	(0.69-1.10)	(0.87-1.67)	(0.44-0.88)	(1.07-1.90)
	South East		0.30	1.13	1.77*	2.10*	1.11	0.98
			(0.07-1.34)	(0.35-3.62)	(1.23-2.55)	(1.30-3.38)	(0.69-1.79)	(0.63-1.53)
	Champlain		0.79	0.87	0.77*	0.91	1.20	0.40*
			(0.43-1.44)	(0.38-2.02)	(0.60-1.00)	(0.62-1.34)	(0.86-1.68)	(0.28-0.58)
	North Simcoe Muskoka		0.78	0.22	1.29	0.61	0.47*	0.76
			(0.30-2.07)	(0.03-1.77)	(0.87-1.90)	(0.35-1.08)	(0.26-0.85)	(0.46-1.26)
	North East		0.65	0.62	0.44*	0.59*	0.57*	0.56*
			(0.36-1.17)	(0.26-1.46)	(0.34-0.56)	(0.40-0.86)	(0.40-0.80)	(0.41-0.75)
	North West		1.30	1.36	1.86*	1.27	1.26	1.11
			(0.67-2.55)	(0.51-3.60)	(1.39-2.50)	(0.82-1.97)	(0.85-1.87)	(0.72-1.71)
ADL-H 3-4	Erie St. Clair	0.69		1.98*	0.48*	0.50*	0.51*	2.62*
		(0.41-1.15)		(1.28-3.07)	(0.35-0.64)	(0.33-0.75)	(0.35-0.74)	(1.92-3.57)
	South West	0.56*		1.42	0.91	1.26	0.67*	4.75*
		(0.34-0.93)		(0.92-2.22)	(0.71-1.17)	(0.94-1.70)	(0.49-0.93)	(3.58-6.29)
	Waterloo Wellington	0.65		0.74	2.91*	2.14*	1.32	2.77*
		(0.39-1.08)		(0.42-1.30)	(2.31-3.67)	(1.58-2.90)	(0.98-1.78)	(2.03-3.78)
	HNHB	0.62*		1.40*	1.05	1.43*	0.54*	1.16
		(0.46-0.84)		(1.02-1.93)	(0.89-1.23)	(1.15-1.76)	(0.43-0.67)	(0.92-1.46)

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Table C.24 – continued from previous page

Initial State	LHIN[1]	Next State						
		ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
	Central West	0.29*		0.82	0.62*	1.62*	0.57*	2.19*
		(0.12-0.69)		(0.30-2.18)	(0.44-0.88)	(1.02-2.58)	(0.36-0.91)	(1.47-3.25)
	Mississauga Halton	0.54*		1.25	1.38*	1.60*	1.03	1.27
		(0.33-0.86)		(0.78-1.99)	(1.10-1.73)	(1.20-2.15)	(0.77-1.37)	(0.92-1.74)
	Central	1.74		1.74	3.22*	2.74*	2.07*	7.44*
		(0.79-3.82)		(0.77-3.94)	(2.01-5.15)	(1.64-4.56)	(1.22-3.51)	(4.48-12.36)
	Central East	0.75		3.82*	1.00	1.54*	0.83	3.22*
		(0.48-1.19)		(2.67-5.46)	(0.79-1.28)	(1.14-2.07)	(0.61-1.13)	(2.42-4.27)
	South East	0.60		1.03	1.24	1.35	0.60*	0.94
		(0.33-1.08)		(0.60-1.77)	(0.94-1.63)	(0.97-1.88)	(0.41-0.86)	(0.65-1.36)
	Champlain	0.64*		0.59*	0.64*	0.64*	0.68*	0.80
		(0.43-0.95)		(0.36-0.96)	(0.51-0.80)	(0.48-0.87)	(0.52-0.91)	(0.59-1.10)
	North Simcoe Muskoka	2.01*		0.86	1.30	0.82	0.62*	1.20
		(1.20-3.37)		(0.42-1.76)	(0.94-1.82)	(0.53-1.25)	(0.40-0.95)	(0.79-1.82)
	North East	0.93		0.41*	0.52*	0.68*	0.69*	1.05
		(0.58-1.51)		(0.20-0.84)	(0.40-0.68)	(0.47-0.97)	(0.49-0.96)	(0.76-1.45)
	North West	0.93		1.26	1.56*	0.79	0.72*	0.91
		(0.61-1.42)		(0.81-1.96)	(1.24-1.98)	(0.58-1.07)	(0.53-0.98)	(0.63-1.31)
ADL-H 5-6	Erie St. Clair	0.57*	0.55*		0.43*	0.82*	0.62*	1.06
		(0.39-0.84)	(0.41-0.75)		(0.37-0.51)	(0.71-0.95)	(0.51-0.74)	(0.89-1.26)
	South West	0.53*	1.03		0.61*	1.17	0.72*	2.31*
		(0.33-0.86)	(0.73-1.46)		(0.51-0.74)	(0.98-1.40)	(0.57-0.92)	(1.89-2.82)
	Waterloo Wellington	0.51	1.50		1.55*	1.83*	1.68*	1.14
		(0.23-1.13)	(0.96-2.34)		(1.21-1.98)	(1.44-2.33)	(1.27-2.24)	(0.82-1.58)
	HNHB	0.73	1.36*		1.06	1.45*	0.72*	0.76*
		(0.51-1.04)	(1.06-1.75)		(0.92-1.23)	(1.26-1.66)	(0.60-0.86)	(0.63-0.92)
	Central West	0.40*	1.13		0.38*	1.45*	0.65*	1.83*
		(0.17-0.94)	(0.66-1.94)		(0.28-0.51)	(1.08-1.96)	(0.44-0.95)	(1.38-2.44)
	Mississauga Halton	0.48*	0.69		1.03	1.25*	0.86	0.60*
		(0.28-0.85)	(0.47-1.00)		(0.85-1.24)	(1.05-1.48)	(0.68-1.09)	(0.47-0.77)
	Central	0.67	1.05		1.49*	1.81*	1.05	2.29*
		(0.34-1.32)	(0.66-1.68)		(1.18-1.88)	(1.43-2.28)	(0.78-1.42)	(1.77-2.97)
	Central East	1.12	1.73*		0.94	1.30*	0.97	2.21*
		(0.71-1.76)	(1.25-2.40)		(0.77-1.16)	(1.08-1.58)	(0.76-1.24)	(1.79-2.73)
	South East	0.94	1.10		1.05	1.74*	1.39*	0.78
		(0.52-1.69)	(0.68-1.81)		(0.82-1.35)	(1.35-2.23)	(1.04-1.86)	(0.58-1.06)
	Champlain	0.74	1.29		0.74*	0.76*	1.04	0.69*
		(0.46-1.19)	(0.93-1.77)		(0.60-0.90)	(0.63-0.93)	(0.83-1.30)	(0.54-0.89)

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Table C.24 – continued from previous page

		Next State						
Initial State	LHIN[1]	ADL-H 0-2	ADL-H 3-4	ADL-H 5-6	Community	LTC	Hospital	Death
	North Simcoe Muskoka	2.39*	2.58*		1.06	0.63*	0.60*	0.96
		(1.32-4.34)	(1.62-4.09)		(0.77-1.47)	(0.47-0.85)	(0.38-0.94)	(0.67-1.38)
	North East	0.85	1.11		0.30*	0.66*	0.63*	0.60*
		(0.49-1.48)	(0.70-1.76)		(0.23-0.40)	(0.51-0.86)	(0.46-0.87)	(0.45-0.81)
	North West	1.07	1.98*		0.75*	0.89	0.74*	0.44*
		(0.63-1.83)	(1.37-2.86)		(0.59-0.94)	(0.71-1.12)	(0.56-0.99)	(0.30-0.64)

* $P < 0.05$

[1] Reference = Toronto Central

C.2 Phase 2: Multistate Transitions Following Community Discharge from Complex Continuing Care

C.2.1 Descriptive Statistics for Sample Used in Phase 2

Table C.25: Distribution of Demographic Variables Among Overall Sample and Initial Functional States, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Overall Sample		State 1 (ADL-H 0-1)		State 2 (ADL-H 2+)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Female		5,407	60.7	2,996	63.6	2,411	57.5
Age Group	0-64	1,265	14.2	640	13.6	625	14.9
	65-74	1,549	17.4	811	17.2	738	17.6
	75-84	3,224	36.2	1,749	37.1	1,475	35.2
	85+	2,869	32.2	1,514	32.1	1,355	32.3
Married		3,948	44.3	1,796	38.1	2,152	51.3
Support Person Positive Towards Discharge		6,905	88.7	3,835	89.4	3,070	87.8

Table C.26: Distribution of Diagnostic Condition Variables Among Overall Sample and Initial Functional States, Ontario Home Care Clients, 2010 - 2014, n = 12,824

	Overall Sample		State 1 (ADL-H 0-1)		State 2 (ADL-H 2+)	
Variable	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Amputation	248	2.8	123	2.6	125	3.0
Arthritis	2,627	29.5	1,423	30.2	1,204	28.7
Cardiac Conditions	4,259	47.8	2,238	47.5	2,021	48.2
Cancer	1,217	13.7	656	13.9	561	13.4
Neurological	863	9.7	318	6.7	545	13.0
Other Medically Complex Conditions	1,435	16.1	762	16.2	673	16.1
Orthopedic	2,663	29.9	1,551	32.9	1,112	26.5
Pulmonary Conditions	1,701	19.1	984	20.9	717	17.1
Spinal Cord Injury	128	1.4	28	0.6	100	2.4
Stroke	2,217	24.9	817	17.3	1,400	33.4
Traumatic Brain Injury	134	1.5	59	1.3	75	1.8

Table C.27: Distribution of Outcome Measures in Complex Continuing Care Among Overall Sample and Initial Functional States, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Overall Sample		State 1 (ADL-H 0-1)		State 2 (ADL-H 2+)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
ADL-Hierarchy Scale	0	490	5.5	416	8.8	74	1.8
	1	706	7.9	558	11.8	148	3.5
	2	2,481	27.9	1,597	33.9	884	21.1
	3	1,827	20.5	912	19.3	915	21.8
	4	1,252	14.1	533	11.3	719	17.1
	5	1,953	21.9	678	14.4	1,275	30.4
	6	198	2.2	20	0.4	178	4.2
Cognitive Performance Scale	0	3,268	36.7	2,102	44.6	1,166	27.8
	1	1,850	20.8	999	21.2	851	20.3
	2	1,665	18.7	891	18.9	774	18.5
	3	1,398	15.7	550	11.7	848	20.2
	4	295	3.3	73	1.5	222	5.3
	5	344	3.9	93	2.0	251	6.0
	6	87	1.0	6	0.1	81	1.9
CHESS	0	2,114	23.7	1,133	24.0	981	23.4
	1	2,673	30.0	1,517	32.2	1,156	27.6
	2	2,470	27.7	1,280	27.2	1,190	28.4
	3	1,275	14.3	639	13.6	636	15.2
	4	356	4.0	140	3.0	216	5.2
	5	18	0.2	5	0.1	13	0.3
Pain Scale	0	2,478	27.8	1,314	27.9	1,164	27.8
	1	2,767	31.1	1,387	29.4	1,380	32.9
	2	3,201	35.9	1,766	37.5	1,435	34.2
	3	461	5.2	247	5.2	214	5.1
Depression Rating Scale	0-2	7,522	84.5	4,062	86.2	3,460	82.5
	3+	1,385	15.5	652	13.8	733	17.5
Rehabilitation Potential	Neither Patient or Provider	2,793	31.4	1,361	28.9	1,432	34.2
	Only Patient	653	7.3	382	8.1	271	6.5
	Only Provider	1,054	11.8	428	9.1	626	14.9
	Both Patient and Provider	4,406	49.5	2,542	53.9	1,864	44.5

Table C.28: Distribution of Outcome Measures in Home Care Among Overall Sample and Initial Functional States, Ontario Complex Continuing Care, 2010 - 2015, n = 76,132

		Overall Sample		State 1 (ADL-H 0-1)		State 2 (ADL-H 2+)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
ADL-Hierarchy Scale	0	3,607	40.5	3,607	76.5	0	0.0
	1	1,107	12.4	1,107	23.5	0	0.0
	2	1,754	19.7	0	0.0	1,754	41.8
	3	1,000	11.2	0	0.0	1,000	23.8
	4	793	8.9	0	0.0	793	18.9
	5	544	6.1	0	0.0	544	13.0
	6	102	1.1	0	0.0	102	2.4
Cognitive Performance Scale	0	3,213	36.1	2,153	45.7	1,060	25.3
	1	1,773	19.9	1,010	21.4	763	18.2
	2	2,997	33.6	1,406	29.8	1,591	37.9
	3	625	7.0	126	2.7	499	11.9
	4	82	0.9	4	0.1	78	1.9
	5	170	1.9	15	0.3	155	3.7
	6	47	0.5	0	0.0	47	1.1
CHESS	0	1,269	14.2	780	16.5	489	11.7
	1	2,915	32.7	1,678	35.6	1,237	29.5
	2	2,891	32.5	1,478	31.4	1,413	33.7
	3	1,484	16.7	671	14.2	813	19.4
	4	332	3.7	105	2.2	227	5.4
	5	16	0.2	2	0.0	14	0.3
Pain Scale	0	2,545	28.6	1,384	29.4	1,161	27.7
	1	943	10.6	514	10.9	429	10.2
	2	4,174	46.9	2,210	46.9	1,964	46.8
	3	983	11.0	481	10.2	502	12.0
	4	262	2.9	125	2.7	137	3.3

Table C.29: Distribution of Therapy Intensity Variables Among Overall Sample and Initial Functional States, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Overall Sample		State 1 (ADL-H 0-1)		State 2 (ADL-H 2+)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Physical Therapy Quintile	No Therapy	535	6.0	281	6.0	254	6.1
	1st Quintile	1,824	20.5	910	19.3	914	21.8
	2nd Quintile	1,570	17.6	791	16.8	779	18.6
	3rd Quintile	1,841	20.7	995	21.1	846	20.2
	4th Quintile	1,490	16.7	809	17.2	681	16.2
	5th Quintile	1,647	18.5	928	19.7	719	17.1
Occupational Therapy Quintile	No Therapy	1,525	17.1	837	17.8	688	16.4
	1st Quintile	1,585	17.8	823	17.5	762	18.2
	2nd Quintile	1,480	16.6	773	16.4	707	16.9
	3rd Quintile	1,585	17.8	825	17.5	760	18.1
	4th Quintile	1,266	14.2	693	14.7	573	13.7
	5th Quintile	1,466	16.5	763	16.2	703	16.8
Physical Therapy in Home Care		2,663	29.9	1,330	28.2	1,333	31.8
Occupational Therapy in Home Care		3,938	44.2	1,765	37.4	2,173	51.8

Table C.30: Distribution of Facility and Region Variables Among Overall Sample and Initial Functional States, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Overall Sample		State 1 (ADL-H 0-1)		State 2 (ADL-H 2+)	
Variable		Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Facility Size	Small	1,355	15.2	781	16.6	574	13.7
	Medium	3,836	43.1	2,036	43.2	1,800	42.9
	Large	3,716	41.7	1,897	40.2	1,819	43.4
LHIN	Erie St. Clair	204	2.3	109	2.3	95	2.3
	South West	446	5.0	308	6.5	138	3.3
	Waterloo Wellington	533	6.0	332	7.0	201	4.8
	HNHB*	2,098	23.6	1,083	23.0	1,015	24.2
	Central West	223	2.5	120	2.5	103	2.5
	Mississauga Halton	483	5.4	210	4.5	273	6.5
	Toronto Central	2,154	24.2	1,028	21.8	1,126	26.9
	Central	367	4.1	162	3.4	205	4.9
	Central East	497	5.6	260	5.5	237	5.7
	South East	491	5.5	281	6.0	210	5.0
	Champlain	406	4.6	190	4.0	216	5.2
	North Simcoe Muskoka	289	3.2	145	3.1	144	3.4
	North East	351	3.9	232	4.9	119	2.8
	North West	365	4.1	254	5.4	111	2.6

C.2.2 Transition Rates within Community Care

Table C.31: State Transitions Rates After Community Discharge by Pain Scale in Home Care, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State						
Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1] (%)	*P-value*
ADL-H 0-1	Pain Scale 0	32.0	6.5	2.1	12.2	4.8	42.4	0.0001
	Pain Scale 1	35.7	6.0	2.2	11.8	4.5	39.8	
	Pain Scale 2	36.2	6.3	1.8	10.7	4.5	40.6	
	Pain Scale 3	36.6	6.7	2.3	16.6	6.0	31.8	
	Pain Scale 4	33.7	7.7	1.8	18.9	6.5	31.4	
ADL-H 2+	Pain Scale 0	5.9	46.0	8.3	12.0	7.7	19.9	0.1958
	Pain Scale 1	5.2	50.1	6.7	11.9	7.2	18.8	
	Pain Scale 2	6.4	46.3	7.8	13.3	7.2	19.1	
	Pain Scale 3	5.7	46.3	7.6	15.0	8.4	17.0	
	Pain Scale 4	4.6	44.0	6.4	20.6	7.3	17.0	

[1] Home care services discontinued

Table C.32: State Transitions After Community Discharge by Local Health Integration Network, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State						
Initial State	Level	ADL-H 0-1 (%)	ADL-H 2+ (%)	LTC (%)	Hospital (%)	Death (%)	Other[1]	*P-value*
ADL-H 0-1	Erie St. Clair	32.2	6.3	0.7	11.9	5.6	43.4	<.0001
	South West	44.0	4.2	2.4	11.8	5.8	31.8	
	Waterloo Wellington	37.5	6.7	1.3	10.4	3.0	41.0	
	HNHB*	33.0	5.4	1.9	9.1	5.2	45.5	
	Central West	24.0	4.1	3.4	19.2	4.8	44.5	
	Mississauga Halton	15.0	3.9	2.6	13.3	4.3	60.9	
	Toronto Central	38.7	7.8	1.8	11.4	3.3	36.9	
	Central	34.2	7.5	0.8	14.2	2.9	40.4	
	Central East	40.1	8.3	2.7	13.7	5.9	29.3	
	South East	36.1	8.2	2.8	11.3	6.4	35.1	
	Champlain	25.5	5.0	2.1	15.5	6.3	45.6	
	North Simcoe Muskoka	33.7	6.7	2.1	16.6	4.1	36.8	
	North East	30.2	5.4	1.7	13.9	4.4	44.4	
	North West	36.7	6.7	2.1	18.2	7.3	29.0	
ADL-H 2+	Erie St. Clair	4.5	42.9	5.3	19.5	9.8	18.0	<.0001
	South West	9.3	43.7	5.1	12.1	10.2	19.5	
	Waterloo Wellington	4.4	46.4	9.1	14.8	7.3	18.0	
	HNHB*	7.0	38.9	14.0	12.7	7.8	19.6	
	Central West	3.3	38.4	3.3	13.9	6.6	34.4	
	Mississauga Halton	3.0	34.8	13.0	14.1	7.5	27.6	
	Toronto Central	5.5	55.5	4.5	11.6	5.9	17.0	
	Central	8.3	58.7	2.2	9.4	7.2	14.3	
	Central East	6.3	50.0	6.3	12.2	11.1	14.0	
	South East	8.0	49.4	9.8	12.4	9.2	11.2	
	Champlain	4.4	38.6	4.8	16.4	7.5	28.3	
	North Simcoe Muskoka	4.9	46.0	7.6	13.8	7.1	20.5	
	North East	4.1	30.8	6.5	24.3	4.7	29.6	
	North West	6.7	44.8	3.0	22.4	10.3	12.7	

* Hamilton Niagara Haldimand Brant
[1] Home care services discontinued

C.2.3 Markov Chain Multistate Transition Model

Table C.33: Adjusted Odds of State Transition After Community Discharge by Age Group, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Initial State	Level	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[1]
ADL-H 0-1	0-64 vs. 65-74		0.88	1.20	0.85	0.75	1.11
			(0.57-1.36)	(0.45-3.24)	(0.62-1.16)	(0.45-1.26)	(0.89-1.38)
	75-84 vs. 65-74		0.93	1.79	0.80	1.08	0.93
			(0.67-1.30)	(0.85-3.77)	(0.63-1.02)	(0.74-1.58)	(0.78-1.11)
	85+ vs. 65-74		1.44*	2.55*	0.72*	1.33	0.78*
			(1.03-2.00)	(1.22-5.32)	(0.56-0.92)	(0.91-1.94)	(0.65-0.94)
ADL-H 2+	0-64 vs. 65-74	0.98		0.60*	0.99	0.79	0.80
		(0.67-1.45)		(0.38-0.96)	(0.75-1.31)	(0.52-1.20)	(0.63-1.01)
	75-84 vs. 65-74	1.19		1.53*	1.23	1.28	1.02
		(0.86-1.64)		(1.10-2.12)	(0.97-1.55)	(0.93-1.76)	(0.84-1.25)
	85+ vs. 65-74	1.24		1.91*	1.32*	1.92*	0.98
		(0.88-1.76)		(1.37-2.67)	(1.03-1.69)	(1.39-2.65)	(0.79-1.22)

[1] Home care services discontinued
* $P < 0.05$

Table C.34: Adjusted Odds of State Transitions After Community Discharged by Diagnosis Group, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Disease	Initial State	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[1]
Cancer	ADL-H 0-1		1.33	2.00*	1.54*	1.37	0.93
			(0.99-1.79)	(1.47-2.72)	(1.22-1.94)	(0.82-2.29)	(0.78-1.12)
	ADL-H 2+	0.79		1.86*	1.40*	1.12	0.92
		(0.56-1.11)		(1.44-2.40)	(1.12-1.75)	(0.83-1.51)	(0.74-1.14)
Cardiac Conditions	ADL-H 0-1		1.04	1.58*	1.44*	1.16	0.99
			(0.83-1.30)	(1.22-2.05)	(1.20-1.71)	(0.79-1.70)	(0.88-1.12)
	ADL-H 2+	0.98		1.34*	1.27*	0.84	0.84*
		(0.78-1.23)		(1.08-1.66)	(1.07-1.49)	(0.69-1.04)	(0.73-0.97)
Neurological Conditions	ADL-H 0-1		1.74*	1.06	1.01	1.98*	0.80
			(1.20-2.52)	(0.64-1.76)	(0.72-1.42)	(1.02-3.84)	(0.63-1.03)
	ADL-H 2+	0.59*		0.78	1.00	0.92	0.72*
		(0.41-0.86)		(0.56-1.09)	(0.80-1.26)	(0.68-1.24)	(0.58-0.89)
Orthopedic Conditions	ADL-H 0-1		1.13	0.67*	0.79*	0.78	1.14
			(0.89-1.43)	(0.50-0.90)	(0.65-0.97)	(0.51-1.18)	(1.00-1.30)
	ADL-H 2+	1.21		0.96	0.82*	1.03	1.07
		(0.94-1.56)		(0.75-1.22)	(0.67-0.99)	(0.82-1.29)	(0.90-1.26)
Other Medically Complex Conditions	ADL-H 0-1		1.44*	1.55*	1.47*	0.93	0.90
			(1.08-1.91)	(1.14-2.11)	(1.18-1.82)	(0.54-1.61)	(0.76-1.07)
	ADL-H 2+	1.31		1.83*	1.22	0.85	0.84
		(0.98-1.74)		(1.44-2.33)	(0.99-1.50)	(0.64-1.14)	(0.69-1.04)
Stroke	ADL-H 0-1		1.20	0.74	0.72*	0.67	0.86
			(0.92-1.57)	(0.53-1.05)	(0.57-0.91)	(0.39-1.15)	(0.73-1.01)
	ADL-H 2+	0.65*		0.70*	0.73*	0.81	0.90
		(0.50-0.84)		(0.56-0.89)	(0.61-0.87)	(0.65-1.02)	(0.78-1.06)

[1] Home care services discontinued
* $P < 0.05$

Table C.35: Adjusted Odds of State Transitions After Community Discharge by Local Health Integration Network, Ontario Home Care Clients, 2010 - 2014, n = 12,824

		Next State					
Initial State	LHIN[1]	ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other
ADL-H 0-1	Central		1.51	2.19	1.07	1.05	0.89
			(0.98-2.32)	(0.93-5.20)	(0.73-1.56)	(0.60-1.84)	(0.68-1.17)
	Central East		0.87	0.98	1.15	0.69	1.09
			(0.54-1.41)	(0.35-2.70)	(0.78-1.69)	(0.36-1.30)	(0.83-1.43)
	Champlain		1.05	1.68	1.99*	1.87	1.99*
			(0.51-2.14)	(0.51-5.51)	(1.20-3.29)	(0.90-3.86)	(1.36-2.89)
	Central West		1.04	7.87*	2.93*	1.71	2.15*
			(0.40-2.68)	(2.43-25.46)	(1.62-5.31)	(0.67-4.40)	(1.35-3.42)
	Erie St. Clair		1.55	0.89	1.40	1.64	1.30
			(0.73-3.27)	(0.11-7.49)	(0.74-2.64)	(0.68-3.96)	(0.84-2.01)
	HNHB		0.94	2.11	1.05	1.53	1.47*
			(0.62-1.44)	(0.92-4.82)	(0.74-1.48)	(0.93-2.53)	(1.16-1.86)
	Mississauga Halton		1.12	4.01*	2.87*	1.46	3.24*
			(0.50-2.48)	(1.29-12.46)	(1.70-4.84)	(0.61-3.51)	(2.19-4.80)
	North East		1.03	1.62	1.95*	1.40	1.58*
			(0.53-1.99)	(0.49-5.31)	(1.21-3.13)	(0.67-2.96)	(1.12-2.23)
	North Simcoe Muskoka		1.31	1.67	1.70	0.97	1.47
			(0.66-2.58)	(0.46-6.08)	(0.99-2.92)	(0.39-2.42)	(0.98-2.19)
	North West		1.09	1.46	1.64*	1.82	0.88
			(0.62-1.92)	(0.50-4.22)	(1.07-2.51)	(0.98-3.37)	(0.63-1.23)
	South East		1.27	2.43	1.08	1.50	1.08
			(0.75-2.16)	(0.92-6.39)	(0.68-1.70)	(0.81-2.79)	(0.79-1.48)
	South West		0.63	1.65	1.02	1.04	0.82
			(0.35-1.13)	(0.63-4.29)	(0.66-1.56)	(0.56-1.92)	(0.61-1.12)
	Waterloo Wellington		1.18	1.13	1.12	0.68	1.14
			(0.69-2.00)	(0.37-3.43)	(0.72-1.74)	(0.34-1.40)	(0.84-1.54)
ADL-H 2+	Central	1.65*		2.21*	1.35	1.70*	0.94
		(1.04-2.63)		(1.33-3.68)	(0.97-1.90)	(1.11-2.59)	(0.70-1.27)
	Central East	1.67*		0.95	1.05	1.39	0.97
		(1.07-2.62)		(0.54-1.68)	(0.75-1.48)	(0.91-2.14)	(0.73-1.29)
	Champlain	1.46		2.63*	2.50*	2.10*	2.35*
		(0.72-2.94)		(1.29-5.37)	(1.61-3.88)	(1.16-3.79)	(1.62-3.40)
	Central West	0.88		2.30*	2.23*	1.23	2.80*
		(0.35-2.19)		(1.01-5.23)	(1.36-3.67)	(0.56-2.68)	(1.89-4.15)

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Table C.35 – continued from previous page

Initial State	LHIN[1]	Next State					
		ADL-H 0-1	ADL-H 2+	LTC	Hospital	Death	Other[2]
	Erie St. Clair	0.97		2.88*	2.38*	1.77	1.26
		(0.36-2.63)		(1.25-6.66)	(1.38-4.11)	(0.85-3.69)	(0.73-2.18)
	HNHB	2.20*		6.79*	1.78*	1.95*	1.66*
		(1.43-3.37)		(4.32-10.69)	(1.30-2.43)	(1.31-2.90)	(1.28-2.15)
	Mississauga Halton	0.83		4.54*	2.40*	2.16*	2.67*
		(0.38-1.80)		(2.59-7.95)	(1.60-3.62)	(1.26-3.73)	(1.91-3.74)
	North East	1.25		3.27*	4.11*	1.43	2.50*
		(0.52-3.02)		(1.45-7.38)	(2.53-6.67)	(0.66-3.11)	(1.59-3.91)
	North Simcoe Muskoka	1.40		3.71*	1.68*	1.13	1.75*
		(0.68-2.90)		(1.89-7.31)	(1.02-2.77)	(0.56-2.27)	(1.16-2.62)
	North West	1.54		1.20	2.67*	2.37*	0.82
		(0.73-3.24)		(0.44-3.29)	(1.65-4.32)	(1.24-4.52)	(0.48-1.41)
	South East	2.09*		3.11*	1.23	1.60	0.76
		(1.20-3.62)		(1.75-5.52)	(0.80-1.90)	(0.95-2.69)	(0.50-1.15)
	South West	2.48*		2.31*	1.40	2.23*	1.48
		(1.34-4.60)		(1.12-4.80)	(0.84-2.34)	(1.24-3.98)	(0.97-2.26)
	Waterloo Wellington	1.25		2.69*	1.66*	1.64	1.24
		(0.63-2.46)		(1.47-4.93)	(1.08-2.55)	(0.93-2.90)	(0.85-1.82)

* $P < 0.05$
[1] Reference = Toronto Central
[2] Home care services discontinued