Clinical Predictors of Protracted Length of Stay in Complex Continuing Care Facilities

by

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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Science
in
Health Studies and Gerontology

Waterloo, Ontario, Canada, 2014

Author's Declaration

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

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Abstract

Purpose: The purpose of this research project was to describe the clinical characteristics of regular and long-stay Ontario CCC patients, identify a group of clinical characteristics available to care planners on admission that are predictive of delayed discharge from a CCC facility, and to determine CCC discharge barriers. In addition, analyses predicting discharge destination using admission characteristics were completed. Lastly, the psychometric performance of a new discharge planning algorithm designed for long-stay nursing home patients was also evaluated using this sample of Ontario CCC patients.

Methods: This project was conducted using a secondary data analysis RAI MDS 2.0 admission assessments from Ontario CCC patients admitted between 2001 and 2013. A total of 154,456 episodes of care were used in the analysis. Long-stay patients were identified as those belonging in the 95th percentile for length of stay. Analyses were completed in parallel for the overall sample and for 5 discharge setting based subsamples (community, residential care, expired in facility, acute care and other settings). Descriptive statistics for pertinent clinical variables were produced and group differences ascertained using Chi-square (χ^2) tests. Multivariate binary logistic regression models were created to identify predictors of long-stay patient status. A nominal logistic regression model was created to identify predictors of discharge setting using admission characteristics. Lastly, the psychometric performance of the Q+ algorithm was assessed.

Results: Numerous clinical characteristics were predictive of long-stay patient status in Ontario CCC facilities. Examples include young age, ADL impairment, aggression, a lack of clinical instability, increased pressure ulcer risk, increased social engagement, neurological diseases such as Alzheimer's diseases and related dementias, Parkinson's and multiple sclerosis, a lack of cancer diagnosis, tracheostomy, ventilator or respirator care, feeding tube, a lack of desire to return to the community and the lack of a support person in the community. Many of the same clinical characteristics also served as early predictors of discharge destination. The area under the curve for the Q+ algorithm predicting successful community discharge in the next 90 days was 0.73. At a threshold score of 12, the algorithm sensitivity was 0.67 and specificity was 0.68.

Conclusions: The findings from this research project suggest that predictors of length of stay are complex, and that numerous patient attributes and process oriented variables, such as provision of therapies and treatments, are responsible for delayed discharged from Ontario CCC facilities. This research lays the groundwork for the development of risk-adjusted facility benchmark tools and decision-support tools for discharge planning.

Acknowledgements

I would like to thank my supervisor, Dr. John Hirdes, for his support and mentorship through both this thesis project and Masters degree. John, I am greatly appreciative the opportunities you have provided me and the freedom you have given to explore questions that are of interest me. I look forward to working alongside you for years to come.

I would also like to thank my committee members, Dr. Chris Perlman and Dr. Brant Fries for their guidance and support through this thesis.

I am grateful to Julie Koreck, Micaela Jantzi, Jonathan Chen and Nancy Curtin-Telegdi. Julie, your patient reminders and extraordinary organization skills have saved me on many occasions. Thanks for looking out for me. Micaela, thank you for listening to my fraught stricken rambling and for easing my fears with your sage advice. Jonathan, your unrelenting assistance has enabled me to address research questions that would ordinarily be beyond my grasp. Nancy, I cannot begin to count the ways you have helped me through this degree. Thank you for advocating on my behalf time and time again.

I would like to thank Marilyn Rook, Ivan Ip, Marilyn Wharton, Jake Tran, Joshua Moralejo, Leo Chow, Racquel Legaspi-Labuntog and Cherry Pond for welcoming me into their team at Toronto Grace Health Centre and providing me with first-hand experience with complex continuing care. Further, I wish to acknowledge Toronto Grace Health Centre for their funding and support of this research project.

Lastly, I would like to thank Caitlin for her patience, selflessness, understanding and support over the course of this thesis. You deserve more credit than I give you.

Dedication

This thesis is dedicated to my late mother, Katherine Hope Turcotte.

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1 Introduction

1.1 Patient Flow

The Canadian health systems is organized as a collection of health service providers caring for patients across a multitude of settings. Individuals that are affected by chronic and complex health conditions diseases, as is often the case amongst older adults, may require care in multiple settings along the "continuum of care" over time. At all points along the continuum, be it acute care hospital, skilled nursing facility, home care, patients are transitioned to adjacent settings as needed with the aim that appropriate care is delivered in the most efficacious way possible (Canadian Institute of Health Information, 2010). Under ideal circumstances, the boundaries between contiguous service settings are seamless and patient transfers are timely. In reality, this vision of an integrated health system with coordinated care across settings has not yet been realized (Sutherland and Crump, 2013).

Patients receiving care in hospital settings that are inappropriate for their needs are designated as Alternative Level of Care (ALC) patients. ALC patient days are considered an inefficient use of hospital resources and may prevent timely access to medically necessary care for other system users (Sutherland and Crump, 2013). In 2008–2009, 13% of all patient days in Canadian acute care hospitals involved ALC patients (Canadian Institute of Health Information, 2010). Nearly two-thirds of patients designated as ALC patients were waiting for placement in another care facility. In over 50% of cases, patients were waiting for access to facility-based post-acute care and in 12% of cases were waiting for access to a rehabilitation facility (Canadian Institute of Health Information, 2010; Sutherland and Crump, 2013).

The collective manner by which patients transition between care settings within a health system is called "patient flow". An understanding of the complexities of patient flow is necessary to refining the operation of a health system as it provides a means to anticipate resource needs, such as number and type patient beds, number of patient days, staffing levels, and system case-mix (Marshall et al., 2005).

While great attention is paid to patient flow in acute care hospitals, barriers to admission and barriers to discharge from post-acute care facilities are comparatively understudied, despite their potential impact on flow in acute care hospitals and other post-acute care facilities along the continuum of care (New et al., 2013b,a). The Greater Toronto Area (GTA) Rehabilitation Network's published reports on ALC surveys in post-acute care facilities found that in 2008 4% of in-patient rehabilitation beds and 14.5% of Low Tolerance Long Duration (LTLD) complex continuing care (CCC) beds were occupied by ALC patients. Nearly 60% of in-patient rehabilitation and 87% of LTLD CCC ALC patients were waiting for admission to a long-term care (LTC) facility (GTA Rehab Network, 2008). A 2007 survey of both acute care and rehabilitation beds in Toronto found that geriatric/medical rehabilitation patients were the largest ALC group (25%), followed by musculoskeletal (23%) and neurological (10%) patient groups. Further, 50% of ALC patients in the survey reported one or more special care needs, the most frequent being wound care (GTA Rehab Network, 2008).

1.2 Complex Continuing Care

In Ontario, Canada, CCC programs provide 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 of time (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. This is reflected by the median CCC length of stay of 31 days for adults aged 20-64 and 29 days for adults aged 65 and older in 2009-2010 (Canadian Institute of Health Information, 2011; Complex Continuing Care and Rehabilitation Provincial Leadership Council of the Ontario Hospital Association, 2006). A wide variety of programs including long-term complex medical care, geriatric assessment and rehabilitation, psycho-geriatric care, palliative care, and respite care are offered in CCC beds (Teare et al., 2004). 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 Ontario, CCC programs are delivered in freestanding CCC hospitals or as designated CCC beds and wards within acute care hospitals (Canadian Institute of Health Information, 2004).

CCC was initially conceived as part of the Health Services Restructuring Commission's (HSRC) Long Term Care Reform. It was determined that CCC facilities, formerly termed chronic care units or hospitals, would serve as the appropriate care setting for individuals necessitating hospital based care along the long-term care continuum (Ontario Health Services Restructuring Commission, 1998; Hirdes et al., 2003b). In 1998, following recommendations from the HSRC, the Resource Utilization Groups (RUG-III) case-mix system derived from the MDS 2.0 assessment became the method to inform funding allocated to CCC hospitals in Ontario (Hirdes et al., 2003b; Fries et al., 1994). The HSRC recommended that patients categorized into Clinically Complex, Extensive Services, and Special Care levels should broadly be considered as CCC patients, while those falling into the Behaviour Problems, Impaired Cognition, and Physical Functions Reduced levels would best be cared for in residential long-term care (LTC) facilities (Ontario Health Services Restructuring Commission, 1998; Hirdes et al., 2003b).

Over time, the role of CCC in Ontario has shifted toward caring for patients with more complex medical needs and delivering rehabilitation to those with functional impairments. This shift may be observed by exploring trends of CCC patient RUG-III classification over time. For example, in 1996, 18% of CCC patients were categorized as Special Rehabilitation patients, rising to 33% in 2002, 51% in 2007 and 59% in 2012 (Hirdes et al., 2013). On the other hand, the proportion of patients in the lowest RUG-III clinical category, Reduced Physical Function, have decreased over time from 23% in 1996 to 9% in 2002, 4% in 2007 and 5% in 2012 (Canadian Institute of Health Information, 2004, 2008, 2013).

An interdisciplinary team of physicians, nurses and allied health professionals comprise the staff of CCC facilities. While the scope of expertise may vary by facility, CCC facilities provide care to patients across a broad array of diseases and conditions. The most common conditions cared for in CCC facilities are hypertension (42%), cerebrovascular accident (21%), dementias including

Alzheimer's and non-Alzheimer's (23%), arthritis (26%), diabetes (26%), cancer (26%), depression (20%) and emphysema (16%) (Canadian Institute of Health Information, 2006). Compared to LTC facilities, neurological conditions such as amyotrophic lateral sclerosis, multiple sclerosis (MS) and traumatic brain injury (TBI) are more likely to be cared in CCC facilities (Danila et al., 2014). Further, patients who are ventilator-dependent, requiring feeding tubes, hemodialysis and other extensive services therapies are likely to be cared for in CCC rather than LTC facilities (Complex Continuing Care and Rehabilitation Provincial Leadership Council of the Ontario Hospital Association, 2006; Hirdes et al., 2011).

In Ontario, acute care patients that are too frail to tolerate high intensity rehabilitation for several hours a day in a traditional rehabilitation facility may be admitted to CCC facilities for the provision of LTLD therapy (Tourangeau et al., 2011). Rehabilitation delivered in CCC facilities is considered a cost-effective means of caring for individuals requiring step-down levels of care with potential for functional improvement. Hospitalized individuals are at risk of musculoskeletal deconditioning as a result of inactivity, immobility and bed-rest; however, the cardio-respiratory, urinary, gastrointestinal, metabolic, endocrine and neurological systems may also be at risk of deleterious changes (Stucki et al., 2005). Older, frail individuals and those with chronic and co-morbid conditions are at greater risk of functional decline following an acute episode (Stucki et al., 2005). Early access to rehabilitation services may minimize loss of function in the frail elderly, prevent further disabilities, promote patient autonomy and prevent the need for long-term care (Lee et al., 2013; Stucki et al., 2005).

1.3 Patient Flow in CCC

Medium growth projections of population aging estimate that 24% of the population will be aged 65 years and older by the year 2036, with the average life expectancy at birth expected to increase to 87.3 years for women and 84.0 years for men (Statistics Canada, 2010; Canadian Institute of Health Information, 2011). Shorter term, population aging is already well underway as older adults 65 years and older made up 14.8% of the population in 2011 compared to 13.7% in 2006

(Statistics Canada, 2012). Nearly one-third of older adults 60–79 years of age and 48% of those aged 80 years and older in Canada have 2 or more of the following chronic conditions: arthritis, cancer, chronic obstructive pulmonary disease, diabetes, heart disease, high blood pressure and mood disorders (Health Council of Canada, 2007). Older adults with 3 or more chronic health conditions are responsible for 40% of reported health care utilization, despite only accounting for 24% of older adults (Canadian Institute of Health Information, 2010, 2011). Further, those with three or more chronic conditions are eleven times more likely to receive home care services and four times more likely to stay overnight in hospital (Health Council of Canada, 2007).

Shortening lengths of stay in acute care hospitals coupled with population aging, increased life expectancy, and the rising prevalence of chronic conditions amongst older adults in Canada are likely to result in an increased need for post-acute care, including access to complex-continuing care. Sutherland and Crump (2011) have alluded that new activity based funding mechanisms for acute care hospitals may also create incentives to quickly discharge patients, further increasing pressure on post-acute care facilities.

As a transition point between acute care and residential long-term or community care, CCC facilities already experience patient flow pressures at both points of admission and discharge. As previously mentioned, a substantial proportion of all ALC patient days are attributable to poor patient throughput from acute care hospitals to CCC facilities and from CCC to LTC facilities. These findings are supported by reports published by select Ontario Local Health Integration Networks (LHINs) indicating near 100% occupancy rates in many Ontario CCC facilities (North East Local Health Integration Network, 2012; Integrated Strategic Alliances Networks (ISAN), 2008; Task Group on Coordinated Strategy for Complex Care, 2010). Further, the proportion of CCC beds occupied by ALC patients may be as high as 36% (North East Local Health Integration Network, 2012; Integrated Strategic Alliances Networks (ISAN), 2008; Task Group on Coordinated Strategy for Complex Care, 2010). This suggests that Ontario's continuing care system needs to improve its capacity for managing individuals with complex and chronic care needs.

In an effort to deliver quality care in an efficient manner, health planners in other countries

such as the United States and United Kingdom are implementing policies that prioritize the delivery of long-term care to individuals with the greatest need such as Medicaid's "Money Follow the Person" (MFP) initiative and the National Health Service's (NHS) "Community Care Act" (Fries and James, 2012; McCoy et al., 2007). These program provide incentives to discharge patients in long-term care institutions back to the community when appropriate supports are available (Fries and James, 2012). While incentive based legislation has not yet been introduced in Canada, programs such as Ontario's "Home First" program put forth a system wide philosophy of exhausting available community care resources before seeking facility based care. Nonetheless, managing patient flow through appropriate placement is undeniably important in ensuring the Canadian health care system has sufficient capacity to care for individuals at all points along the continuum of care.

Gassoumis et al. (2013) suggest that there are four sub-populations in continuing care: patients who are able to transition back to the community without support, patients who may transition with support, patients that require hospital care due complex conditions and may die in hospital, and patients who will remain institutionalized as a result of chronic conditions. Care planners responsible for discharge planning in CCC facilities should focus on identifying those patients who require support because they may be at risk of long-term delayed discharge. In addition to an awareness of patient flow both in and out of CCC facilities, system planners require knowledge of those patients who stay in a CCC facility for extended periods due to persisting complex medical needs. This information is essential when allocating resources and organizing services.

A better understanding of the clinical characteristics of CCC patients with protracted lengths of stay and the determining factors of long-term delayed discharge for this patient population is necessary to enable front-line CCC staff to deliver quality and efficient care and to guide system planners in organizing Ontario's continuing-care services. The purpose of this thesis is to describe the clinical characteristics of long-stay CCC patients, describe barriers associated with long-term delayed discharge and identify a set of early clinical predictors that are indicative of need for long duration care in a CCC facility.

2 Literature Review

To date little empirical research has been published concerning patients receiving care in CCC facilities, especially literature that investigates the clinical characteristics of patients with protracted lengths of stay. Articles describing subacute patients in other jurisdictions are available; however, given the heterogeneity of international health systems, conclusions drawn by studies in foreign countries may not be directly applicable to Ontario CCC facilities. Much of the available research is focused on describing outcomes and transitions of subacute patients, primarily as these patients return to community settings. Although there is a moderate sized body of published research describing the clinical characteristics and discharge barriers of short-stay versus long-stay subacute care patients, the majority of the studies use a relatively short length of stay threshold (typically 90 days) when defining long-stay patients. Nonetheless, these studies may be valuable in selecting potential early predictors of protracted lengths of stay in Ontario CCC facilities.

A wide variety of diseases and conditions are cared for in CCC facilities and as previously mentioned, patient needs are addressed by multitude of care programs. For this reason studies of care facilities that delivered similar types of care as what may be offered in Ontario CCC facilities were reviewed. Examples may include long-term acute care hospitals and in-patient rehabilitation facilities. Caution has been taken when reviewing articles as the intensity of care offered in a particular setting may differ from what is offered in a CCC facility. Henceforth, CCC-like facilities in other jurisdictions will be broadly referred to as sub-acute care facilities.

Literature searches were conducted using the MEDLINE (PubMED), Scopus, Web of Science and Google Scholar journal indexes using appropriate Medical Subjects Headings (MeSH) and 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.

This review of the literature is presented by grouping major themes and topics observed in

the published research. When applicable, a critique of the methods used in the studies that were reviewed is presented. A summary table of selected literature is presented in Table 31 located in Appendix B.

2.1 Subacute Care Length of Stay

The Hospital Report Research Collaborative's 2003 report on CCC facilities in Ontario described differences in clinical characteristics between long-stay chronic, short-stay and ultra-short-stay patients (Teare et al., 2004). Long-stay patients, defined as those hospitalized for 90 days or more represented one-third of the report's sample. Short-stay patients were those who were hospitalized between 14 and 90 days and ultra-short-stay patients had been hospitalized for less than 14 days. The median length of stay amongst long-stay patients in this report's sample was 220 days. In this sample, 14% of long-stay patients were discharged home and 24% were discharged to a long-term care facility (Teare et al., 2004). Clinically, 25% of long-stay patients were severely cognitively impaired, while only 20% of ultra-short-stay patients had greater than mild-moderate cognitive impairment as measured using the Cogntive Performance Scale (CPS) (Teare et al., 2004). Based on the ADL Hierarchy Scale (ADL-H), 64% of long-stay patients were dependent or totally dependent on others to complete activities of daily living compared to 48% of ultra-short-stay patients (Teare et al., 2004). Unfortunately, this report failed to provide CPS and ADL-H scale scores for short-stay patients.

The Canadian Institute of Health Information (2006) report on short-stay (LOS $\leq$ 92 days) and long-stay (LOS >92 days) hospital-based continuing care patients found that the mean ADL-H scale score for short-stay patients was 3.6 compared to 4.2 for long-stay patients. In this report, 16% of short-stay and 32% of long-stay patients scored a 6 on the ADL-H scale indicating that they were totally dependent on others for basic activities of daily living. Mean CPS scores for these two patient groups were 2.1 for short-stay patients and 3.1 for long-stay patients. Nearly a quarter (23%) of long-stay patients had a CPS score of 6 compared to 9% for the short-stay group. Amongst long-stay patients, 28% showed signs suggestive of a mood disorder indicated by a DRS score of

3 or greater. Comparatively, approximately 20% of short-stay patients showed signs suggestive of a mood disorder. There was little difference between groups on Pain Scale scores, averaging 1.4 and 1.2 for short-stay and long-stay groups, respectively. ABS scores also so showed little change between groups, averaging 0.7 and 1.1 for short-stay and long-stay groups, respectively. A greater proportion of long-stay patients were classified into the Extensive Services, Special Care, Impaired Cognition and Reduced Physical Function RUG-III clinical categories. Lastly, a greater proportion of long-stay patients were younger than 65 years of age.

Hirdes et al.'s (2011) study of Ontario CCC patients from 2009-2010 found that 57% of patients were discharged within 90 days of admission. Comparatively, only 6% of LTC patients were discharged within that time span.

United States nursing home residents who are were more likely to have short stays of less than 180 days in a nursing home had the following clinical characteristics: male; younger than 85 years old; higher levels of education; diagnosed with cancer, heart disease or hip fracture; less cognitive impairment and more functional impairment (Banaszak-Holl et al., 2011).

In a study of Southern California nursing facility residents, 11% were discharged within 14 days of admission, 43% within 30 days of admission and 68% within 90 days. In this sample, 14% of residents had lengths of stay between 91-365 days, and 18% remained in the nursing facility for more than a year (Gassoumis et al., 2013). Residents who remained in the nursing facility between 91 and 365 days were more likely to be unmarried, older, less educated, functionally dependent, incontinent, cognitively impaired, have Alzheimer's or other dementia diagnosis, have a psychiatric disorder, diabetes, cancer or end-stage disease, were more likely to haven fallen in the past 180 days and more likely to have been temporarily discharged back to acute care within the first 90 days of their nursing facility stay, have low care needs, and receive Medicaid funding for their stay (Arling et al., 2011; Gassoumis et al., 2013).

Patients with dementia receiving care in skilled nursing facilities (SNFs) had a significantly longer length of stay compared to those without a dementia diagnosis (92.9 ± 313 vs. 29.7 ± 136.8 days, $P<0.001$). This finding was true within all age groups over the age of 69. Further, among

patients with a dementia diagnosis, gender did not have an impact on SNF length of stay (Sabbagh et al., 2003). The authors have suggested that demented patients may have a longer length of stay compared to other patients because they are admitted to SNFs for reasons related to dementia (e.g., behaviour issues) as opposed to physical impairment or medical needs (Sabbagh et al., 2003). Unfortunately, further analyses did not evaluate this hypothesis.

Within 180 days of admission, nearly half (48%) of acute stroke patients admitted to Ontario CCC facilities for LTLD rehabilitation therapy are discharged to an independent or semi-independent community setting and 35% are discharged to a nursing home facility. After 180 days, the remaining patients are either readmitted to an acute care hospital or remain in the facility for continued care (Tourangeau et al., 2011). Stroke patients in this sample were hospitalized for a mean of 113(S.D.$\pm$49) days. Mean length of stay was 123 days for those discharged to the community, 98 days for those discharged to nursing homes and 114 days for those readmitted to acute care (Tourangeau et al., 2011). Standard deviation statistics were not reported for mean length of stay by discharge setting.

2.2 Discharge Prognosis on Admission

A study of stroke patients receiving care in skilled nursing facilities found that patients that were discharged to the community most frequently had a discharge prognosis on admission of less than 30 days. For patients with no discharge expected on admission, only 6% were discharged home over the 3-year study period (Wodchis et al., 2005). Patients who desired discharge and who had a discharge support person were more likely to have better discharge prognosis. Conditions such as heart failure, hypertension, peripheral vascular disease, seizures, urinary tract infection and thrombosis in addition to level of assistance required for dressing, eating and transferring did not affect discharge prognosis (Wodchis et al., 2005).

Stroke patients receiving rehabilitation in SNFs who were admitted with poor outlook for improvement were discharged more frequently to nursing homes for long-term care compared to those with good outlook at admission. At discharge, patients with poor outlook on admission transition-

ing to community settings resembled patients with good outlook at admission. Patients with both poor and good outlooks at admission who were discharged from the SNF showed improvements in ADLs, balance, arm function and walking ability. Patients in the poor outlook group also had fewer complaints of depression and neuropsychiatric symptoms compared to at admission (Buijck et al., 2012).

2.3 Trajectories of Change

For CCC patients, especially those requiring rehabilitation following an acute hospitalization, restoring or ameliorating functional status by increasing independence in ADLs is a primary focus of care. Banaszak-Holl et al. (2011) plotted trajectories of functional change for long-stay ($\geq$ 180 days) in United States nursing home residents. Overall, ADL impairment was shown to increase over the length stay for long-stay residents. Residents with a greater degree of physical impairment at admission showed slower progression in functional impairment over time, while those with lower functional impairment at admission demonstrated improvement in the initial year of stay followed by a lesser degree of functional decline over time. A greater degree of cognitive impairment at baseline was predictive of greater physical impairment over time (Banaszak-Holl et al., 2011). Heart disease and hip fracture, both of which counter-intuitively slowed the rate of functional impairment, had a significant effect on trajectories of functional change at admission. Residents aged 85 years and older experienced more functional impairment over time. Residents of this study who were temporarily discharged and readmitted within 6 months were assigned a single episode of care for the purpose of calculating length of stay. Assigning a single care episode to residents who resided 6 months outside of the care facility is overly generous, given that in a similar study design, Gassoumis et al. (2013) assigned residents with a maximum of 30 days outside of the care facility a single episode of care. In addition, caution should be taken regarding the generalizability of this particular study to the CCC population of the proposed study because the mean length of stay was relatively long at 1.9 years.

2.4 Clinical Instability in Subacute Care

Patients receiving rehabilitation in a post-acute care facility should be medically stable to ensure that medical conditions do not interfere with participation in rehabilitation therapy (Guerini et al., 2010). In patients admitted to a rehabilitation and aged care unit, 23% were classified as clinically unstable at admission. In this study, patients with clinical instability or delirium were 6.2 times more likely to have poor functional recovery at the end of their stay. Patients with both clinical instability and delirium were 12.1 times more likely to experience poor functional recovery (Guerini et al., 2010). Further, the mean length of stay for patients with clinical instability or delirium was significantly greater than for those who were clinically stable on admission. This study is limited in its ability to assess the true impact of clinical instability on rehabilitation outcomes as the 3-group design does not isolate patients with clinical instability from those with delirium. Instead, a 4-group design should have been utilized.

In Taiwanese post-acute care (PAC) facilities, 13% of patients return to acute care facilities for more intensive or specialized care within the first 30 days of stay, a transition pathway that Lee et al. (2013) deem to be indicative of clinical instability. Clinically unstable PAC patients have a lower BMI and poorer nutritional status, cognitive function and ambulation ability than stable patients (Lee et al., 2013). These findings are mirrored by Guerini et al. (2010). Clinically unstable PAC patients are most frequently readmitted to acute care for respiratory, genitourinary and digestive conditions. However, patients re-admitted between 14 and 30 days are more likely to have suffered an upper limb fracture or dislocation. Poor cognitive status, as measured using the Mini Mental State Exam (MMSE) was the only predictive risk factor of an acute care readmission within 30 days of PAC admission (Lee et al., 2013). It is important to note that this study is disproportionately represented by males, as 97% of the sample was male. This sample bias is because study participants were recruited from Taiwanese Veteran Affairs tertiary referral centres and community hospitals.

Leong et al. (2009) studied factors affecting unplanned readmission from community hospitals to acute care facilities in Singapore. The rates of early and unplanned readmission, defined as a

length of stay less than 7 days before readmission, were 8%. Late readmission rates (LOS $\geq$ 7 days) were 10%. In this sample, predictive factors of unplanned readmissions included functional, cognitive and nutritional status in addition to degree of organ impairment across multiple systems (Leong et al., 2009). As noted by the authors, the validity of this study is hindered by its lack of delirium measures, and thus it was not possible to adjust for delirium as a potential confounder of clinical instability.

2.5 Eligibility for Discharge

Mor et al. (2007) found that 5-12% of long-stay nursing home residents had low-care needs and were likely be able to successfully reside in the community with support. Low-care residents were less likely than other residents to have had a stroke, hip fracture, urinary tract infection or impaired vision. Low-care nursing home residents were more likely to be living alone in the community. This may partially explain the need for prolonged institutionalization in these low-care cases.

Nursing facility transition (NFT) programs such as the "Money Follows the Person" (MFP) initiative have been implemented across the majority of US states to identify and relocate long-term care residents who are suitable for discharge to the community with the necessary supports in place (Fries and James, 2012). The Q+ Index by Fries and James (2012) serves as a tool to identify long-stay nursing facility residents that would be strong candidates for discharge to a community setting. Although the MDS 2.0 contains two items assessing discharge readiness, the Q+ index makes use of additional routinely collected items to provide discharge planners with greater insight for prioritizing resident transitions. The Q+ Index takes into account the resident's age, cognitive and functional status, select disease conditions, RUG-III group, length of stay, preference to return to the community and availability of a support person in the community (James et al., 2007; Fries and James, 2012). In studies of the performance of the Q+ Index with samples of nursing home residents in three US states with NFT programs, residents more likely to transition to the community were younger in age, had quadriplegia, hemiplegia or paraplegia, were involved in activities more than 1/3 of time, classified in the lowest resource intensity groups as measured

by RUG-III, expressed a desire to return to the community, did not have schizophrenia, were not severely cognitively impairment, did not require task segmentation and had not be institutionalized for more than 2 years (Fries and James, 2012) To date, the Q+ Index algorithm has not been tested in other patient populations or jurisdictions.

2.6 Discharge Destination

Given that CCC facilities operate primarily as transition points between acute care and community based care or residential long-term care facilities, discharge destination and its impact upon length of stay is important to consider. A Canadian Institute of Health Information (2006) report showed that short-stay (LOS$\leq$ 92 days) and long-stay (LOS>days) patients were transferred to acute-care facilities in nearly equal proportions at 12% and 14%, respectively. 31% of short-stay patients returned to the community compared to only 16% of long-stay patients. The inverse was true for residential care facility discharges with 17% of short-stay patients and 28% of long-stay patients receiving facility based continuing care after CCC discharge. Nearly one-third (35%) of short-stay and 38% of long-stay patients died in the CCC facility.

Residents who transitioned to the community were most frequently discharged within the first 30 days of stay. By 90 days of institutionalization, 92% of residents transitioning to the community were discharged, suggesting a critical period for transition back to the community within 90 days of admission with increasing community transition difficulty over time (Gassoumis et al., 2013). Other studies reported similar proportions of residents, ranging between 18% and 30%, with lengths of stay greater than 90 days in nursing facilities (Arling et al., 2011, 2010; Mor et al., 2007).

Residents with a support person who is positive toward discharge are 3.8 times more likely to be discharged to the community within 90 days of admission (Gassoumis et al., 2013). Other significant predictors of community transition within 90 days are: admission from an acute-care hospital, hip or other fracture, Extensive or Rehabilitation RUG-III category, minimal cognitive impairment and ADL dependence, have a preference to return to the community, receipt of training in community living skills, being younger, married, female and being responsible for personal

decision making, lacking Alzheimer's and other dementias, depression or other mental disorder, diabetes, cancer, or end-stage disease (Arling et al., 2011, 2010; Gassoumis et al., 2013; Thomas et al., 2010). While Gassoumis et al. (2013) found that the presence of behaviours problems was associated with discharge to the community within 90 days, Arling et al. (2010) found the opposite to be true. Thomas et al. (2010) observed that enrolment in a Social Health Maintenance Organization (S/HMO) increased the likelihood of transitioning to the community within 90 days.

In addition to individual characteristics that are predictive of community discharge, facility and market characteristics may have an impact on discharge destination for nursing home residents (Arling et al., 2011). Community discharge rates were highest in facilities with greater proportions of residents preferring to be discharged to the community, higher nursing staff levels and higher nursing facility occupancy rates. Facilities located in more populated areas and regions with a greater ratio of home care base supports (HCBS) to nursing home residents had higher community discharge rates (Arling et al., 2011). These findings demonstrate the importance of the availability of home care services for reducing utilization rates of nursing facilities by discharging residents who may live successfully in the community.

Wodchis et al. (2004) completed a competing-risks hazard regression comparing relative risk of discharge from SNF to home, hospital, death or transfer to another SNF facility. Factors strongly associated with discharge to the community included the absence of cognitive impairment, ADL impairment, ambulation, lack of indwelling catheter, lack of feeding tube, lack of Alzheimer's disease and other dementias , stroke and pressure ulcer. Patients that were male, dependent in ADLs, had in-dwelling catheters, feeding tubes, and receiving oxygen therapy had greater odds of hospital discharge. Advanced age was protective against hospital discharge in this study. Separation by death in the SNF was associated with male gender, advanced age, cognitive impairment, ADL impairment, immobility, pressure ulcers, oxygen therapy, and indwelling catheter. The use of a feeding tube was protective against death in the facility.

2.7 Discharge Barriers

The interface between adjacent care settings, for instance subacute care discharging to long-term residential care, is important to consider when studying factors that may affect length of stay. Barriers to admission and discharge impede patient flow and decrease system efficiency, resulting in the provision of care in settings that do not match patient needs. New et al. (2013b) studied Australian inpatient rehabilitation patients to determine the most common discharge barriers and the impact various discharge barriers had on additional hospitalization days. The most common discharge barriers were patients being non-weight bearing after lower limb fracture, discharge planning issues that were attributable to family negotiations and discussions as well as waits due to home modification and accommodation availability. Patients younger than 50 years of age and males had the greater odds of experiencing a discharge barrier (New et al., 2013b). In a study of an inpatient stroke rehabilitation unit in Singapore, 36% of discharges were found to be delayed (Tan et al., 2010). This study found that age, gender and ethnicity did not differ significantly for patients with delayed discharges compared to prompt discharges. Patients discharged to a nursing home had 4.6 (95% CI 1.90–11.25) greater odds of experiencing a discharge delay than community bound stroke patients. In 44% of delayed discharge cases, requests for extension of stay were made by the patient's family. This accounted for the largest proportion of delayed discharges in this study (Tan et al., 2010). A study of delayed and non-delayed discharges from hospital conducted by Challis et al. (2013) found that age, gender and pre-admission living arrangement were not significantly different between study groups. Clinical characteristics such as the presence of cognitive impairment, high level of dependence, injury, and mental and behavioural issues were significantly associated with delayed discharge. Patients under the care of trauma and orthopaedics specialists were more likely to have a discharge delay. Patients discharged to the community were less likely to experience a delayed discharge as compared to those admitted to care homes. Further, those returning to the community with home care services were more likely to experience a discharge delay than those not requiring support. Overall, this study found that organizational factors, such as nursing facility and home care coordination, were stronger predictors of delayed hospital discharge than patient characteristics (Challis et al., 2013).

3 Study Rationale

3.1 Study Purpose

As previously discussed, the clinical predictors of extended hospitalizations in CCC facilities along with barriers to CCC discharge have not yet been studied in Ontario.Therefore, the purpose of this study is to:

1. Describe the clinical characteristics of long-stay Ontario CCC patients
2. Determine barriers to discharge that are associated with long-term delayed discharge from an Ontario CCC facility
3. Determine predictors of long-stay patient status based upon baseline clinical characteristics available in the MDS 2.0 admission assessment instrument

This study extends the published research that describes long-stay patients in subacute care facilities offering similar levels of cares as Ontario CCC facilities. While published studies typically define long-stay patients as those remaining in the facility 90 days after admission, this study will instead define long-stay patients as those with lengths of stay in the 95th percentile by discharge setting. This modified long-stay patient definition is intended to identify individuals for whom transitions to the community care or long-term care is unlikely without substantial gains in functional status or extensive discharge planning. In addition, defining long-stay patients by this method permits the identification of patients who are likely to remain institutionalized in a CCC facility for the foreseeable future as a result of persistent complex medical needs that may not be manageable in lesser care settings. This may be the case for individuals who are categorized as Extensive Services, Special Care or Clinically Complex by the RUG-III system. Lastly, identifying patients in the 95th percentile for length of stay is a method of targeting patients who consume the greatest proportion of total patient days, information that system planners may use to inform policy decisions to build system capacity.

3.2 Scholarly Contributions

Gassoumis et al. (2013) has called for research that identifies the characteristics of long-stay patients that may be indicative of potential discharge success and the types of supports and services these long-stay patients will require to complete a transition. In part, this research study will address this gap in the literature by characterizing and comparing long-stay CCC patients to those patients experiencing more timely discharges. This research study will also expand on the few research studies evaluating discharge barriers from subacute care settings that have begun to emerge using Australian data (New et al., 2013a,b). This study is the first to evaluate barriers to CCC discharge using data from Canadian care settings. Further, the proposed study will help to further the development of Fries and James (2012) Q+ Index by evaluating its performance in a Canadian setting. The findings that are obtained from this research project will be made available to policy makers, care and discharge planners as a source of evidence for decisions impacting patient flow. On their own, these identified early clinical predictors of extended CCC hospitalization are anticipated to be useful to these health professionals to support discharge planning. However, an opportunity also exists to use the identified clinical characteristics to be used in decision support algorithms capable of identifying patients likely to become long-stay patients and risk-adjusted facility benchmarks. This research will provide the groundwork for further explorations in these domains.

4 Methods

4.1 Ethics

Ethics clearance for secondary data analysis of MDS 2.0 assessments contained in the Continuing Care Reporting System (CCRS) was provided by the University of Waterloo Office of Research Ethics on June 29, 2012 (ORE File#: 18228). A copy of the ethics clearance is presented in Appendix A.

4.2 Data Source

The primary data for this research study are interRAI Resident Assessment Instrument Minimum Data Set 2.0 (MDS 2.0) assessments in the Continuing Care Reporting System (CCRS) data repository. The CCRS is maintained by the Canadian Institute for Health Information (CIHI) and includes MDS 2.0 assessments from LTC and CCC sectors from seven Canadian provinces and territories (Canadian Institute of Health Information, 2012). 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., 2008; Ikegami et al., 2002). The CCRS data repository represents all Ontario CCC hospital patients assessed using the MDS 2.0 instrument beginning July 1, 1996 (Hirdes et al., 2003b).

The MDS 2.0 is a valuable asset to both clinicians and care staff, especially when used as a decision-support tool. Clinical Assessment Protocols (CAPs) that are derived from the assessment instrument provide clinicians with guidance in formulating care plans (Morris, 2010). Validated clinical scales derived from the MDS 2.0 assessment, such as the ADL-H scale and the CPS, allow clinicians to quickly obtain summary measures of patient health status and provide a method of measuring clinical change over time (Morris et al., 1999, 1994). Further, outcome-based quality indicators derived from the MDS 2.0 provide health planners with summary measures of quality

and may highlight areas for improvement in delivery of care (Zimmerman et al., 1995; Jones et al., 2010).

While some have argued that administrative data should not be used for research purposes, the MDS 2.0 assessment provides researchers with population-level health data, enabling research on important clinical and policy questions that otherwise would not be feasible (Hawes et al., 1992; Mor, 2004; Poss et al., 2008). Through the widespread implementation of the MDS 2.0 assessment in CCC in 1996, and LTC facilities later in 2005, Ontario gained its first province-wide health information system upon which evidence-informed decisions could be made (Hirdes et al., 2003b). Today the MDS 2.0 is exemplar of an integrated health information system with numerous evidence-informed applications including care planning and 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., 2003b). The validity and reliability of these various applications are reliant on high quality health information. By completing a system level assessment of the MDS 2.0 populated Canadian Institute of Health Information (CIHI) Continuing Care Reporting System (CCRS) data repository, Hirdes et al. (2013) found that overall MDS 2.0 data quality across both Ontario CCC and LTC settings is strong.

Reliability

The reliability of the MDS assessment has been evaluated across numerous patient populations and countries. In 1997, Sgadari et al. conducted an evaluation of inter-rater reliability of the MDS 1.0 assessment in nursing homes across seven English and non-English speaking countries including the United States, Denmark, Iceland, Italy, Japan, Sweden and Switzerland. Inter-rater reliability was measured by assessing agreement between two trained individual raters completing MDS assessments 2 to 14 days apart. Instrument reliability was measured across countries using the kappa statistic (κ), where κ of 0.4–0.75 is indicative of adequate reliability and $\kappa > 0.75$ indicates excellent reliability. The proportion of items achieving adequate reliability ($\kappa \geq 0.4$) ranged from 76% in Sweden to 97% in Switzerland. Further, a substantive number of items in all countries

achieved excellent reliability ($\kappa \geq 0.75$), ranging from 84% in Switzerland to 16.7% in Japan. The results of this study indicate that the assessment has utility as both a clinical instrument and as a reliable source of health data for scientific research.

The MDS 2.0 assessment featured 82 items from the original assessment and included many new and revised items addressing health domains such as pain, infection, service and medication utilization, mood, behaviour, delirium and change in health status (Morris et al., 1997). Almost all of the new MDS 2.0 items achieved adequate reliability ($\kappa \geq 0.4$) and many of the revised items saw an increase in inter-rate reliability with an average overall κ increase of 18% (Morris et al., 1997).

Validity

Numerous outcome scales and indexes derived from the MDS 2.0 assessment have been validated. Outcome scales allow clinicians to obtain concise measures of patient's status in select domains of health and provides a means to measure change over time for a given patient. Seven scales may be derived from the MDS 2.0 assessment, the ADL Self-Performance Hierarchy Scale (ADL-H), Cognitive Performance Scale (CPS), Depression Rating Scale (DRS), Changes in Health, End-Stage Disease, Signs and Symptoms Scale (CHESS), Aggressive Behaviour Scale (ABS), Pressure Ulcer Risk Scale (PURS), Pain Scale and the Index of Social Engagement (ISE).

The ADL-H scale takes early, middle and late loss activities of daily living into account to create a hierarchical measure of functional performance (Morris et al., 1999). MDS 2.0 ADL items demonstrate strong validity when compared to commonly used functional assessment tools such as the Functional Independence Measure (FIM) (Williams et al., 1997).

The CPS uses five measures of cognition to groups patients into seven distinct levels of cognitive function (Morris et al., 1994). The CPS was validated against the Mini-Mental State Examination (MMSE), which is a commonly used and "gold standard" measure of cognitive function. In this validation study against the MMSE, the CPS performed very strongly with specificity of 0.94 (95% CI 0.90-0.98) sensitivity of 0.94 (95% CI 0.87-0.96) (Hartmaier et al., 1995). In a

more recent study of Dutch nursing home patients, the CPS explained 45% of the variation in the MMSE. With respect to diagnostic performance in detecting cognitive impairment, the CPS performed well with sensitivity and specificity statistics of 0.81 (95% CI 0.73-0.86) and 0.80 (95% (0.65-0.89), respectively (Paquay et al., 2007).Wellens et al. (2013) had similar findings. Lastly, amongst nursing home patients with Alzheimer's disease (Smart et al., 2011) found a significant correlation between the CPS and MMSE with sensitivity and specificity statistics of 0.44 and 0.71, respectively.

The MDS 2.0 assessment features sixteen mood and behaviour items, seven of which are used in the DRS to screen for depression in continuing-care facilities (Burrows et al., 2000). The DRS scale was found to be highly correlated with the Hamilton Rating Scale for Depression (HAM-D) and demonstrated strong predictive accuracy compared to psychiatrist's diagnoses of depression (Burrows et al., 2000). Amongst CCC patients, the DRS scale was shown to be significantly predictive of new depression diagnosis at follow-up (Martin et al., 2008).

CHESS is a measure of health instability that is strongly predictive of mortality in institutionalized older adults (Hirdes et al., 2003a). Amongst CCC and LTC patients, CHESS has demonstrated strong predictive validity for mortality across many neurological conditions (Hirdes et al., 2014). Similarly, for patients in nursing homes situated in China, greater CHESS scores were independently associated with shorter survival time (Lee et al., 2009).

The ABS serves as an overall measure of aggressive behaviour that has been validated against the Cohen Mansfield Agitation Inventory (CMAI) in both LTC and CCC facilities (Perlman and Hirdes, 2008). The ABS considers the occurrence of verbal abuse, physical abuse, socially disruptive behaviour and resistance of care (Perlman and Hirdes, 2008). The ABS has been shown to be significantly correlated with the CMAI ($\rho = 0.54, P = 0.004$) but not correlated with the Neuropsychiatric Inventory (NPI) agitation/aggression subscale ($\rho = 0.10, P = 0.63$) amongst a small sample of LTC patients with moderate to severe Alzheimer's disease aggression (Smart et al., 2011).

Analogous to the Braden Scale, The Pressure Ulcer Risk Scale (PURS) is a seven item scale

intended to identify individuals at risk of developing a pressure ulcer. By classifying patients into a risk groups, care providers may implement preventative measures to mediate the risk of developing a pressure ulcer (Poss et al., 2010).

The Pain Scale takes into account the frequency and severity of pain a patient experiences to provide clinicians with summary measure of pain using routinely collected MDS data. A validation study by Fries et al. (2001) found that the MDS Pain Scale was highly predictive of 'gold-standard' Visual Analogue Scale (VAS) pain scores. Amongst CCC patients, a decrease in mean pain score was observed with increasing age (Zyczkowska et al., 2007).

The Index of Social Engagement (ISE) is an observational scale intended to assess a patient's social behaviour through engagement and participation in social opportunities offered by the facility (Mor et al., 1995; Gerritsen et al., 2008).

4.3 Sample

From 1996 to 2000 the Ontario Health Services Restructuring Commission (1998) implemented policy changes that broadly differentiated CCC and LTC facilities by patient case-mix. As a result, CCC facility case-mix is markedly different today (Canadian Institute of Health Information, 2004). To account for these changes, only Ontario CCC patients residing in CCC facilities from March 31, 2001 to March 31, 2013 were included in the study sample. Ontario CCC facilities are not obligated to complete the MDS 2.0 assessment on patients with a length of stay less than 14 days. As a result, not all patients receiving care of short duration are represented in the CCRS data repository. For the purposes of this research study, short-stay cases of fewer than 14 days were removed from the sample.

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. Thus, when measuring lengths of stay in the proposed study, episodes of care will be used. An episode of care is defined as the period a patient receives care in a CCC facility without a temporary discharge of more than 14 days. It is important to note that this

definition differs from Gassoumis et al.'s (2013) definition of an episode of care. Gassoumis et al. (2013) allow for a temporary discharge of 30 days or less; however, given the complexity of CCC patients, a more conservative episode of care gap period was chosen. In instances where a patient is temporarily discharged more than once during the episode of care, assessments following the second temporary discharge were removed from the sample.

Analytic Sample

The analytic sample was created by identifying episodes of care within the CCRS dataset that matched the following criteria: (1) admission assessment was conducted in a CCC facility, (2) date of admission assessment occurred on March 31, 2001 or later, (3) episode of care ended on or prior to March 31, 2013 with a discharge from a CCC facility, (4) episode of care began with an admission assessment, (5) episode of care was not interrupted by a temporary discharge greater than 14 days. A final sample of 154,456 episodes of care was used to complete the analysis for this study.

4.4 Dependent Variables

The dependent variable in this analysis of long-stay patients in CCC facilities is inclusion in the long-stay patient group. Long-stay patients are those with episodes of care in the 95th percentile for length of stay. It is hypothesized that patients experience a different set of discharge barriers depending on the setting that they are discharged to. In order to study difference in discharge barriers for various discharge setting, analyses were replicated for a series of discharge setting based subsamples. For analyses involving the discharge setting based subsamples , long-stay patients are identified as those patients with episodes of care in the 95th percentile amongst patients that are discharged to the care setting of interest.

Discharge setting by episode of care was ascertained from the MDS 2.0 Discharge Tracking Form and organized into five primary discharge settings; Community care, Residential care, Acute care, Expired in facility and Other. Community care includes patients discharged to home

care services, board and care residential care services, and home without home care. Residential care includes patients discharged to 24-hour nursing residential care settings. Acute care includes patients discharged to inpatient acute care services. Expired in facility includes patients that deceased within the CCC facility. Other includes all discharges to settings not previously mentioned; ambulatory health services, inpatient continuing care services, inpatient rehabilitation services, inpatient psychiatry services and other/unclassified services. The proportion of Ontario CCC patients discharged to the various discharge settings is presented in Figure 1.

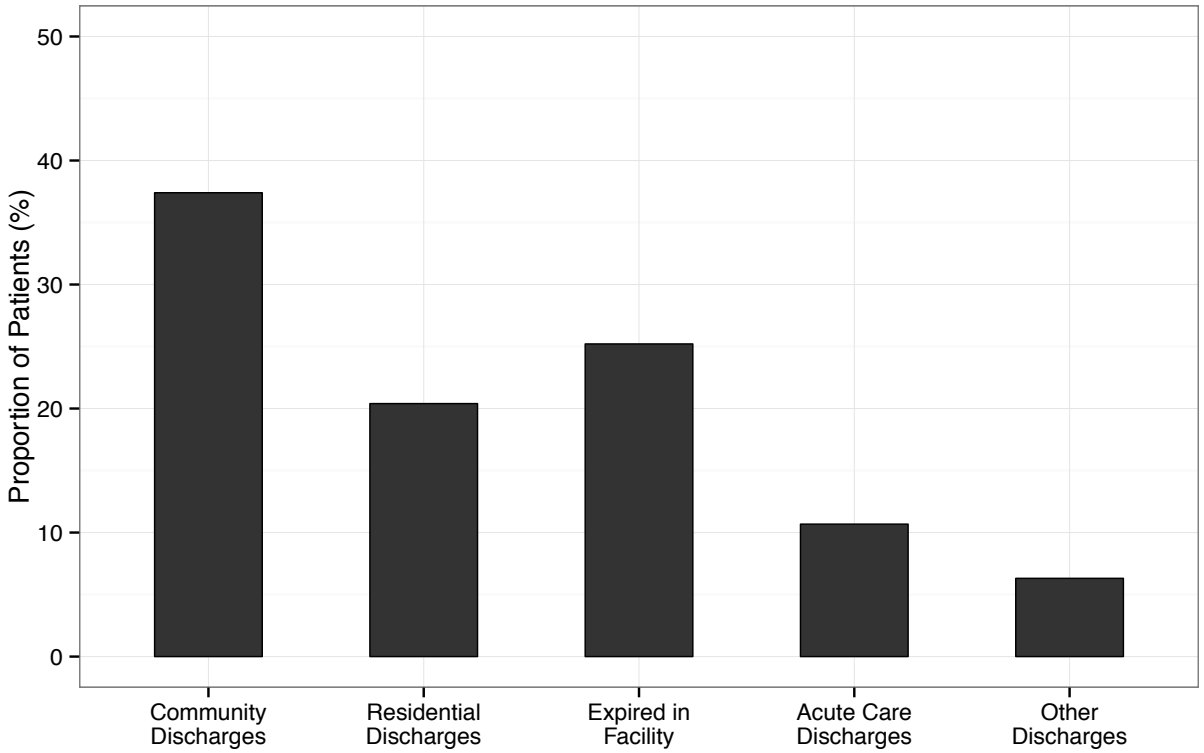

Figure 1: Percent distribution of discharge setting for Ontario CCC patients, 2001-2013

In this sample, patients whose episode of care was 327 days or greater (representing the 95th percentile) were considered long-stay patients. Long-stay community discharges were those with a length of stay of 149 days or greater, while those discharged to residential care were considered long-stay after 347 days. Long-stay acute care discharges received at least 813 days of CCC care, while those who expired within the CCC were considered long-stay if their length of stay was 423

days or greater. Finally, patients that were discharged to other care settings were considered long-stay patients after 368 days or more. The distribution of episode of care length of stay stratified by discharge setting is presented in Figure 2.

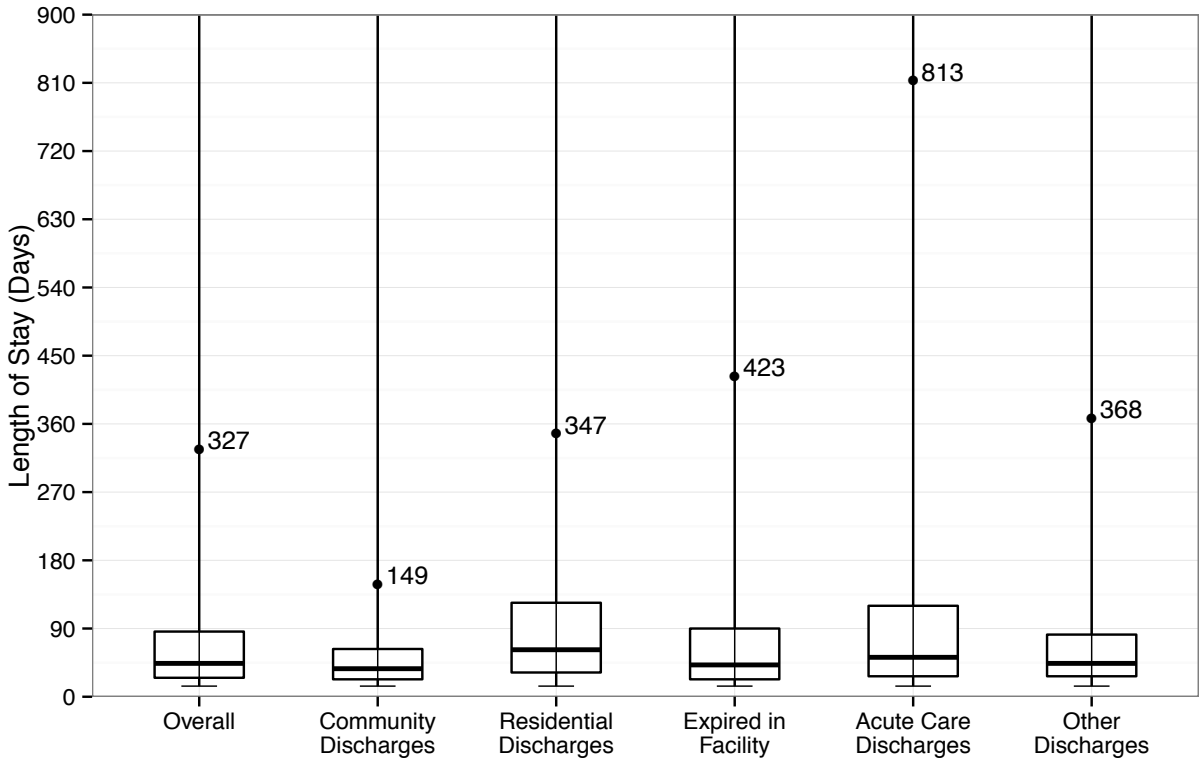

Figure 2: Distribution of episode of care length of stay by discharge setting for Ontario CCC patients, 95th percentile length of stay value marked

4.5 Independent Variables

Clinical characteristics that may be predictive of protracted lengths of stay in Ontario CCC facilities were selected as independent variables based on information obtained through a review of the academic literature and consultation with care providers in Ontario CCC facilities. The following sections identify the corresponding MDS 2.0 section and item numbers in parenthesis.

Demographics

Gender (AA2) was reported as a binary item called 'Female', where female gendered patients were denoted by a value of 1. 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 5 level ordinal variable (0-64, 65-74, 75-84, 85-94, 95+). Marital status (A5) was collapsed into a binary variable where individuals that were married at the time of assessment were denoted by a value of 1. Patients that lived alone prior to entry into the CCC facility were assigned a value on the 1 on a binary variable named 'lived alone prior to entry'. A binary variable was created for language where patients whose primary language was not English or French were assigned a value of 1.

Residential History

Prior stay in a sub-acute care facility was reported as a binary variable wherein patients who had experienced a 'Prior stay at this facility' (AB5a) or a 'Prior stay in other similar level of care facility' (AB5b) in the 5 years prior to entry in the CCC facility were assigned a value of 1. 'Prior stay in other board and care facility' (AB5c) and 'Prior stay in psychiatric facility' (AB5d) were used to identify patients who had previously been institutionalized in a LTC or psychiatric care facility, respectively.

Psychosocial Well-Being

Several aspects of psychosocial well-being were considered as independent variables in the analysis. Patients that exhibited 'covert/open conflict with or repeated criticism of staff' (F2a), 'were unhappy with their roommate' (F2b) or 'openly expresses conflict/anger with family or friends' were assigned a score of 1 on binary response independent variable for conflict with others. 'Absence of personal contact with family or friends' (F2e) was also considered as an independent variables in the analysis.

Discharge Potential

Two discharge potential items were considered as independent binary variables: 'resident expresses or indicates a preference to return to the community' (Q1a) and 'resident has a support person who is positive toward discharge' (Q1b).

Health Resource Use

The number of hospital stays (P5) and emergency room visits (P6) in the past 90 days were both collapsed into variables with three response options for inclusion as independent variables in the analysis. The response options for these variables was no stays/visits, 1 stay/visit or 2+ stays/visits in the past 90 days. The number of physician visits (P7) and the numbers of physician change orders (P8) since admission were included in the analysis. The distribution of the RUG-III clinical categories was reported as part of the descriptive statistics, but was not included as independent variable predictive of protracted length of stay as it is a composite measure of many of the variables included as independent variables in the analysis.

Diseases

Cancer (I1rr), depression (I1gg), cerebrovascular accident (stroke) (I1u), hemiplegia/hemiparesis (I1w), Huntington's chorea (I1x), aphasia (I1s), Parkinson's disease (I1aa), quadriplegia (i1bb), congestive heart failure (I1f), amyotrophic lateral sclerosis (I1q), multiple sclerosis (I1y), bipolar disorder (I1hh), renal failure (i1uu), schizophrenia (I1ii), Alzheimer's disease or related dementia (ADRD) (I1r and I1v), traumatic brain injury (I1ee) and hip fracture (I1m) were considered as independent variables predicting length of stay.

Infections

Several infections were included in the analysis as potential independent predictors of protracted lengths of stay, including presence of antibiotic resistant infection (I2a), *clostridium difficile*

infection (I2c), HIV infection (I2e), pneumonia (I2f), respiratory infections (I2g), septicemia (I2h), active tuberculosis (I2j), urinary tract infections (I2k), and wound infections (I2m).

Conditions

A wide range of health conditions were considered as independent variables in the analysis including: 'weight gain or loss of 1.5 kg or more in the last 7 days' (J1a), 'inability to lie flat due to shortness of breath' (J1b), dehydration (J1c), 'insufficient fluid intake' (J1D), edema (J1g), fever(J1h), hallucinations or delusions (J1i and J1e), internal bleeding (J1j), lung aspirations (J1k), shortness of breath (J1l), syncope (J1m), unsteady gait (J1n) and vomiting (J1o), occasional or worse bladder (H1a) or bowel (H1b) incontinence and the presence of an ostomy (H3i). Lastly, patients with a Body Mass Index (BMI) of 40 or greater were considered to be bariatric patients for this analysis.

In addition to broader health conditions, numerous skin conditions were assessed as independent variables. History of resolved pressure ulcers that was resolved or cured in the last 90 days (M3), presence of a stage 3 or greater pressure ulcer (M2a), second or third degree burns (M4b), open lesions other than ulcers, rashes or cuts (M4c) and surgical wounds (M4g) were treated as binary variables. A continuous count variable of stage 2 or greater pressure ulcers was also included.

Treatments, Procedures and Programs

Numerous special treatments, procedures and programs were considered as independent variables in the analysis. Special treatments included chemotherapy (P1aa), dialysis (P1ab), IV medication (P1ac), fluid intake/output monitoringw (P1ad), monitoring an acute medical condition (P1ae), oxygen therapy (P1ag), radiation (P1ah), suctioning (P1ai), tracheotomy care or the use of a ventilator or respirator (P1aj and P1al), transfusions (P1ak) and indwelling catheterization (H3d). Special nutritional approaches that were also considered as independent variables included parenteral/IV feeding (K5a), feeding tube (K5b) and Syringe (oral) feeding (K5d). Programs considered as independent variables included hospice care (P1ao), training in skills required to return

to the community (P1ar) and planned weight change program (K5h). Finally, any use of trunk restraint, limb restraint or chairs that prevent rising in the past 7 days was considered as a single binary restraint variable.

Therapies

Provision of therapy by certified allied health professionals were considered as independent variables in the analysis. Therapy variables were converted to binary response sets based on the number of days patients received a given therapy for at least 15 minutes in the past 7 days. Patients that received 7 days of respiratory therapy (P1bda) in the past 7 days were assigned a value of 1 for receipt of respiratory therapy. Patients that received 3 days or more of occupational (P1bba) or physical (P1bca) therapy were assigned a value of 1 on the respective independent binary variables. Finally, patients that received 1 day or more of speech (P1baa), psychological (P1bea) or recreation (P1bfa) therapy were assigned a value of 1 on the respective independent binary variable included in the analysis.

Scales

Collapsed versions of the ADL-H, CPS, DRS, CHESS, ABS, PURS, Pain Scale and ISE were considered as independent variables in the analysis. Clinical scales were collapsed following the example set out by Hirdes et al. (2011) in order to reduce the number of class levels for clinical scales to ease interpretation of the results. For example, the DRS is a 14 level scale, for the purposes of this thesis the it was rescaled to three levels, 0, 1-2 and 3+. The Deafblind Severity Index was converted into a binary variable where those with severe impairment in both senses were assigned a score of 1. A description of the clinical scales that may be derived from the MDS 2.0 assessment is presented in section 4.2.

CAPs

The following clinical assessment protocols (CAPs) were included as independent variables in the analysis: Activities CAP, ADL CAP, Urinary Incontinence CAP, Ulcer CAP, Social Relationships CAP, Restraint CAP, Pain CAP, Nutrition CAP, Mood CAP, Depression CAP, Medication CAP, Feeding Tube CAP, Falls CAP, Delirium CAP, Dehydration CAP, Communication CAP, Cognitive CAP, Cardio-Respiratory CAP, Bowel CAP and the Behaviour CAP (Morris, 2010).

4.6 Missing Values

As a result of changes made to the MDS 2.0 over time, assessments that were completed prior to August 2003 did not provide assessors with the option of identifying patients with Amyotrophic lateral sclerosis (ALS) and Huntington's disease diagnoses using the pick list in section Disease Diagnosis section. The MDS 2.0 assessment features 6 open text fields for assessors to enter ICD-10-CA diagnostic codes for diseases not listed in the Disease Diagnosis pick list. The "G12.21" ICD-10-CA code was used instead of item I1q to identify ALS patients assessed using older versions of the assessment. Similarly, the "G10" ICD-10-CA code was used instead of item I1x to identify Huntington's disease patients assessed prior to August 2003. Items I1q and I1x were coded as 1 for patients identified with the appropriate corresponding ICD-10-CA codes for ALC and Huntington's disease.

4.7 Statistical Analysis

Statistical Analysis Software (SAS), Version 9.2 (SAS Institute, Cary, NC, USA) was used to conduct all statistical analyses for the proposed study.

4.8 Sample Demographic and Clinical Descriptors

Descriptive statistics were calculated for pertinent MDS 2.0 clinical variables, outcome measures, scales, indices and CAPs of long and regular-stay CCC patient. These analyses were then

replicated for the five predominant discharge destinations. Chi-square (χ^2) tests were used to determine the statistical significance of differences in the frequency response between groups for binary and categorical variables of interest. The first MDS 2.0 assessment for each episode of care included in the study sample was used to calculate the sample characteristics for both groups.

4.9 Predictors of Protracted Length of Stay

A total of six of multivariate logistic regression models were created. The first examined clinical predictors of protracted length of stay for all episodes of care in the sample, regardless of discharge destination. The subsequent bivariate logistic regression analyses were conducted for each of the five primary discharge destinations (i.e., Community, Residential Care, Expired in Facility, Acute Care and Other Settings). All models specified inclusion in the long-stay patient group as the event of interest. The following sections outline the steps taken to complete the multivariate logistic regression.

Bivariate Logistic Regression Analysis

Bivariate logistic regression analyses were conducted for all variables that were expected to be predictors of inclusion in the long-stay patient group within each discharge sample (i.e., Community, Residential Care, Expired in Facility, Acute Care and Other Settings) as identified by the results of the descriptive statistics analyses that identified significant group differences for variables of interest.

Multivariate Logistic Regression Analysis

Variables from the bivariate analyses that achieved a significance cutoff of $P < 0.05$ were selected for inclusion in the six multivariate logistic regression models. First, full models that included all independent variables from the bivariate models were fit using automated backward selection methods to identify variables achieving a significance cutoff of $P < 0.05$ in the multivariate

analysis. Subsequently, as a means of further reducing the size of the models, variables with odds ratios ranging between 0.77 and 1.3 were removed from the model. These variable screening cut-points were selected with the intention of eliminating variables whose odds ratios approached a value of 1 so that only variables with relatively large effect sizes remained in the model. Variables that were removed from the model during this screening phase of model building were re-introduced into the models individually to ensure that their removal did not have a strong impact on the parameter estimates of other variables in the model. Finally, interaction terms for variables that hypothetically could be related and were clinically relevant were tested individually in the models and only included in the final model if they achieved a significance cutoff of $P < 0.05$ or better. It should be noted that regardless of the significance level they achieved in the model, age and gender variables were included in all final models.

4.10 Predictors of Discharge Setting on Admission

A multinomial logistic regression model was created to identify Ontario CCC patient admission characteristics that are predictive of discharge setting at the end of the episode of care. The following sections outline the steps taken to complete the multinomial logistic regression.

Bivariate Multinomial Logistic Regression

Bivariate nominal logistic regression analyses were conducted for all variables that were expected to be predictors of discharge destination upon completion of an episode of care from an Ontario CCC facility. The bivariate analyses tested the association between the hypothesized predictor variable and discharge to the five discharge destinations of interest: Community care, Residential care, Acute care, Expired in facility and Other.

Multivariate Multinomial Logistic Regression

Variables from the bivariate analyses that achieved a significance cutoff of $P < 0.01$ were selected for inclusion in the multinomial logistic regression model predicting discharge destination. A full model was then fit with all significant variables. Variables that did not achieve significance cutoff of $P < 0.01$ were removed one at time until all variables in the model were significant. As with the binary logistic regression models, to further reduce the number of variables included in the model, variables with odds ratios less than 0.67 or greater than 1.50 for a single discharge destination were included in the final model. Based on information obtained from the literature review, five additional variables were forced back into the final (age, gender, CPS, ADL-H and PURS) final model.

4.11 Performance of the Q+ Index in CCC Populations

The psychometric performance of Fries and James's (2012) Q+ Index of community discharge readiness was tested in this sample of Ontario CCC patients using specificity and sensitivity statistics. A receiver operating characteristic (ROC) curve was used to identify the indices' optimal threshold for identifying CCC patients suitable for discharge to the community within the next 90 days. ROC curves are a graphical tool used to demonstrate a model or test's ability to discriminate between two binary outcomes (Pepe et al., 2009).

Unlike other analyses, the final MDS 2.0 assessment in the episode of care was used to complete this analysis. In instances where there was only a single assessment in the episode of care, typically when the episode of care is 90 days or less, the admission assessment was used to complete the analysis. A total of 154,456 episodes of care were used in the sample for this analysis. To create the ROC curve, sensitivity and specificity statistics were computed for each Q+ Index score using a binary logistic regression model, wherein the dependent outcome of interest was discharge to the community and the independent variable was the Q+ Index score treated as a continuous variable. The optimal Q+ threshold was chosen by identifying the score that maximized both sensitivity and specificity statistics.

Fries and James's (2012) Q+ Index was originally created for use with nursing home clients who typically have a longer overall length of stay and thus is only calculated for residents with a length of stay of 90 days or greater. Given that the majority of CCC patients episode length of stay is less than 90 days, the minimum length of stay requirement on the Q+ Index was removed for this analysis.

5 Results

5.1 Descriptive Statistics

The following sections present descriptive statistics comparing regular and long-stay CCC patients for the 'Overall' sample and the five discharge setting based subsamples (Community, Residential Care, Expired in Facility, Acute Care and Other Settings). As previously discussed, day of stay cutoffs differentiating regular and long-stay patient groups were determined by observing the length of stay distribution within the particular sample and selecting the 95th percentile score as the day of stay cutoff (see section 4.4).

Table 1 shows the number of patients belonging to each discharge sample and the day of stay cutoffs that differentiate regular and long-stay patients.

Table 1: Sample size and length of stay group cutoffs

Sample	Length of Stay Group	Number of Patients	Length of Stay (days)
Overall	Regular	146,810	14-326
	Long	7,646	327+
Community	Regular	55,027	14-148
	Long	2,900	149+
Residential Care	Regular	30,001	14-346
	Long	1,578	347+
Acute Care	Regular	15,828	14-812
	Long	809	813+
Expired in Facility	Regular	36,651	14-422
	Long	1,923	423+
Other Settings	Regular	9,265	14-367
	Long	474	368+

5.1.1 Patient Demographics, History and Discharge Potential

Table 2 shows the distribution of patient demographic and history variables by length of stay group. Only in the 'Expired in Facility' group was there a shift towards older age groups for the long-stay group compared with the regular stay group. In all samples, a greater percentage of

regular-stay patients were female and a greater percentage lived alone prior to admission to the CCC facility. Differences in the percentage of patients that were married were insignificant for all groups except for patients in the 'Other' discharge group. In all samples a greater percentage of long-stay patient did not speak English or French as their primary language. Although the percentage of CCC patients with a prior stay in a psychiatric care facility in the past 5 years was small, a greater percentage of the long-stay patients had previously resided in a facility of this type. Overall, one-third of CCC patients had previously received care in a sub-acute care facility in the past 5 years. Comparing length of stay groups reveals that a greater percentage of long-stay patients had previously received care in a sub-acute care facility, although the difference was not significant between groups in the 'Community' and 'Residential Care' samples. Despite being a small difference, a greater percentage of long-stay patients in the 'Overall' sample had previously resided in a board and care facility such as LTC. This was true in all other samples except for patients in the 'Community' sample where the difference between groups was not significant and for those in the 'Residential Care' sample where fewer long-stay patients had previously stayed in a board and care facility. In the 'Overall' sample, on admission, 68% of regular-stay patients expressed or indicated a preference to return to the community compared to only 38% of long-stay patients. Similarly, 64% of regular-stay patients had a support person who was positive towards discharged compared to only 33% of long-stay patients. This trend holds true for all discharge setting based samples. In all samples, a greater percentage of long-stay patients lacked personal contact with family or friends, and greater percentage of long-stay patients were in conflict with others. Group differences for absence of contact with family or friends and conflict with others were not significant for patients belonging to the 'Other' discharge sample.

Table 2: Patient demographics and residential history by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Characteristic	LOS Group	%	%	%	%	%	%
Age Group							
0–64	Regular	14.6	15.3	6.4	20.8	15.5	22.0
	Long	22.5	29.5	18.9	33.0	12.6	29.3
65–74	Regular	17.8	18.3	12.3	20.1	19.8	19.2
	Long	16.7	21.6	17.1	15.6	13.9	19.8
75–84	Regular	37.3	38.0	39.0	36.1	36.1	34.8
	Long	34.7	30.5	37.3	33.5	38.0	31.2
85–94	Regular	27.6	26.1	38	21.6	25.7	22.5
	Long	23.9	17.2	23.7	17.1	31.9	18.8
95+	Regular	2.7	2.2	4.3	1.5	2.9	1.5
	Long	2.2	1.2	3.0	0.9	3.6	0.8
Female	Regular	58.7	62.1	63.0	51.3	53.1	56.7
	Long	49.0	55.0	56.7	45.4	47.2	51.9
Married	Regular	39.3*	40.3*	31.3	41.9*	43.3*	39.6*
	Long	40.1*	39.5*	34.1	42.8*	42.7*	42.4*
Lived alone prior to entry	Regular	28.2	30.3	31.7	25.9	22.3	30.2
	Long	20.9	27.2	27.5	16.9	15.7	24.3
Primary language other than English and French	Regular	8.5	8.1	7.7	9.8	9.2	7.8
	Long	11.0	11.7	11.2	12.6	11.3	11.4

Table continued on following page. . .

Table 2 – continued from previous page

Characteristic	LOS Group	Overall	Discharge Setting Subsamples: Community	Residential Care	Acute Care	Expired in Facility	Other Settings
		%	%	%	%	%	%
Residential History (past 5 years)							
Board and care facility	Regular	7	5.1*	12.1	5.6	6.7	6.3
	Long	7.9	4.7*	7.0	10.6	8.8	9.3
Psychiatric care facility	Regular	0.8	0.6	1.4	0.9	0.5*	1.1
	Long	2.2	1.1	2.9	1.4	2.4*	2.5
Subacute care facility	Regular	31.3	31.6*	34*	32.8	28.7	30.3
	Long	38.7	31*	33.5*	41.9	45.1	37.3
Community return desired	Regular	68.1	90.8	65.9	67.5	30.9	79.2
	Long	37.8	73.1	50.3	29.0	20.1	45.8
Support person present	Regular	64.1	87.4	62.6	62.5	26.1	74.5
	Long	33	68.6	46.4	20.9	18.8	39.9
Absence of contact with family or friends	Regular	6.4	4.9	8.3	6.5	7	6.4*
	Long	9.6	8.0	10.1	9.6	9.6	5.9*
Conflict with others	Regular	11.4	9.6	14.1	12.3	11.4	11.8*
	Long	15.6	13.7	17	16.6	14.7	14.6*

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

5.1.2 Health Resource Utilization

The percentage of patients that had visited the ER or had been admitted to hospital in the 90 days prior to their admission to the CCC facility is presented in Table 3. In all samples, a lesser percentage of long-stay patients had experienced either an ER visit or a hospital stay prior to admission.

Across all samples, the majority of patients belonged to the Rehabilitation RUG-III group followed by the Clinically Complex group. Generally, a greater percentage of long-stay patients were classified as Extensive Services, Special Care, Impaired Cognition, and Reduced Physical Function patients (see Table 4). Consistent with the recommendations of the HSRC, few patients fell into the Impaired Cognition, Behaviour Problem and Reduced Physical Function clinical categories (Ontario Health Services Restructuring Commission, 1998). It is important to note that broad RUG-III clinical categories may not explain all RUG-III related variation in length of stay as there are substantiative differences between RUG-III hierarchy groups within the clinical categories. Table 5 shows differences in the percentage of regular and long-stay patients that belong to each RUG-III hierarchy group.

Table 3: Hospital use in the last 90 days by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
System Resource Used	LOS Group	%	%	%	%	%	%
ER visits in the past 90 days							
1 visit	Regular	39.0	38.1	42.0	36.1	38.1	42.4
	Long	27.2	33.9	31.6	19.9	25.4	25.1
2+ visits	Regular	8.3	7.6	9.4	7.7	9.0	7.1
	Long	4.0	4.9	5.6	2.5	2.9	3.6
Hospital stays in past 90 days							
1 stay	Regular	55.5	57.2	55.0	52.3	54.0	55.8
	Long	42.0	53.7	50.3	32.6	33.8	50.2
2+ stays	Regular	21.3	21.0	22.2	20.5	20.8	22.4
	Long	10.5	14.3	14.4	5.8	8.4	12.2

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

Table 4: RUG-III Clinical Categories, 44 group, distribution by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
RUG Group	LOS Group	%	%	%	%	%	%
Rehabilitation	Regular	59.5	75.4	56.5	62.2	33.2	69.2
	Long	49.9	68.2	56.3	48.6	40.6	54.9
Extensive Services	Regular	7.3	3.3	3.5	9.9	16.5	4.2
	Long	10.1	4.8	4.9	13.6	12.2	7.2
Special Care	Regular	9.0	5.1	6.5	10.3	17.1	7.2
	Long	12.3	8.5	9.3	13.7	13.8	13.3
Clinically Complex	Regular	20.2	13.0	25.0	14.6	31.0	15.2
	Long	19.6	14.6	19.9	16.4	22.7	15.2
Impaired Cognition	Regular	1.0	0.5	2.8	0.6	0.3	1.0
	Long	2.3	0.9	3.3	2.5	2.7	3.2
Behaviour Problem	Regular	0.1	0.1	0.2	0	0	0.1
	Long	0.2	0.1	0.5	0	0.2	0
Reduced Physical Function	Regular	2.9	2.5	5.4	2.3	1.7	3.0
	Long	5.5	2.9	5.8	5.2	7.8	6.3

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

Table 5: RUG-III, 44 groups, distribution by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
RUG Group	LOS Group	%	%	%	%	%	%
Special Rehabilitation							
RUC	Long	0.4	0.4	0.3	0.7	0.3	0.0
	Regular	0.1	0.1	0.2	0.2	0.1	0.4
RUB	Long	0.4	1.0	0.6	0.0	0.2	0.0
	Regular	0.3	0.4	0.2	0.3	0.1	0.4
RUA	Long	0.1	0.5	0.2	0.1	0.0	0.0
	Regular	0.1	0.3	0.0	0.1	0.0	0.2
RVC	Long	0.7	0.9	0.9	0.9	0.5	1.3
	Regular	0.5	0.4	0.6	0.7	0.3	1.0
RVB	Long	0.7	2.0	1.1	0.2	0.3	0.8
	Regular	1.2	1.9	0.7	1.4	0.3	1.5
RVA	Long	0.3	0.9	0.2	0.1	0.2	0.0
	Regular	0.7	1.4	0.3	0.4	0.1	0.6
RMC	Long	11.9	14.9	13.1	13.0	9.8	14.8
	Regular	8.8	6.4	10.2	12.7	8.7	11.8
RMB	Long	9.3	17.9	10.5	8.9	6.0	13.5
	Regular	15.9	22.2	14.6	16.3	5.6	20.3
RMA	Long	2.5	4.7	3.5	1.4	1.2	5.1
	Regular	7.8	14.4	5.4	4.9	1.5	6.1
RLB	Long	13.3	10.2	12.0	14.0	14.1	11.8
	Regular	7.4	4.4	8.6	10.3	9.6	8.5
RLA	Long	7.6	9.0	10.3	6.2	6.3	4.9
	Regular	9.9	12.6	10.8	8.9	5.2	10.7

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			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
RUG Group	LOS Group	%	%	%	%	%	%
RHC	Long	1.9	3.0	2.4	2.1	1.2	1.7
	Regular	2.5	2.8	2.6	3.1	1.2	3.8
RHB	Long	0.7	2.0	1.0	0.9	0.3	0.6
	Regular	2.5	4.5	1.5	1.9	0.5	2.8
RHA	Long	0.2	0.9	0.3	0.1	0.2	0.4
	Regular	1.8	3.8	0.6	0.8	0.2	1.1
Extensive Services							
SE3	Long	3.6	1.8	2.0	3.8	4.7	2.3
	Regular	2.8	1.2	1.5	3.7	6.5	1.3
SE2	Long	6.2	2.9	2.9	9.4	7.3	4.6
	Regular	4.4	2.1	2.0	6.0	9.8	2.8
SE1	Long	0.3	0.2	0.1	0.4	0.3	0.2
	Regular	0.1	0.0	0.1	0.2	0.3	0.1
Special Care							
SSC	Long	4.7	2.1	3.7	4.9	5.8	5.3
	Regular	2.7	0.8	1.7	2.4	7.0	1.4
SSB	Long	3.5	2.0	3.0	4.2	3.7	2.5
	Regular	2.2	0.9	1.9	2.7	4.5	1.8
SSA	Long	4.1	4.5	2.6	4.6	4.3	5.5
	Regular	4.1	3.5	3.0	5.2	5.7	4.1
Clinically Complex							
CC2	Long	1.9	0.8	1.8	1.6	2.4	1.9
	Regular	2.2	0.4	2.0	1.2	5.8	0.8
CC1	Long	1.6	0.8	2.0	1.1	2.1	1.7
	Regular	1.4	0.3	1.3	0.8	3.6	0.7

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Table 5 – continued from previous page

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
RUG Group	LOS Group	%	%	%	%	%	%
CB2	Long	3.3	2.4	2.9	2.5	4.0	1.9
	Regular	3.0	1.0	3.7	2.2	5.9	2.1
CB1	Long	3.0	2.2	2.8	2.1	3.9	2.3
	Regular	3.1	1.4	3.9	2.6	5.4	2.8
CA2	Long	4.5	3.3	5.6	3.5	5.0	3.0
	Regular	4.1	3.1	6.2	3.0	4.4	3.5
CA1	Long	5.2	5.1	4.9	5.7	5.4	4.4
	Regular	6.5	6.8	7.9	4.9	5.9	5.3
Impaired Cognition							
IB2	Long	0.5	0.1	0.4	1.1	0.9	0.4
	Regular	0.2	0.1	0.5	0.2	0.1	0.2
IB1	Long	0.6	0.1	0.6	0.4	0.7	0.6
	Regular	0.3	0.1	0.8	0.2	0.1	0.2
IA2	Long	0.4	0.2	0.7	0.5	0.5	0.6
	Regular	0.2	0.1	0.5	0.1	0.0	0.2
IA1	Long	0.8	0.5	1.6	0.5	0.6	1.5
	Regular	0.4	0.2	1.0	0.2	0.1	0.4
Behaviour Problem							
BB2	Long	0.0	0.0	0.1	0.0	0.0	0.0
	Regular	0.0	0.0	0.0	0.0	0.0	0.0
BB1	Long	0.0	0.0	0.1	0.0	0.1	0.0
	Regular	0.0	0.0	0.0	0.0	0.0	0.0
BA2	Long	0.0	0.0	0.1	0.0	0.1	0.0
	Regular	0.0	0.0	0.0	0.0	0.0	0.0

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RUG Group	LOS Group	Overall	Discharge Setting Subsamples: Community	Residential Care	Acute Care	Expired in Facility	Other Settings
		%	%	%	%	%	%
BA1	Long	0.1	0.1	0.3	0.0	0.1	0.0
	Regular	0.0	0.0	0.1	0.0	0.0	0.1
Reduced Physical Function							
PE2	Long	0.6	0.2	0.7	0.4	0.9	1.1
	Regular	0.2	0.1	0.5	0.2	0.3	0.2
PE1	Long	0.8	0.4	0.8	0.1	1.5	0.6
	Regular	0.3	0.1	0.7	0.2	0.4	0.3
PD2	Long	1.1	0.4	0.8	1.4	2.0	0.6
	Regular	0.4	0.3	0.8	0.4	0.3	0.5
PD1	Long	1.2	0.2	1.1	1.2	2.0	1.1
	Regular	0.5	0.3	1.0	0.4	0.3	0.6
PC2	Long	0.1	0.1	0.0	0.1	0.1	0.0
	Regular	0.1	0.1	0.1	0.1	0.0	0.1
PC1	Long	0.1	0.1	0.0	0.1	0.3	0.0
	Regular	0.1	0.1	0.2	0.1	0.1	0.1
PB2	Long	0.1	0.1	0.3	0.1	0.1	0.2
	Regular	0.1	0.1	0.2	0.1	0.0	0.1
PB1	Long	0.2	0.2	0.3	0.1	0.2	0.2
	Regular	0.2	0.3	0.3	0.2	0.0	0.2
PA2	Long	0.3	0.3	0.3	0.6	0.1	0.4
	Regular	0.2	0.2	0.3	0.1	0.1	0.2
PA1	Long	1.0	0.8	1.6	1.0	0.8	2.1
	Regular	0.7	0.9	1.2	0.5	0.2	0.7

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.0$ unless denoted by an *

5.1.3 Diseases, Conditions and Infections

Table 6 shows the percentage of patients with selected diseases in the regular and long-stay groups. There was a greater percentage of patients with ADRD, ALS, aphasia, depression, diabetes, hemiplegia/hemiparesis, Huntington's chorea, bipolar disorder, multiple sclerosis, Parkinson's disease, quadriplegia, renal failure, schizophrenia, stroke and traumatic brain injury in the long-stay group. There were fewer patients with cancer, congestive heart failure and hip fracture in the long-stay group compared to the regular-stay group. While group differences for all diseases that were selected were significant to $P \leq 0.05$ for the 'Overall' sample, not all differences in disease prevalence were significant when examining the discharge setting based samples. For instance, length of stay group differences in the percentage of ADRD patients in the 'Residential Care' sample were not significant. Some diseases in the discharge setting based subsamples, had the opposite distributions of what was seen in the 'Overall' sample. For example, unlike the 'Overall' sample, the prevalence of renal failure was not significantly different for regular and long-stay patients in the 'Acute Care' subsample.

The percentage of patients with select health conditions in the regular and long-stay groups are presented in Table 7. In the 'Overall' sample, a greater percentage of long-stay patients were admitted with the following health conditions: hallucinations or delusions, lung aspirations, occasional or worse bladder incontinence and ostomy. A greater percentage of regular-stay patients were admitted with dehydration, edema, inability to lie flat due to shortness of breath, insufficient fluid intake, internal bleeding, shortness of breath, unsteady gait and vomiting. Also, a greater percentage of regular-stay patients were bariatric patients. Group difference for patients admitted with fever and weight gain or loss of 1.5kg+ in the last seven days were not significant. A large number of conditions showed non-significant group differences in the discharge setting based subsamples. Occasional or worse bladder incontinence was the only condition that demonstrated significant differences in the prevalence rate by length of stay group across all samples.

Table 8 shows the percentage of patients with selected infections in the regular and long-stay groups. A greater percentage of long-stay patients in the 'Overall' sample had an antibiotic

resistant, HIV, respiratory or wound infection. Fewer long-stay patients in the 'Overall' sample had urinary-tract infections on admission. The percentage of patients with Clostridium difficile and pneumonia and were not significantly different between groups.

Table 6: Percentage of patients with select diseases by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Disease	LOS Group	%	%	%	%	%	%
ADRD	Regular	22.1	16.1	39*	19.3	20.7	16.0
	Long	34.7	19.0	38.4*	30.8	44.8	24.9
Amyotrophic lateral sclerosis	Regular	0.3	0.2*	0.1*	0.3	0.5	0.2*
	Long	0.8	0.1*	0.1*	1.1	1.5	0.4*
Aphasia	Regular	4.8	3.1	5.4	7.5	5.3	7.1
	Long	14.9	9.4	15.9	16.4	16.1	13.5
Cancer	Regular	27.0	15.4	14.2	18.5	62.0	14.0*
	Long	15.5	13.0	10.6	10.6	19.7	15.0*
Congestive heart failure	Regular	14.0	13.5	14.6	16.1*	14.4	10.3*
	Long	13.1	10.9	10.4*	11.9*	15.3	10.8*
Depression	Regular	20.0	19.5	22.4	22.6	17.7*	20.5
	Long	23.8	21.0	25.0	22.9	23.8*	25.5
Diabetes	Regular	27.2	27.7	25.6	35.2*	23.7	29.2
	Long	28.9	30.6	28.1	29.3*	25.6	23.8
Emphysema/COPD	Regular	16.6	16.6	16.0*	17.9	17.8	12.6*
	Long	14.7	12.2	14.2*	12.4	15.5	12.2*
Hemiplegia/Hemiparesis	Regular	8.4	7.2	9.4	11.6	5.9	14.4*
	Long	14.3	19.7	15.8	16.2	11.5	15.2*
Hip fracture	Regular	12.7	16.2	14.0	12.3	5.8	15.5
	Long	9.0	10.9	10.8	6.9	9.3	9.1
Huntington's chorea	Regular	0.1	0.1*	0.1*	0.2	0.1	0.1
	Long	0.4	0.1*	0.3*	0.6	0.7	0.8

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			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Disease	LOS Group	%	%	%	%	%	%
Bipolar disorder	Regular	1.2	1.2	1.4*	1.4	0.8*	1.6*
	Long	1.7	1.8	1.8*	2	1.8*	0.8*
Multiple sclerosis	Regular	1.0	1.3	0.8	1.6*	0.5	1.1
	Long	3.4	2.7	2.0	8.0*	2.4	4.4
Parkinson's disease	Regular	4.1	4.4*	5.9*	4.0	2.8	3.4*
	Long	6.4	3.7*	5.1*	6.7	9.1	4.4*
Quadriplegia	Regular	0.6	0.5	0.2	2.1	0.6	0.9
	Long	3.8	2.3	1.9	7.5	2.9	3.6
Renal failure	Regular	11.3	10.0*	9.9	17.9*	12.4	9.2*
	Long	13.1	11.0*	8.0	14.2*	12.9	11.0*
Schizophrenia	Regular	1.1	1.0	1.6	1.4	0.8*	1.5
	Long	2.0	1.4	2.9	2.1	1.3*	3.2
Stroke	Regular	19.8	17.7	24.9	23.5	14.6	28.9*
	Long	28.9	30.5	31.2	31.1	28.0	26.2*
Traumatic brain injury	Regular	1.3	1.1	1.1	2.4	0.7	3.8
	Long	3.7	3.4	4.3	4.3	2.5	5.9

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
ABS = Aggressive Behaviour Scale

Table 7: Percentage of patients with select conditions by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Condition	LOS Group	%	%	%	%	%	%
Bariatric (BMI $\geq$ 40)	Regular	1.8	1.7	1.0*	1.8	2.4*	1.9*
	Long	1.4	2.4	1.2*	1.7	0.9*	1.7*
Dehydrated	Regular	2.9	1.0*	1.7*	2.5	7.6*	1.1*
	Long	2.3	1.1*	1.6*	2.1	2.9	2.1*
Edema	Regular	24.9	22.6	21.5	24.9	31.9*	21.8*
	Long	17.9	20.4	16.1	17.1	16.8*	19.8*
Fever	Regular	3.8*	2.5*	2.5*	5.0	6.6*	3.0*
	Long	3.8*	3.1*	2.6*	4.6	3.5*	2.3*
Hallucinations or delusions	Regular	6.7	3.7	9.3*	5.7*	9.8*	5.7
	Long	7.9	4.9	9.6*	6.9*	8.7*	8.0
Inability to lie flat due to shortness of breath	Regular	16.7	11.5*	12.5*	17.3	29.8	10.7*
	Long	15.3	10.9*	12.4*	13.5	16.2	11.6*
Insufficient fluid intake	Regular	7.9	3.2*	5.6*	5.4	19.2*	3.4*
	Long	5.0	3.5*	4.7*	4.4	7.2*	2.7*
Internal bleeding	Regular	4.7	4.3*	3.2*	5.3	6.5	4.1
	Long	3	4.3*	3.0*	2.2	2.7	2.1
Lung aspirations	Regular	1.8	1.1	1.1	3.1	3.4	1.1
	Long	4.4	1.8	2.7	5.9	5.2	3.6
Occasional or worse bowel or bladder incontinence	Regular	51.7	36.2	60.6	58.5	66.5	47.9
	Long	70.7	56.4	68	72.7	76.1	66.2
Ostomy present	Regular	3.8	3.2*	2.1*	5.5	5.6	2.8
	Long	5.4	3.9	3.2	8.5	5.5	5.7

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Table 7 – continued from previous page

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Condition	LOS Group	%	%	%	%	%	%
Shortness of breath	Regular	25.4	19.7	19.6	25.3	41.8	15.9*
	Long	21.1	16.0	16.7	19.2	23.2	18.6*
Unsteady gait	Regular	47.9	52	51.5*	42.2	41.4	45.7
	Long	36.5	38.8	38.8*	31.6	39.5	34.6
Vomiting	Regular	8.8	6.1*	5.9*	9.5	15.3*	7.2*
	Long	6.1	7.0*	4.9*	7.8	5.4*	6.3*
Weight gain or loss of 1.5kg+ in last 7 days	Regular	4.2*	2.6*	2.2*	4.6	8.3	2.8*
	Long	4.5*	2.6*	2.7*	6.3	4.9	3.4*

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

Table 8: Percentage of patients with select infections by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Infection	LOS Group	%	%	%	%	%	%
Antibiotic resistant infection	Regular	6.9	6.0	5.9	11.3	7.4*	7.1
	Long	10.6	10.5	8.7	11.0	9.4*	10.1
Clostridium difficile	Regular	2.4*	1.9	2.3*	3.7*	2.5	2.3*
	Long	2.4*	2.5	2.7*	1.9*	2.4	3.6*
HIV infection	Regular	0.2	0.2	0.1	0.3*	0.2*	0.2*
	Long	0.4	0.9	0.4	0.7*	0.1*	0*
Pneumonia	Regular	7.1*	6.8	6.0*	8.6*	8.5*	4.7
	Long	7.6*	5.4	5.3*	7.4*	8.9*	7.4
Respiratory infection	Regular	2.7	2.3*	2.1*	3.9	3.7*	2.2*
	Long	4.0	2.0*	2.3*	5.1	5.4*	3.0*
Urinary tract infection	Regular	18.5	18.3	21.7	18.6*	16.2	18.2*
	Long	15.6	16.0	16.9	15.0*	15.0	16.0*
Wound infection	Regular	5.7	5.2	3.8	10.7*	5.8	5.7*
	Long	7.2	9.0	5.4	6.8*	6.4	6.1*

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

5.1.4 Treatments, Therapies and Medications

Table 9 shows the percentage of patients in the regular and long-stay groups that received or participated in selected treatments and programs. In the 'Overall' sample, a greater percentage of long-stay patients required dialysis, feeding tube, indwelling catheter, intake/output monitoring, suctioning, tracheotomy care, ventilator or respirator, and trunk, limb or chair restraints. A smaller percentage of long-stay patients in the 'Overall' sample required acute condition monitoring, chemotherapy, community skills training, hospice care, IV medication, oxygen therapy, and transfusions. The percentage of patients in the 'Overall' sample requiring parenteral IV feeding was not significantly different. Generally, group differences for the percentage of patients in the discharge setting based subsamples receiving or participating in selected treatments and programs matched the 'Overall' sample.

The percentage of patients in the regular and long-stay groups that received selected therapies offered by certified allied health professionals are presented in Table 10. In the 'Overall' sample, a greater percentage of long-stay patients received psychological, respiratory and speech therapy. Conversely, a greater percentage of regular-stay patients from the 'Overall' sample received occupational, physical, and recreation therapy. Group differences in the percentage of patients receiving selected therapies in the discharge setting based subsamples followed the 'Overall' sample. It should be noted that for some therapies, group differences in the percentage of patients receiving a particular therapy in the subsamples were not significant. For example in the case of 'Residential Care' and 'Acute Care' patients, differences in the percentage of patients receiving occupational therapy were not significant. Length of stay group differences for recreation therapy were not significant for any of the discharge destination subsamples except for 'Acute Care' discharges.

Table 11 shows the percentage of patients in the regular and long-stay groups that received selected types of medications. Although group differences were small for the 'Overall' sample, a greater percentage of long-stay patients received antidepressant and antipsychotic medications, while antianxiety and hypnotic medications were administered to a greater percentage of regular-stay patients. Within the discharge setting based subsamples, the majority of group differences in

the percentage of patients provided selected medications were either small or not significant. For patients in the 'Other' discharge subsample, a greater percentage of long-stay patients were administered antianxiety medications. Antipsychotic medications were provided to a greater percentage of patients in the 'Community' and 'Residential Care' subsamples.

Table 9: Percentage of patients administered select treatments by length of stay group and discharge setting

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Therapy	LOS Group	%	%	%	%	%	%
Acute condition monitoring	Regular	45.8	42.9*	40.1	52.7	51.0	48.0
	Long	37.2	43.6*	35.9	30.8	34.9	30.0
Chemotherapy	Regular	1.2	0.9*	0.6	1.3	2.1	0.8*
	Long	0.5	1.0*	0.1	0.2	0.5	0.4*
Community skills training	Regular	37.2	56.7	30.7	37.4	9.5	43.3
	Long	15.2	45.3	25.0	7.0	4.1	11.6
Dialysis	Regular	2.0	1.7	1.1*	6.4	1.8*	1.7
	Long	4.9	2.7	1.6*	7.2	3.6*	3.8
Feeding tube	Regular	4.3	2.3	2.9	11.1	5.7	6.7
	Long	17.4	8.6	10.2	25.2	18.4	24.7
Hospice	Regular	12.9	2.7	2.3	3.3	43.3*	3.6*
	Long	5.1	3.9	3.5	2.1	7.6*	3.8*
Indwelling catheter	Regular	20.1	12.3	16.9	23.2	33.9*	18.3
	Long	22.3	18.5	19.4	23.4	23.0*	24.9
Intake/Output	Regular	27.4	20.6	21.2	35.1*	41.1	24.0
	Long	36.7	28.5	29.2	38.7*	40.0	33.1
IV medication	Regular	11.3	8.9*	5.7*	17.1	18.3	8.1*
	Long	10.5	9.0*	6.7*	11.6	10.2	8.0*
Oxygen therapy	Regular	20.1	13.2	13.0*	21.4	38.6	10.8*
	Long	17.7	11.4	11.5*	18	21.3	13.7*
Parenteral IV	Regular	6.0*	4.0	3.6*	8.1	10.7	4.3*
	Long	5.6*	4.9	3.4*	5.4	6.8	3.0*
Suctioning	Regular	2.7	1.0	0.8	6.3	5.8	2.3
	Long	8.7	3.7	3	13	9.8	9.3

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Table 9 – continued from previous page

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Therapy	LOS Group	%	%	%	%	%	%
Tracheostomy, ventilator or respirator	Regular	1.5	0.8	0.4	4.8	2.1	1.9
	Long	6.7	3.0	2.5	10.8	6.7	7.4
Transfusions	Regular	2.2	1.7*	1.2*	2.9	3.6	1.3*
	Long	1.4	1.3*	0.8*	1.1	1.7	1.7*
Trunk, limb or chair restraint	Regular	12.4	7.4	19.4	13.7	13.8	13.8
	Long	22.0	14.9	21.4	24.8	23.9	21.5

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

Table 10: Percentage of patients administered select therapies by length of stay group and discharge setting for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Therapy	LOS Group	%	%	%	%	%	%
Occupational	Regular	29.1	39.0	25.4*	30.1*	14.4	34.6
	Long	21.4	35.0	24.1*	20.5*	15.5	19.8
Physical	Regular	52.7	69.0	51.4	52.1	25.9	60.9
	Long	36.3	54.5	43.9	33.0	28.4	44.7
Psychological	Regular	14.6	14.1	11.3	14.9*	18.6	11.7*
	Long	19.0	18.7	20.8	17.6*	18.3	14.6*
Recreation	Regular	28.4	31.4*	32.5*	26.0	20.4*	32.3*
	Long	27.1	29.8*	31.4*	23.5	26.3*	23.2*
Respiratory	Regular	6.4	4.2*	3.1	7.6	13*	3.7
	Long	8.4	5.0*	5.3	8.7	9.6*	7.2
Speech	Regular	12.9	10.9	12.6	16.4	13.7	16.0*
	Long	18.7	21.0	19.1	20.5	17.8	16.0*

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

Table 11: Percentage of patients administered select medications by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Medication	LOS Group	%	%	%	%	%	%
Antianxiety	Regular	29.6	25.0*	28.2*	26.6	40.0*	25.9
	Long	27.3	24.2*	29.0*	26.6	26.1*	34.6
Antidepressant	Regular	30.1	29.4	34.2*	33.7	26.0*	31.6*
	Long	35.2	32.8	36.4*	36.6	33.5*	34.2*
Antipsychotic	Regular	19.1	12.9	26.3	16.1*	25.1*	15.9
	Long	23.2	16.0	28.7	18.4*	24.1*	22.2
Hypnotic	Regular	16.2	16.0*	15.3*	16.1	17.0	16.9*
	Long	13.6	14.7*	14.4*	11.9	12.1	17.7*

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

5.1.5 Clinical Scales

Table 12 shows the distribution of ADL-H scores for patients in the regular and long-stay patient groups. In the 'Overall' sample, a greater percentage of long-stay patients had ADL-H scores of 0 and 1-2, but fewer had scores of 5-6 compared with regular-stay group. Patients belonging to the 'Community' sample followed the same trend as 'Overall' sample. A greater percentage of long-stay patients in the 'Residential Care' and 'Acute Care' sample had ADL-H scores of 0, 1-2 and 3-4. For patients in the 'Expired in Facility' discharge setting based subsample, a greater percentage of the long-stay patients had ADL-H scores of 1-2 and 5-6. Lastly, a greater percentage of long-stay patients belonging to the 'Other' sample had ADL-H scores of in the mid-range of 1-2 and 3-4.

The distribution of CPS scores for patients in the regular and long-stay patient groups are presented in Table 13. In the 'Overall' sample, a greater percentage of long-stay patients have CPS scores of 3-4 and 5-6, representing a shift towards more severe impairment then in the regular-stay group. This trend holds true for all of the discharge setting based subsamples.

Table 14 shows the distribution of DRS scores for patients in the regular and long-stay patient groups. A greater percentage of long-stay patients in the 'Overall' sample had DRS scores of 1-2 and 3+.This is trend was generally true for all discharge setting based subsamples. Table 15 shows the distribution of ABS scores for patients in the regular and long-stay patient groups. The distribution of ABS scores in both the 'Overall' sample and the discharge setting based subsamples follow the same trend that was set by the DRS scale.

Table 16 shows the distribution of CHESS scores for patients in the regular and long-stay patient groups. In the 'Overall' sample, a greater percentage of long-stay patients had lower CHESS scores (0 and 1-2) compared with the regular-stay group. In contrast, fewer long-stay patients had CHESS scores of 3+. This trend holds true for all other groups in the discharged setting based samples except for 'Community' and 'Other'. Among patients belonging to the 'Community' discharge based sample, a greater percentage of long-stay patients had CHESS scores of 0 and 3+. In the 'Other' sample, a greater percentage of regular-stay patients had CHESS scores of 1-2 and

3+.

Pain Scale score distributions for patients in the regular and long-stay patient groups are shown in Table 17. In the 'Overall' sample, a greater percentage of long-stay patients had Pain Scale scores of 0, while regular-stay patients had a greater percentage of patients with scores of 1-2 and 3. In the 'Community' and 'Residential Care' samples, a greater percentage of long-stay patients had Pain Scale scores of 3. Group differences for the patients belonging to the 'Other' sample were not significant.

Table 18 shows the distribution of PURS scores for patients in the regular and long-stay patient groups. In the 'Overall' sample, a greater percentage of long-stay patients had PURS scores of 3, 4-5 and 6+, representing a shift towards greater pressure ulcer risk. This trend was observed in all of the discharge setting based subsamples except for patients in the 'Expired in Facility' sample where the distribution for long-stay patients was shifted towards lower PURS scores of 0, 1-2 and 3.

The distribution of ISE scores for patients in the regular and long-stay patient groups are presented in Table 17. In the 'Overall' sample, a greater percentage of long-stay patients had ISE scores of 0-1, describing patients that exhibit low degrees of social engagement. In the 'Community' sample, compared to regular-stay patients, the distribution of ISE for long-stay patients was shifted to lower scores of 0-1 and 2-4. For patients in the 'Expired in Facility' sample, a greater percentage of long-stay patients had ISE scores of 5-6.

Table 12: ADL-H scores by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
ADL-H	LOS Group	%	%	%	%	%	%
0	Regular	3.4	4.3	3.7	3.0	2.9	6.0
	Long	5.8	9.8	4.5	3.7	2.0	4.5
1-2	Regular	12.6	18.8	15.6	10.4	9.0	20.5
	Long	24.8	37.4	22.8	18.2	9.7	24.9
3-4	Regular	26.4	33.8	29.2	27.1	25.1	19.2
	Long	25.7	26.7	31.0	29.7	16.3	30.8
5-6	Regular	57.6	43.1	51.6	59.6	63.0	53.8
	Long	43.7	26.1	41.6	48.5	72.0	39.0

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days,
Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
ADL-H = Activities of Daily Living Hierarchy Scale

Table 13: CPS score distribution by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
CPS	LOS Group	%	%	%	%	%	%
0	Regular	27.1	38.6	15.0	28.3	17.4	32.8
	Long	17.7	29.3	13.8	20.4	12.4	23.0
1-2	Regular	33.9	37.5	31	33.8	30.7	33.2
	Long	26.6	33.1	27.6	27.3	23.5	24.9
3-4	Regular	25.8	17.9	35.9	24.7	30.7	24.0
	Long	29.5	25.7	32.4	26.9	31.3	26.4
5-6	Regular	13.1	6.1	18.1	13.2	21.2	10.0
	Long	26.2	11.9	26.2	25.3	32.9	25.7

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
CPS = Cognitive Performance Scale

Table 14: DRS score distribution by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
DRS	LOS Group	%	%	%	%	%	%
0	Regular	49.4	59.0	45.7	47.2	37.3	53.2
	Long	42.1	50.3	40.5	42.4	40.2	43.9
1-2	Regular	29.3	24.9	29.8	30.3	35.6	27.3
	Long	31.1	29.4	33.2	31	31.1	31.2
3+	Regular	21.3	16.0	24.5	22.4	27.0	19.5
	Long	26.8	20.3	26.3	26.6	28.6	24.9

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days,
Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
DRS = Depression Rating Scale

Table 15: ABS scores by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
ABS	LOS Group	%	%	%	%	%	%
0	Regular	76.5	84.4	69.6	75.6	69.3	80.1
	Long	65.7	75.8	61.0	67.2	62.2	69.2
1-2	Regular	19.6	13.8	24.3	20.0	25.4	16.1
	Long	24.7	19.6	27.8	24.4	26.3	22.4
3+	Regular	3.9	1.8	6.1	4.4	5.3	3.9
	Long	9.7	4.7	11.2	8.4	11.5	8.4

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days,
Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
ABS = Aggressive Behaviour Scale

Table 16: CHESS scores by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
CHESS	LOS Group	%	%	%	%	%	%
0	Regular	15.8	21.0	17.5	17.3	4.2	22.5
	Long	27.8	25.8	26.2	34.7	27.2	29.7
1-2	Regular	46.7	56.9	50.4	51.9	24.4	53.6
	Long	48.6	50.9	48.0	49.2	46.9	47.3
3+	Regular	37.5	22.1	32.1	30.8	71.4	23.9
	Long	23.6	23.3	25.8	16.1	25.9	23.0

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days,
Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
CHESS = Changes in Health, End-Stage Disease, Signs, and Symptoms Scale

Table 17: Pain scales scores by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Pain Scale	LOS Group	%	%	%	%	%	%
0	Regular	25.5	26.1	32.7	25.5	18.4	27.9*
	Long	35.5	30.4	36.7	37.3	38.4	32.5*
1-2	Regular	65.7	67.6	62.8	64.4	65.6	65.3*
	Long	57.4	61.8	57.2	54.5	55.6	62.2*
3	Regular	8.8	6.3	4.5	10.2	16.0	6.9*
	Long	7.1	7.8	6.1	8.2	5.9	5.3*

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days, Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *

Table 18: PURS scores by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
PURS	LOS Group	%	%	%	%	%	%
0	Regular	13.9	20.2	17.4	8.8	4.1	12.7
	Long	9.4	10.7	13.9	8.9	7.4	9.5
1-2	Regular	41.3	52.9	39.9	37.1	25.2	45.6
	Long	31.5	39.5	33.8	28.6	29.3	36.3
3	Regular	20.8	15.6	22.7	25.8	24.4	22.7
	Long	29.3	27.1	27	30.7	30.7	26.2
4-5	Regular	22.0	10.6	18.7	26.0	41.6	17.6
	Long	26.6	20.8	23.1	28.4	28.9	24.5
6+	Regular	2.0	0.7	1.3	2.4	4.8	1.4
	Long	3.2	1.9	2.2	3.5	3.7	3.6

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days,
Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
PURS = Pressure Ulcer Risk Scale

Table 19: ISE scores by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

			Discharge Setting Subsamples				
		Overall	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
ISE	LOS Group	%	%	%	%	%	%
0-1	Regular	33.6	19.4	37.7	33.9	54.0	26.8
	Long	42.2	28.3	42.4	42.5	49.1	39.5
2-4	Regular	42.7	45.6	41.6	45.4	37.6	42.8
	Long	40.1	46.6	39.4	37.6	37.3	40.7
5-6	Regular	23.7	35.0	20.7	20.8	8.4	30.4
	Long	17.7	25.1	18.3	19.9	13.6	19.8

Overall sample long-stay = 327+ days, Community subsample long-stay=149+ days, Residential care subsample long-stay = 347+ days,
Acute care subsample= 813+ days, Expired in facility subsample long-stay = 423+ days, Other settings subsample long-stay = 368+ days
All statistics significant to $P \leq 0.05$ unless denoted by an *
ISE = Index of Social Engagement

5.1.6 Clinical Assessment Protocols (CAPs)

The percentage of patients in the regular and long-stay groups that triggered specific CAPs are presented in Table 20. In the 'Overall' sample, the CAPS with the largest length of stay group differences for the percentage of patients triggering the CAP are the ADL CAP, Behaviour CAP, Cognition CAP, Medications CAP, Falls CAP, Feeding Tube CAP, Social Relationships CAP and the Urinary Incontinence CAP. Generally, these CAPS also showed large length of stay group differences in the discharge setting based subsamples.

Table 20: Proportion of patients triggering selected CAPs

				Proportion in Each Discharge Setting Group				
			Overall Sample	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Disease	CAP Level	LOS Group	%	%	%	%	%	%
Activities CAP	1	Regular	35.8	26.2	37.9	35.7	49.7	31.0*
		Long	32.6	32.8	31.9	31.6	32.4	31.4*
ADL CAP	1	Regular	5.2	4.6	6.7	9.7	3.4	5.3
		Long	20.7	13.2	14.6	30.8	22.7	16.2
	2	Regular	69.2	80.8	81.2	75.2	34.7	82.7
		Long	55.8	74.8	66.9	47.7	46.1	54.9
Behaviour CAP	1	Regular	19.4	14.4	24.7	19	23.9	15.9
		Long	21.8	17.8	25.7	20.9	22.4	21.9
	2	Regular	8.1	4.4	12.3	8.4	10.6	7.3
		Long	16.2	8.9	18.1	14.6	19.4	12.4
Bowel CAP	1	Regular	18.1	10.8	23.2	16.4	25.9	16.6
		Long	20.9	16.3	21.4	20.8	23.2	22.6
	2	Regular	15.0	15.0	16.9	17.4	12.1	15.3
		Long	11.3	17.8	13.9	9.0	8.4	12.7
Cardio-Respiratory CAP	1	Regular	32.3	27.0	26.7	31.4	48	23.3*
		Long	26.6	21.4	22.4	24.2	29	24.3*
Cognition CAP	1	Regular	43.9	63.8	32.6	48.6	17.7	53.4
		Long	35.0	51.3	31.1	41	27.2	38.7
	2	Regular	17.3	12.3	13.5	13.8	30.8	12.7
		Long	10.0	11.3	10.6	7.5	9.8	10.7

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Table 20 – continued from previous page

Disease	CAP Level	LOS Group	Overall Sample	Proportion in Each Discharge Setting Group				
				Community	Residential Care	Acute Care	Expired in Facility	Other Settings
			%	%	%	%	%	%
Communication CAP	1	Regular	13.0	10.0	13.1	13.7*	16.9	14.1*
		Long	15.4	16.5	14.5	16.1	16.5	13.3
	2	Regular	18.1	13.3	26.7	15.7*	20.2	15.4*
		Long	19.2	17.3	21.3	18.0	20.6	18.5
Dehydration CAP	1	Regular	1.4	1.0*	1.5*	1.2	2.3*	0.8*
		Long	1.5	1.0*	1.2*	0.7	2.8*	0.8*
	2	Regular	7.4	2.7	4.9	5.2	18.5	3.1
		Long	4.6	2.9	4.2	4.9	5.8	3.2
Delirium CAP	1	Regular	15.2*	7.7	15.3*	12.3	28.5*	12.3*
		Long	14.4*	9.1	14.8*	12.5	17.7*	12.2*
Medications CAP	1	Regular	36.5	33.2	31.8	39.0	45.2	31.2
		Long	25.7	29.2	24.1	21.5	24.3	25.7
Falls CAP	1	Regular	24.9	29.3	26.3	19.9	18.6	26.5
		Long	14.2	17.0	17.8	10.3	14.0	13.9
	2	Regular	5.8	6.0	8.0	4.4	4.5	4.7
		Long	3.8	4.2	5.4	3.0	3.1	3.2
Feeding Tube CAP	1	Regular	1.5	0.6	1.1	4.2	2.2	2.4
		Long	8.8	2.3	5.3	13.0	10.1	13.7
	2	Regular	2.8	1.7	1.8	6.9	3.5	4.3
		Long	8.7	6.2	4.9	12.2	8.3	11.0

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Table 20 – continued from previous page

Disease	CAP Level	LOS Group	Overall Sample	Proportion in Each Discharge Setting Group				
				Community	Residential Care	Acute Care	Expired in Facility	Other Settings
			%	%	%	%	%	%
Mood CAP	1	Regular	33.8	28.0	34.4	34.9	42.1	31.6
		Long	37.1	33.4	39.1	37.7	37.7	35.4
	2	Regular	16.9	13.0	19.9	17.8	20.6	15.2
		Long	20.9	16.3	20.4	19.9	22.0	20.7
Nutrition CAP	1	Regular	17.3	18.4*	21.5	18.2	11.6	17.0*
		Long	20.7	17.2*	20.1	22.1	22.4	18.4*
	2	Regular	12.0	11.8	14.9	13.1	9.9	10.9
		Long	14.1	11.9	12.9	15.3	16.4	9.6
Pain CAP	1	Regular	36.6	38.7	32.4	36.2	36.8	36.0*
		Long	28.3	33.3	28.1	26.6	26.8	35.9*
	2	Regular	9.4	6.7	4.9	10.9	17.0	7.5
		Long	7.6	8.5	6.7	8.8	6.4	5.5
Ulcer CAP	1	Regular	13.2	9.4	10.6	20.1	18.8	11.7
		Long	18.2	16.8	14.1	21.4	17.2	16
	2	Regular	9.2	6.4	8.9	8.9	14	8.2
		Long	8.9	8.3	7.9	8.2	10.3	11.2
	3	Regular	7.2	2.8	6.2	8.6	14.4	7.1
		Long	11	8.0	8.9	11.7	11.5	11.8
Restraint CAP	1	Regular	9.0	4.6	13.8	9.8	11.8	9.6
		Long	16.0	9.5	15.9	17.3	17.7	14.3
	2	Regular	3.0	2.5	5.3	2.9	1.6	3.5
		Long	4.2	4.5	4.6	3.7	5.0	3.8

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Table 20 – continued from previous page

				Proportion in Each Discharge Setting Group				
			Overall Sample	Community	Residential Care	Acute Care	Expired in Facility	Other Settings
Disease	CAP Level	LOS Group	%	%	%	%	%	%
Social Relationships CAP	1	Regular	59.4	59.1	55.6	60.5	62.9	56.3
		Long	48.4	57.6	50.0	46.0	44.0	47.8
Urinary Incontinence CAP	1	Regular	47.2	58.0*	35.1	44.4	40.6	49.9
		Long	31.5	44.2*	31.8	31.4	25.7	37.6
	2	Regular	31.7	24.8	38.9	36.2	33.7	34.4
		Long	38.4	39.1	37.3	40.2	38.0	31.9
	3	Regular	8.0	11.1	7.9	6.2	4.5	5.7
		Long	3.9	4.8	4.8	3.1	3.4	4.9

All statistics significant to $P \leq 0.05$ unless denoted by an *

5.2 Multivariate Binary Logistic Regression Models

The following sections present the results, and the intermediary analyses, of the multivariate logistic regression models. Long-stay patient status was the binary dependent variable of interest. Again, depending on the sample, the day of stay cutoff differentiating regular and long-stay patients varies (see section 4.4).

5.2.1 Bivariate Binary Logistic Regression

Table 21 summarizes a series of bivariate analyses predicting inclusion in the long-stay group for the 'Overall' sample and the five discharge setting based subsamples. Each table cell represents the results of a separate bivariate binary logistic regression model, modelling the effect of the independent variable of interest on inclusion in the long-stay patient group. Symbols have been used to summarize the results of the analyses, categorizing each independent variable as either predictive (+), protective (-) or not significant (N.S.) for patients in a particular sample.

Table 21: Results of bivariate logistic regression analyses predicting length of stay

Variable	Overall	Community	Residential Care	Acute Care	Died in Facility	Other Settings
Lived alone prior to entry	+	+	N.S.	N.S.	N.S.	N.S.
History of mental illness	+	+	+	+	+	+
Indwelling catheter	+	+	+	-	N.S.	+
Ostomy present	+	N.S.	+	N.S.	+	+
Parkinsons disease	+	N.S.	N.S.	+	+	N.S.
Quadriplegia	+	+	+	+	+	+
Traumatic brain injury	+	+	+	+	+	+
Congestive heart failure	-	-	-	N.S.	-	N.S.
Depression	+	+	+	+	N.S.	+
Bipolar disorder	+	+	N.S.	+	N.S.	N.S.
Schizophrenia	+	+	+	+	N.S.	+
Emphysema/COPD	-	-	N.S.	-	-	N.S.
Hip fracture	-	-	-	+	-	-
Osteoporosis	+	N.S.	N.S.	+	+	N.S.
Cancer	-	-	-	-	-	N.S.
Aphasia	+	+	+	+	+	+
Stroke	+	+	+	+	+	N.S.
Renal failure	+	N.S.	-	N.S.	-	N.S.
Hemiplegia/hemiparesis	+	+	+	+	+	N.S.
Huntington's chorea	+	N.S.	N.S.	+	+	+
Multiple sclerosis	+	+	+	+	+	+
Antibiotic resistant infection	+	+	+	+	N.S.	+
Cellulitis	N.S.	+	N.S.	N.S.	N.S.	N.S.
C. Difficile infection	N.S.	+	N.S.	N.S.	-	N.S.
HIV infection	+	+	+	N.S.	N.S.	N.S.
Pneumonia	N.S.	-	N.S.	N.S.	N.S.	+
Respiratory infection	+	N.S.	N.S.	+	N.S.	N.S.
Septicemia	N.S.	N.S.	N.S.	N.S.	N.S.	+
Tuberculosis (active)	N.S.	N.S.	N.S.	+	N.S.	N.S.
Urinary tract infection (last 30 days)	-	-	-	N.S.	-	N.S.
Viral hepatitis	N.S.	+	N.S.	N.S.	N.S.	N.S.
Wound infection	+	+	+	N.S.	-	N.S.
Sudden weight change	N.S.	N.S.	N.S.	-	+	N.S.
Inability to lie flat due to SOB	-	N.S.	N.S.	-	-	N.S.
Dehydrated	-	N.S.	N.S.	-	N.S.	N.S.

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Table 21 – continued from previous page

Variable	Overall	Community	Residential Care	Acute Care	Died in Facility	Other Settings
Insufficient fluid	-	N.S.	N.S.	-	N.S.	N.S.
Edema	-	-	-	-	-	N.S.
Fever	N.S.	N.S.	N.S.	-	N.S.	N.S.
Internal bleeding	-	N.S.	N.S.	-	-	-
Recurrent lung aspirations (last 90 days)	+	+	+	+	+	+
Shortness of breath	-	-	-	-	-	N.S.
Syncope	-	-	N.S.	N.S.	N.S.	N.S.
Unsteady gait	-	-	-	N.S.	-	-
Vomiting	-	N.S.	N.S.	-	N.S.	N.S.
Parenteral/IV feeding	N.S.	+	N.S.	-	-	N.S.
Feeding tube	+	+	+	+	+	+
Planned weight change program	+	+	+	+	+	+
History of resolved pressure ulcers	+	+	+	+	+	+
Burns (second or third degree)	N.S.	+	N.S.	N.S.	N.S.	N.S.
Open lesions	+	+	+	N.S.	N.S.	N.S.
Surgical wounds	-	-	N.S.	N.S.	-	-
Occupational therapy	-	-	N.S.	N.S.	-	-
Chemotherapy	-	N.S.	-	-	-	N.S.
Dialysis	+	+	N.S.	+	N.S.	+
IV medication	-	N.S.	N.S.	-	-	N.S.
Intake/output	+	+	+	N.S.	+	+
Acute condition monitoring	-	N.S.	-	-	-	-
Ostomy care	+	+	+	+	+	+
Oxygen therapy	-	-	N.S.	-	-	+
Radiation	-	N.S.	N.S.	-	N.S.	N.S.
Suctioning	+	+	+	+	+	+
Transfusions	-	N.S.	N.S.	-	-	N.S.
Hospice care	-	+	+	-	N.S.	N.S.
Community skills training	-	-	-	-	-	-
Behaviour evaluation program	+	+	+	+	+	N.S.
Mental health specialist evaluation	+	+	+	+	N.S.	N.S.
Physician visits (last 14 days)	-	-	-	-	-	-
Physician change orders (last 14 days)	-	-	-	-	-	-
Physical therapy	-	-	-	+	-	-
Community return desired	-	-	-	-	-	-
Support person present	-	-	-	-	-	-
Recreation therapy	-	N.S.	N.S.	+	N.S.	-

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Variable	Overall	Community	Residential Care	Acute Care	Died in Facility	Other Settings
ADRD	+	+	N.S.	+	+	+
Antianxiety medications	-	N.S.	N.S.	-	N.S.	+
Antidepressant medications	+	+	N.S.	+	N.S.	N.S.
Antipsychotic medications	+	+	+	N.S.	N.S.	+
Bariatric (BMI ≥ 40)	-	+	N.S.	-	N.S.	N.S.
Conflict with others	+	+	+	+	+	N.S.
DBSI	+	N.S.	N.S.	+	+	+
Female	-	-	-	-	-	-
Hallucinations or delusions	+	+	N.S.	N.S.	N.S.	+
Stage 3+ pressure ulcer	+	+	+	+	+	+
Hypnotic medications	-	N.S.	N.S.	-	-	N.S.
Bladder or bowel incontinence	+	+	+	+	+	+
Married	N.S.	N.S.	+	N.S.	N.S.	N.S.
Primarily speaks other language	+	+	+	+	+	+
Stage 2+ pressure ulcer count	+	+	+	N.S.	N.S.	+
Previously in subacute care facility	+	N.S.	N.S.	+	+	+
Previously in psychiatric care facility	+	+	+	+	N.S.	+
Previously in board and care facility	+	N.S.	-	+	+	+
Psychological therapy	+	+	+	N.S.	+	N.S.
Respiratory therapy	+	N.S.	+	-	N.S.	+
Trunk, limb or chair restraint	+	+	+	+	+	+
Speech therapy	+	+	+	+	+	N.S.
Tracheostomy, ventilator or respirator	+	+	+	+	+	+
ABS	+	+	+	+	+	+
PURS	+	+	+	-	+	+
ADL-H	+	+	+	-	+	+
CHESS	-	-	-	-	-	-
CPS	+	+	+	+	+	+
DRS	+	+	+	+	+	+
Pain Scale	-	-	-	-	-	-
ISE	-	-	-	+	-	-

+ positive association with $P \leq 0.05$
- negative association with $P \leq 0.05$
N.S. not significant at $P = 0.05$

5.2.2 Multivariate Logistic Regression Model for Overall Sample

The multivariate logistic regression model predicting the binary dependent variable of being in the long-stay rather than the regular-stay group for the 'Overall' sample is presented in Table 22. Female patients had lower odds of being long-stay patients. All age groups had lower odds then the reference group of being long-stay patients, There was a general trend of older patients having a lower odds of being long-stay patients with each increment in age group. Patients admitted with an ADL-H score of 1-2 were not significantly more likely to be long-stay patients compared to those with ADL-H score of 0; however, the odds of being a long-stay patient increases for patients with ADL-H scale scores of 3–4 and 5–6. Greater ABS scores were associated with higher odds of being a long-stay patient. Those with higher CHESS scores had lower odds of being long-stay patients then those with a CHESS score of 0. Higher PURS scores showed incremental increase in the odds of inclusion in the long-stay patient group. Although the differences between patients with ISE scores of 2–6 were small, they both had greater odds of being long-stay then patients demonstrating low social engagement (0–1). An increased number of hospital stays and ER visits in the 90 days prior to admission decreased the patient's odds of being a long-stayer. Diseases and health conditions that increased a patient's odds of being a long-stay patient included severe dual sensory impairment (measured by the DBSI), ADRD, Parkinson's disease, quadriplegia, schizophrenia, aphasia, Huntington's chorea, multiple sclerosis and HIV infection. Patients admitted with a cancer diagnosis or insufficient fluid intake had lower odds of being long-stay patients. Treatments and therapies that increased the odds of being a long-stay patient included tracheostomy care, ventilator or respirator, feeding tube, use of a planned weight change program, dialysis, and psychological therapy. Patients receiving acute condition monitoring, hospice care or community skills training were less likely to be long-stay patients. There was interaction effect between the presence of a support person and desire to return to the community (Figure 3).

Table 22: Multivariate binary logistic regression model for overall sample

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Intercept		-1.93 (0.08)	
Female		-0.14 (0.03)	0.87 (0.83 - 0.92)
Age	65-74 vs. 0-64	-0.34 (0.04)	0.71 (0.66 - 0.77)
	75-84 vs. 0-64	-0.32 (0.04)	0.72 (0.67 - 0.78)
	85-94 vs. 0-64	-0.39 (0.04)	0.68 (0.62 - 0.73)
	95+ vs. 0-64	-0.46 (0.09)	0.63 (0.53 - 0.75)
ADL-H	1-2 vs. 0	0.13 (0.07)*	1.14 (0.99 - 1.31)
	3-4 vs. 0	0.60 (0.07)	1.82 (1.58 - 2.10)
	5-6 vs. 0	0.53 (0.07)	1.70 (1.47 - 1.96)
ABS	1-2 vs. 0	0.20 (0.03)	1.22 (1.15 - 1.3)
	3+ vs. 0	0.48 (0.05)	1.61 (1.46 - 1.77)
CHESS	1-2 vs. 0	-0.36 (0.03)	0.70 (0.65 - 0.74)
	3+ vs. 0	-0.85 (0.04)	0.43 (0.39 - 0.46)
PURS	1-2 vs. 0	0.19 (0.05)	1.21 (1.10 - 1.33)
	3 vs. 0	0.37 (0.05)	1.45 (1.31 - 1.62)
	4-5 vs. 0	0.38 (0.06)	1.46 (1.31 - 1.63)
	6+ vs. 0	0.63 (0.09)	1.86 (1.56 - 2.21)
ISE	2-4 vs. 0-1	0.27 (0.03)	1.31 (1.23 - 1.39)
	5-6 vs. 0-1	0.25 (0.04)	1.28 (1.18 - 1.39)
Hospital Stays	1 stay	-0.47 (0.03)	0.63 (0.59 - 0.67)
	2+ stays	-0.71 (0.05)	0.49 (0.45 - 0.54)
ER Visits	1 visit	-0.20 (0.03)	0.82 (0.77 - 0.87)
	2+ visits	-0.36 (0.07)	0.70 (0.62 - 0.80)
DBSI		0.32 (0.14)	1.37 (1.04 - 1.80)
ADRD		0.35 (0.03)	1.42 (1.34 - 1.51)
Parkinson's disease		0.29 (0.05)	1.34 (1.20 - 1.48)
Quadraplegia		0.35 (0.08)	1.42 (1.21 - 1.66)
Schizophrenia		0.34 (0.09)	1.41 (1.17 - 1.70)
Aphasia		0.49 (0.04)	1.63 (1.50 - 1.76)
Huntingtonx's chorea		0.56 (0.22)	1.75 (1.14 - 2.70)
Multiple sclerosis		0.65 (0.08)	1.91 (1.63 - 2.22)
HIV Infection		0.49 (0.20)	1.63 (1.10 - 2.43)
Cancer		-0.52 (0.04)	0.59 (0.55 - 0.64)
Insufficient fluid intake		-0.49 (0.06)	0.61 (0.55 - 0.69)
Trach., ventilator, respirator		0.44 (0.07)	1.55 (1.36 - 1.76)
Feeding tube		0.56 (0.05)	1.76 (1.61 - 1.92)
Weight change program		0.53 (0.047)	1.71 (1.56 - 1.87)
Dialysis		0.67 (0.06)	1.95 (1.73 - 2.20)
Intake/Output		0.28 (0.03)	1.32 (1.24 - 1.39)
Psychological therapy		0.36 (0.03)	1.43 (1.34 - 1.53)
Acute condition monitoring		-0.34 (0.03)	0.71 (0.67 - 0.75)
Hospice care		-0.92 (0.06)	0.40 (0.35 - 0.45)
Community skills training		-0.58 (0.04)	0.56 (0.52 - 0.60)

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Table 22 – continued from previous page

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Community return desired (Q1a)		-0.42 (0.04)	
Support person present (Q1b)		-0.82 (0.05)	See Figure 3
Q1a x Q1b		-0.15 (0.07)	

All statistics significant to $P \leq 0.05$ unless denoted by an *
Model C statistic = 0.810

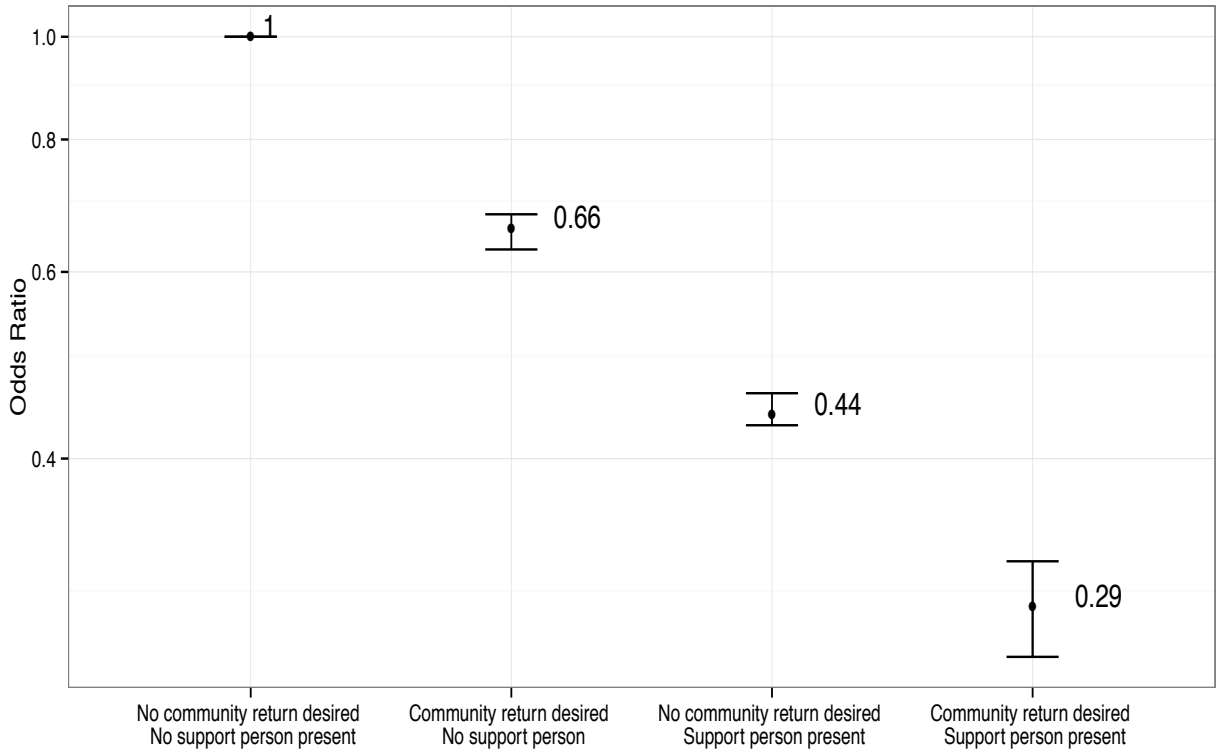

Figure 3: Plot of odds ratios for interaction term between presence of a support person (Q1b) and desire to return to the community (Q1a)

5.2.3 Multivariate Logistic Regression Model for LTC Subsample

The results of the multivariate binary logistic regression model predicting inclusion in the long-stay group for patients belonging to the 'Residential Care' subsample are presented in Table 23. Statistically, females were no more likely than males to be long-stay patients; however gender was left in the model to be consistent with others that include age and sex adjusted estimates. All

age groups over 65, had lower odds of being long-stay patients than the 0-64 age group. Patients with lower capacity to complete ADLs, as measured by the ADL-H scale, were more likely to be long-stay patients. Patients with higher ABS scores had greater odds of being long-stay patients, but the opposite was true for the CHESS score. An increased number of hospital stays and ER visits in the 90 days prior to admission decreases the odds of being a long-stay patient. Diseases and conditions that increased the likelihood of being a long-stay patient included history of mental illness, quadriplegia, traumatic brain injury, aphasia, presence of a stage 3+ pressure ulcer, antibiotic resistant infection and HIV infection. Treatments and programs that increased the odds of being a long-stay patient include feeding tube, planned weight change program, hospice, tracheostomy care, ventilator or respirator, behaviour evaluation program, psychological therapy and respiratory therapy. Patients whose primary language was not English or French had greater odds of being a long-stay patient. Conversely, those who had previously resided in residential care and those who had a support person who was positive towards discharge were less likely to be long-stay patients.

Table 23: Multivariate binary logistic regression model for LTC discharges

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Intercept		-1.96 (0.16)	
Female		0.01 (0.06)*	1.01 (0.91 - 1.13)
Age	65-74 vs. 0-64	-0.57 (0.09)	0.57 (0.47 - 0.68)
	75-84 vs. 0-64	-0.81 (0.08)	0.44 (0.38 - 0.52)
	85-94 vs. 0-64	-1.07 (0.09)	0.34 (0.29 - 0.41)
	95+ vs. 0-64	-0.88 (0.17)	0.41 (0.30 - 0.58)
ADL-H	1-2 vs. 0	0.08 (0.15)*	1.08 (0.80 - 1.46)
	3-4 vs. 0	0.36 (0.15)	1.43 (1.07 - 1.92)
	5-6 vs. 0	0.56 (0.15)	1.76 (1.32 - 2.34)
CHESS	1-2 vs. 0	-0.35 (0.07)	0.71 (0.62 - 0.81)
	3+ vs. 0	-0.54 (0.08)	0.58 (0.50 - 0.68)
ABS	1-2 vs. 0	0.21 (0.06)	1.23 (1.09 - 1.39)
	3+ vs. 0	0.38 (0.10)	1.46 (1.20 - 1.77)
Hospital Stays	1 stay	-0.21 (0.07)	0.81 (0.71 - 0.93)
	2+ stays	-0.44 (0.09)	0.64 (0.54 - 0.77)
ER Visits	1 visit	-0.32 (0.06)	0.73 (0.64 - 0.82)
	2+ visits	-0.40 (0.12)	0.67 (0.53 - 0.85)
History of mental illness		0.24 (0.10)	1.28 (1.05 - 1.55)
Quadriplegia		1.08 (0.26)	2.94 (1.76 - 4.89)
Traumatic Brain Injury		0.64 (0.15)	1.89 (1.41 - 2.55)
Aphasia		0.60 (0.08)	1.83 (1.55 - 2.15)
Stage 3+ pressure ulcer		0.66 (0.11)	1.94 (1.56 - 2.41)
Antibiotic resistant infection		0.28 (0.10)	1.32 (1.09 - 1.60)
HIV infection		1.45 (0.51)	4.25 (1.56 - 11.56)
Feeding tube		0.65 (0.11)	1.91 (1.55 - 2.36)
Weight change program		0.34 (0.11)	1.40 (1.12 - 1.75)
Hospice		0.41 (0.15)	1.50 (1.12 - 2.01)
Trach., ventilator, respirator		0.71 (0.22)	2.04 (1.33 - 3.13)
Behaviour evaluation program		0.33 (0.11)	1.38 (1.11 - 1.73)
Psychological therapy		0.47 (0.07)	1.60 (1.39 - 1.85)
Respiratory therapy		0.46 (0.13)	1.58 (1.22 - 2.04)
Primarily speaks other language		0.27 (0.09)	1.31 (1.10 - 1.55)
Support person present		-0.63 (0.06)	0.54 (0.48 - 0.60)
Previously in residential care		-0.58 (0.10)	0.56 (0.46 - 0.69)

All statistics significant to $P \leq 0.05$ unless denoted by an *
Model C statistic = 0.737

5.2.4 Multivariate Logistic Regression Model for Community Subsample

The multivariate binary logistic regression model predicting inclusion in the long-stay group for patients in the 'Community' discharge sample is presented in Table 24. Female patients were no more likely than males to be long-stay patients. Older, patients had lower odds of being long-stay

patients than the 0-64 group. The odds of being a long-stay patient for those with ADL-H scores of 1–2 were not significantly different from those with an ADL-H score of 0, but patients with ADL-H of three or more were more likely to be long-stay. Patients with higher PURS scale scores, indicating increased pressure ulcer risk, had greater odds of being long-stay patients. An increased number of hospital stays in the 90 days prior to admission to the CCC facility resulted in decreased odds of being a long-stay patient. Patients triggering the ADL CAP have greater odds of being long-stay patients than those who do not. Those triggering the CAP to facilitate improvement have lower odds of being a long-stay patient than those triggering the CAP to prevent decline. Diseases and conditions that increase the odds of being long-stay patients include traumatic brain injury, stroke, hemiplegia/hemiparesis, antibiotic resistant infection, HIV infection, open lesions and the presence of a stage 3+ pressure ulcer. Unsteady gait and pneumonia decreased one's odds of being a long-stay patient. Treatments and programs that increase the odds of being a long-stay patient include tracheostomy care, ventilator or respirator, feeding tube, planned weight change program, dialysis, mental health evaluation program and speech therapy. Patients that receive physical therapy have lower odds of being a long-stay patient. Lastly, patients that desire to return the community and patients that have a support person that is positive towards discharge have lower odds of being long-stay patients.

Table 24: Multivariate binary logistic regression model for community discharges

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Intercept		-2.10 (0.12)	
Female		-0.04 (0.04)*	0.96 (0.88 - 1.04)
Age	65-74 vs. 0-64	-0.36 (0.06)	0.70 (0.62 - 0.78)
	75-84 vs. 0-64	-0.61 (0.05)	0.55 (0.49 - 0.61)
	85-94 vs. 0-64	-0.77 (0.06)	0.46 (0.41 - 0.52)
	95+ vs. 0-64	-1.16 (0.18)	0.31 (0.22 - 0.45)
ADL-H	1-2 vs. 0	-0.20 (0.13)*	0.82 (0.63 - 1.06)
	3-4 vs. 0	0.46 (0.13)	1.58 (1.22 - 2.05)
	5-6 vs. 0	0.40 (0.131)	1.48 (1.15 - 1.92)
PURS	1-2 vs. 0	0.18 (0.07)	1.20 (1.05 - 1.37)
	3 vs. 0	0.52 (0.08)	1.69 (1.44 - 1.97)
	4-5 vs. 0	0.59 (0.09)	1.80 (1.53 - 2.13)
	6+ vs. 0	0.80 (0.17)	2.23 (1.60 - 3.12)
Hospital Stays	1 stay	-0.20 (0.05)	0.82 (0.74 - 0.91)
	2+ stays	-0.48 (0.07)	0.62 (0.54 - 0.72)
ER Visits	1 visit	-0.04 (0.05)	0.96 (0.88 - 1.05)
	2+ visits	-0.27 (0.10)	0.76 (0.63 - 0.92)
ADL CAP	1 vs. 0	0.92 (0.102)	2.50 (2.05 - 3.06)
	2 vs. 0	0.58 (0.09)	1.78 (1.51 - 2.11)
Traumatic brain injury		0.71 (0.12)	2.02 (1.59 - 2.57)
Stroke		0.34 (0.06)	1.40 (1.25 - 1.56)
Hemiplegia/hemiparesis		0.63 (0.07)	1.87 (1.64 - 2.14)
Antibiotic resistant infection		0.33 (0.07)	1.39 (1.21 - 1.59)
HIV infection		1.02 (0.24)	2.77 (1.72 - 4.47)
Stage 3+ pressure ulcer		0.61 (0.08)	1.83 (1.57 - 2.14)
Open lesions		0.3 0(0.10)	1.35 (1.11 - 1.65)
Pneumonia		-0.38 (0.09)	0.68 (0.57 - 0.81)
Unsteady gait		-0.36 (0.04)	0.70 (0.64 - 0.76)
Trach., ventilator, respirator		0.58 (0.14)	1.78 (1.36 - 2.33)
Feeding tube		0.45 (0.09)	1.56 (1.32 - 1.85)
Weight change program		0.43 (0.074)	1.53 (1.32 - 1.77)
Dialysis		0.34 (0.13)	1.41 (1.10 - 1.80)
Mental health evaluation		0.43 (0.06)	1.54 (1.36 - 1.73)
Speech therapy		0.36 (0.05)	1.43 (1.29 - 1.59)
Community return desired		-0.67 (0.06)	0.51 (0.46 - 0.58)
Support person present		-0.77 (0.05)	0.46 (0.42 - 0.51)

All statistics significant to $P \leq 0.05$ unless denoted by an *
Model C statistic = 0.779

5.2.5 Multivariate Logistic Regression Model for Acute Care Subsample

Table 25 shows the results of the multivariate binary logistic regression model predicting inclusion in the long-stay group for patients in the 'Acute Care' discharge subsample. Gender was

not significant in this model. Patients under the age of 65 had greater odds of being long-stay patients. Increasing CHESS scores resulted in lower odds of being long-stay patient within this subsample. Patients with an increasing number of hospital stays had lower odds of being long-stay patients. Patients with one ER visit in the 90 days prior to admission had lower odds of being long-stay patients than those with no ER visits; however patients with two or more ER visits were not significantly different from those with no visits prior to admission. Patients triggering the ADL CAP at low level had greater odds of being long-stay patients than those in the non-triggering group. Diseases and conditions that increased the odds of being a long-stay patient included ADRD, Parkinson's disease, quadriplegia, stroke, hemiplegia/hemiparesis, multiple sclerosis and recent weight gain or loss of 1.5 kg or more in the last seven days. Patients admitted with a emphysema/COPD, cancer and wound infection had lower odds of being a long-stay patients than those without those conditions on admission. Treatments and programs that were associated with increased odds of being a long-stay patient included planned weight change program, behavioural evaluation program and psychological therapy. Patients receiving acute condition monitoring and community skills monitoring had lower odds of being a long-stay patient. Patients who wished to return to the community and those that had a support person who was positive towards discharge had lower odds of being long-stay patients. Lastly, patients who had previously resided in a sub-acute care facility had greater odds of being long-stay patients.

Table 25: Multivariate binary logistic regression model for acute care discharges

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Intercept		-1.34 (0.14)	
Female		0.09 (0.08)*	1.09 (0.93 - 1.28)
Age	65-74 vs. 0-64	-0.55 (0.12)	0.58 (0.45 - 0.73)
	75-84 vs. 0-64	-0.41(0.11)	0.66 (0.54 - 0.82)
	85-94 vs. 0-64	-0.61 (0.13)	0.54 (0.42 - 0.70)
	95+ vs. 0-64	-0.78(0.41)*	0.46 (0.21 - 1.01)
CHESS	1-2 vs. 0	-0.24 (0.09)	0.79 (0.66 - 0.94)
	3+ vs. 0	-0.47 (0.13)	0.63 (0.49 - 0.80)
Hospital Stays	1 vs. 0 stays	-0.45 (0.10)	0.64 (0.52 - 0.78)
	2+ vs. 0 stays	-0.94 (0.18)	0.39 (0.27 - 0.55)
ER Visits	1 vs. 0 visits	-0.25 (0.11)	0.78 (0.63 - 0.97)
	2+ vs. 0 visits	-0.41 (0.25)*	0.66 (0.40 - 1.09)
ADL CAP	1 vs. 0	0.24 (0.12)	1.27 (1.01 - 1.61)
	2 vs. 0	-0.06 (0.10)*	0.95 (0.77 - 1.16)
ADRD		0.40 (0.09)	1.50 (1.24 - 1.80)
Parkinson's		0.60 (0.16)	1.82 (1.33 - 2.49)
Quadriplegia		0.56 (0.17)	1.75 (1.27 - 2.43)
Stroke		0.34 (0.10)	1.41 (1.16 - 1.71)
Hemiplegia/hemiparesis		0.31 (0.13)	1.36 (1.07 - 1.74)
Multiple sclerosis		1.09 (0.17)	2.98 (2.13 - 4.15)
Recent weight gain or loss of 1.5+ kg		0.35 (0.16)	1.41 (1.03 - 1.95)
Emphysema/COPD		-0.27 (0.12)	0.76 (0.61 - 0.96)
Cancer		-0.43 (0.12)	0.65 (0.51 - 0.82)
Wound infection		-0.33 (0.15)	0.72 (0.53 - 0.97)
Planned weight change program		0.51 (0.12)	1.67 (1.31 - 2.13)
Behaviour evaluation program		0.53 (0.17)	1.70 (1.23 - 2.35)
Psychological therapy		0.27 (0.11)	1.32 (1.07 - 1.62)
Acute condition monitoring		-0.69 (0.09)	0.50 (0.43 - 0.59)
Community skills training		-1.13 (0.15)	0.32 (0.24 - 0.44)
Community return desired		-0.39 (0.10)	0.68 (0.55 - 0.83)
Support person present		-0.99 (0.11)	0.37 (0.30 - 0.46)
Previous stay in nursing home		0.54 (0.13)	1.71 (1.32 - 2.20)

All statistics significant to $P \leq 0.05$ unless denoted by an *
Model C statistic = 0.843

5.2.6 Multivariate Logistic Regression Model for Expired in Facility Subsample

The multivariate binary logistic regression model predicting inclusion in the long-stay group for patients in the 'Expired in Facility' discharge sample are presented in Table 26. Both Gender and age were not significant in this model. Patients at all levels of ADL impairment were less likely than those with ADL-H score of 0 to be long-stay patients. Greater CHESS and Pain Scale scores

were associated with lower odds of being a long-stay patient. Greater ISE scores, reflecting increased social engagement, increased the odds of being a long-stay patient. Patients who experience 1 or more hospitalizations prior to admission had lower odds of being a long-stay patient, as did patients who had visited the ER two or more times prior to admission. Patients triggering the ADL CAP have greater odds of being long-stay patients at both trigger levels. Diseases and conditions that increased the odds of being a long stay patient included a history of mental illness, history of resolved pressure ulcers, ADRD, Parkinson's disease, traumatic brain injury, aphasia, Huntington's chorea and multiple sclerosis. Patients with cancer, insufficient fluid intake and fever had lower odds of being long-stay patients. Treatments and programs that increased the odds of being a long-stay patient included feeding tube, planned weight change program, tracheostomy care, ventilator or respirator and, behaviour evaluation program. Treatments and programs that reduced the odds of being a long-stay patient included oxygen therapy, hospice care and community skills training. Patients whose primary language was not English or French had greater odds of being a long-stay patient. The same was true for patients who had previously resided in a sub-acute care facility. Patients who wished to return to the community had lower odds of being long-stay patients.

Table 26: Multivariate binary logistic regression model for patients that expired in the facility

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Intercept		-1.18 (0.19)	
Female		0.09 (0.05)*	1.09 (0.98 - 1.21)
Age	65-74 vs. 0-64	-0.19 (0.10)*	0.82 (0.67 - 1.01)
	75-84 vs. 0-64	-0.01 (0.09)*	0.99 (0.83 - 1.19)
	85-94 vs. 0-64	-0.07 (0.10)*	0.94 (0.77 - 1.13)
	95+ vs. 0-64	0 (0.16)*	1.00 (0.73 - 1.37)
ADL-H	1-2 vs. 0	-0.69 (0.19)	0.50 (0.35 - 0.72)
	3-4 vs. 0	-0.37 (0.18)	0.69 (0.49 - 0.97)
	5-6 vs. 0	-0.71 (0.17)	0.49 (0.35 - 0.68)
CHESS	1-2 vs. 0	-0.55 (0.07)	0.57 (0.50 - 0.66)
	3+ vs. 0	-1.19 (0.09)	0.31 (0.26 - 0.36)
DRS	1-2 vs. 0	0.22 (0.06)	1.24 (1.10 - 1.40)
	3+ vs. 0	0.33 (0.07)	1.39 (1.22 - 1.59)
Pain Scale	1-2 vs. 0	-0.18 (0.06)	0.83 (0.75 - 0.93)
	3 vs. 0	-0.69 (0.11)	0.5 (0.40 - 0.63)
ISE	2-4 vs. 0-1	0.27 (0.06)	1.31 (1.16 - 1.48)
	5-6 vs. 0-1	0.45 (0.09)	1.56 (1.31 - 1.86)
Hospital Stays	1 stay	-0.71 (0.07)	0.49 (0.43 - 0.56)
	2+ stays	-0.91 (0.10)	0.40 (0.33 - 0.49)
ER Visits	1 visit	0.12 (0.07)*	1.12 (0.98 - 1.29)
	2+ visits	-0.40 (0.16)	0.67 (0.49 - 0.91)
ADL CAP	1 vs. 0	0.86 (0.09)	2.35 (1.96 - 2.82)
	2 vs. 0	0.46 (0.07)	1.58 (1.37 - 1.81)
History of mental illness		0.48 (0.11)	1.62 (1.30 - 2.02)
ADRD		0.46 (0.06)	1.62 (1.45 - 1.82)
Parkinsons disease		0.56 (0.10)	1.81 (1.49 - 2.20)
Traumatic brain injury		0.59 (0.19)	1.79 (1.24 - 2.60)
Aphasia		0.43 (0.08)	1.53 (1.30 - 1.80)
Huntington's chorea		0.98 (0.37)	2.65 (1.22 - 5.76)
Multiple sclerosis		0.99 (0.20)	2.69 (1.81 - 3.98)
Cancer		-0.95 (0.07)	0.39 (0.34 - 0.44)
Insufficient fluid intake		-0.43 (0.10)	0.65 (0.53 - 0.78)
Fever		-0.43 (0.14)	0.65 (0.50 - 0.85)
Feeding tube		0.56 (0.09)	1.75 (1.47 - 2.07)
Weight change program		0.60 (0.09)	1.82 (1.51 - 2.18)
History of resolved ulcers		0.39 (0.11)	1.47 (1.19 - 1.82)
Trach., ventilator, respirator		0.57 (0.13)	1.77 (1.37 - 2.30)
Behaviour evaluation program		0.38 (0.12)	1.47 (1.16 - 1.85)
Oxygen therapy		-0.35 (0.07)	0.70 (0.62 -0.80)
Hospice		-0.81 (0.10)	0.44 (0.36 - 0.54)
Community skills training		-0.93 (0.13)	0.40 (0.31 - 0.51)
Primarily speaks other language		0.27 (0.09)	1.31 (1.11 -1.55)
Previously in subacute facility		0.41 (0.05)	1.51 (1.36- 1.68)
Community return desired		-0.57 (0.07)	0.57 (0.50 - 0.65)

All statistics significant to $P \leq 0.05$ unless denoted by an *
Model C statistic = 0.876

5.2.7 Multivariate Logistic Regression Model for Other Settings Subsample

Table 27 shows the results of the multivariate binary logistic regression model for inclusion in the long-stay group for patients that were discharged to the 'Other' care setting group. In this model, females were not significantly more likely than males to be long-stay patients, and age was also not a significant. The difference between patients who scored a 1-2 compared to 0 on the ADL-H scale was not significant. However, patients with ADL-H of 3-4 and 5-6 had lower odds of being long-stay patients compared to who did not require support in completing ADLs. Patients with DRS scores of 3 and greater had higher odds of being long-stay patients, although those with DRS scores of 1-2 were not significantly more likely to experience protracted discharge. Increased pressure ulcer risk, as measured by the PURS scale resulted in increased of being a long-stay patient. This effect was especially strong for patients scoring about 6 on the PURS. Increased number of ER visits in the 90 days prior to admission lowered the odds of being a long-stay patient. Diseases and conditions that increased the odds of being a long-stay patient included renal failure, Huntington's chorea, multiple sclerosis and occasional or worse bowel and bladder incontinence. Patients admitted with surgical wounds had lower odds of being long-stay patients. Patients receiving the following treatments and programs had lower odds of being long-stay patients: hospice care, community skills training and occupational therapy. Patients who expressed a desire to return to the community had lower odds of being long-stay patients. The same was true for patients who had a support person who was positive towards discharge.

Table 27: Multivariate binary logistic regression model for patients discharged to other care settings

Variable	Level	Parameter Estimate (S.E.)	Odds Ratio (95% CI)
Intercept		-1.71 (0.26)	
Female		0.07 (0.10)*	1.07 (0.88 - 1.30)
Age	65-74 vs. 0-64	0.06 (0.15)*	1.06 (0.79 - 1.43)
	75-84 vs. 0-64	-0.05 (0.14)*	0.95 (0.72 - 1.24)
	85-94 vs. 0-64	-0.07 (0.16)*	0.93 (0.68- 1.27)
	95+ vs. 0-64	-0.76 (0.53)*	0.47 (0.17- 1.34)
ADL-H	1-2 vs. 0	-0.29 (0.23)*	0.75 (0.48- 1.17)
	3-4 vs. 0	-0.96 (0.25)	0.38 (0.24 - 0.62)
	5-6 vs. 0	-0.90 (0.25)	0.41 (0.25 - 0.66)
DRS	1-2 vs. 0	0.21 (0.12)*	1.24 (0.98 - 1.56)
	3+ vs. 0	0.30 (0.13)	1.35 (1.05- 1.73)
PURS	1-2 vs. 0	0.47 (0.19)	1.59 (1.11 - 2.29)
	3 vs. 0	0.52 (0.22)	1.67 (1.08 - 2.59)
	4-5 vs. 0	0.51 (0.23)	1.67 (1.06 - 2.64)
	6+ vs. 0	1.12 (0.35)	3.05 (1.53 - 6.11)
ER Visits	1 visit	-0.65 (0.11)	0.52 (0.42 - 0.65)
	2+ visits	-0.93 (0.26)	0.39 (0.24 - 0.66)
Renal failure		0.35 (0.16)	1.42 (1.04 - 1.95)
Huntington's chorea		1.40 (0.66)	4.05 (1.12 - 14.61)
Multiple sclerosis		1.42 (0.28)	4.14 (2.39 - 7.18)
Feeding tube		1.11 (0.15)	3.04 (2.27 - 4.07)
Surgical wounds		-0.41 (0.14)	0.66 (0.50 - 0.87)
Incontinence		0.37 (0.13)	1.44 (1.12 - 1.86)
Hospice		-0.70 (0.26)	0.50 (0.30 - 0.83)
Community skills training		-1.20 (0.15)	0.30 (0.22 - 0.41)
Occupational therapy		-0.43 (0.13)	0.65 (0.51 - 0.84)
Community return desired		-0.48 (0.13)	0.62 (0.48 - 0.80)
Support person present		-0.81 (0.13)	0.44 (0.35 - 0.57)

All statistics significant to $P \leq 0.05$ unless denoted by an *
Model C statistic = 0.809

5.3 Clinical Predictors of Discharge Setting

The results of the multinomial logistic regression model predicting discharge setting based on admission characteristics are presented in Tables 28 and 29. Discharge to community care was selected as the reference setting for this analysis; therefore the odds of discharge to a given setting are presented in reference to community care.

Clinical characteristics that were strongly associated with discharge to acute care settings

compared to community care included previous stay in a psychiatric facility, schizophrenia, HIV infection, feeding tube, dialysis and IV medication. Clinical characteristics that were strongly protective against discharge to acute care settings compared to community care included desire to return to the community, presence of a support person, hospice care and community skills training.

Clinical characteristics that were strongly associated with discharge by means of expiring in the CCC facility compared to community care included previous stay in a psychiatric facility, CHESS, ALS, cancer, dialysis, oxygen therapy, radiation therapy and hospice care. Clinical characteristics that were strongly protective against discharge by expiring in the facility compared to community care included desire to return to the community, presence of a support person, quadriplegia, traumatic brain injury, hip fracture, multiple sclerosis and community skills training.

Clinical characteristics that were strongly predictive of discharge to residential care settings compared to community care included advanced age, previous stay in a psychiatric care facility, previous stay in a nursing home and schizophrenia. Clinical characteristics that were strongly protective against discharge to residential care settings compared to community care included being married, having desire to return to the community, presence of a support person, quadriplegia, hip fracture, HIV infection, treatment with IV medications,radiation therapy, suctioning, hospice care and community skills training.

Lastly, clinical characteristics that were strongly predictive of discharge to other care settings compared to community care included previous stay in a psychiatric care facility, traumatic brain injury, tracheostomy, ventilator or respirator care and feeding tube. Clinical characteristics that were strongly protective against discharge to other care settings compared to community care included return to the community, presence of a support person, quadriplegia, ALS, multiple sclerosis, HIV infection, oxygen therapy, radiation therapy, and community skills training.

Table 28: Results of nominal logistic regression analyses predicting discharge setting, parameter estimates

Variable	Acute Care	Expired in Facility	Residential Care	Other Settings
	Parameter Estimate (S.E.)	Parameter Estimate (S.E.)	Parameter Estimate (S.E.)	Parameter Estimate (S.E.)
Intercept	-0.84 (0.04)	-2.07 (0.04)	-0.97 (0.04)	-1.12 (0.05)
Demographics & History				
Age (0-64, 65-94 by 10, 95+)	-0.1 (0.01)	0.15 (0.01)	0.29 (0.01)	-0.16 (0.01)
Married	-0.05 (0.02)	-0.03 (0.02)	-0.32 (0.02)	-0.1 (0.02)
Previous stay in psychiatric facility	0.26 (0.1)	0.31 (0.1)	0.48 (0.08)	0.41 (0.11)
Previous stay in nursing home	0.01 (0.04)	0.22 (0.04)	0.56 (0.03)	0.18 (0.05)
Discharge Potential				
Community return desired	-0.59 (0.03)	-1.1 (0.03)	-0.51 (0.02)	-0.31 (0.04)
Support person present	-0.89 (0.03)	-1.44 (0.02)	-0.78 (0.02)	-0.54 (0.03)
Clinical Scales				
ADL-H	0.14 (0.01)	0.25 (0.01)	0.09 (0.01)	0.14 (0.01)
CPS	0.04 (0.01)	0.12 (0.01)	0.24 (0.01)	0.02 (0.01)
PURS	0.23 (0.01)	0.21 (0.01)	0.07 (0.01)	0.14 (0.01)
CHESS	0.01 (0.01)	0.37 (0.01)	0.07 (0.01)	-0.03 (0.01)
Diseases & Conditions				
Quadriplegia	-0.06 (0.08)	-0.5 (0.1)	-0.98 (0.13)	-0.61 (0.12)
Traumatic brain injury	0.14 (0.07)	-0.41 (0.09)	-0.06 (0.07)	0.78 (0.07)
Schizophrenia	0.29 (0.08)	-0.04 (0.1)	0.45 (0.07)	0.25 (0.1)
Hip Fracture	-0.17 (0.03)	-0.57 (0.03)	-0.29 (0.02)	0.01 (0.03)
ALS	-0.03 (0.18)	1.23 (0.16)	-0.21 (0.21)	-0.5 (0.26)
Cancer	0.18 (0.03)	1.2 (0.02)	-0.06 (0.02)	-0.14 (0.03)
Multiple sclerosis	-0.18 (0.07)	-0.39 (0.1)	-0.05 (0.08)	-0.63 (0.1)
HIV infection	0.31 (0.17)	-0.17 (0.22)	-0.68 (0.23)	-0.31 (0.24)
Treatments and Therapies				
Tracheostomy, ventilator, respiator	0.52 (0.08)	-0.03 (0.08)	-0.07 (0.1)	0.32 (0.11)

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Variable	Acute Care	Expired in Facility	Residential Care	Other Settings
	Parameter Estimate (S.E.)	Parameter Estimate (S.E.)	Parameter Estimate (S.E.)	Parameter Estimate (S.E.)
Feeding Tube	0.56 (0.04)	0.11 (0.05)	-0.23 (0.05)	0.46 (0.05)
Dialysis	1.12 (0.05)	0.59 (0.06)	0.02 (0.07)	0.01 (0.08)
IV medication	0.27 (0.03)	0 (0.03)	-0.6 (0.03)	-0.24 (0.04)
Oxygen therapy	0.07 (0.03)	0.4 (0.02)	-0.14 (0.02)	-0.4 (0.04)
Radiation	-0.09 (0.16)	0.43 (0.12)	-0.68 (0.2)	-0.28 (0.23)
Suctioning	0.07 (0.07)	0.06 (0.07)	-0.81 (0.09)	-0.17 (0.1)
Hospice Care	-0.61 (0.06)	1.01 (0.04)	-0.68 (0.05)	-0.01 (0.07)
Community skills training	-0.33 (0.02)	-1.11 (0.02)	-0.74 (0.02)	-0.36 (0.02)

Table 29: Nominal logistic regression model predicting discharge setting on admission, odds ratios

Variable	Acute Care Odds Ratio (95% CI)	Expired in Facility Odds Ratio (95% CI)	Residential Care Odds Ratio (95% CI)	Other Settings Odds Ratio (95% CI)
Demographics & History				
Age (0-64, 65-94 by 10, 95+)	0.91 (0.89 - 0.93)	1.16 (1.14 - 1.18)	1.34 (1.32 - 1.36)	0.85 (0.84 - 0.87)
Married	0.95 (0.91 - 0.99)	0.97 (0.93 - 1.01)	0.73 (0.7 - 0.75)	0.91 (0.87 - 0.95)
Previous stay in psychiatric facility	1.3 (1.06 - 1.59)	1.37 (1.12 - 1.68)	1.62 (1.39 - 1.89)	1.51 (1.22 - 1.88)
Previous stay in nursing home	1.01 (0.94 - 1.1)	1.25 (1.16 - 1.34)	1.74 (1.65 - 1.84)	1.2 (1.1 - 1.32)
Discharge Potential				
Community return desired	0.56 (0.53 - 0.59)	0.33 (0.32 - 0.35)	0.6 (0.57 - 0.63)	0.73 (0.69 - 0.79)
Support person present	0.41 (0.39 - 0.43)	0.24 (0.23 - 0.25)	0.46 (0.44 - 0.48)	0.58 (0.55 - 0.62)
Clinical Scales				
ADL-H	1.15 (1.13 - 1.17)	1.28 (1.26 - 1.3)	1.09 (1.08 - 1.1)	1.15 (1.13 - 1.17)
CPS	1.04 (1.03 - 1.05)	1.12 (1.11 - 1.14)	1.27 (1.26 - 1.28)	1.02 (1.01 - 1.04)
PURS	1.25 (1.23 - 1.27)	1.23 (1.21 - 1.25)	1.08 (1.06 - 1.09)	1.15 (1.13 - 1.17)
CHESS	1.01 (1 - 1.03)	1.45 (1.43 - 1.48)	1.08 (1.06 - 1.09)	0.97 (0.95 - 0.99)
Diseases & Conditions				
Quadriplegia	0.94 (0.8 - 1.11)	0.6 (0.49 - 0.74)	0.38 (0.29 - 0.48)	0.55 (0.43 - 0.69)
Traumatic brain injury	1.15 (1 - 1.32)	0.66 (0.56 - 0.79)	0.95 (0.83 - 1.08)	2.17 (1.9 - 2.49)
Schizophrenia	1.33 (1.13 - 1.57)	0.96 (0.8 - 1.16)	1.56 (1.36 - 1.79)	1.28 (1.07 - 1.55)
Hip Fracture	0.84 (0.8 - 0.89)	0.57 (0.53 - 0.6)	0.75 (0.71 - 0.78)	1.01 (0.95 - 1.08)
ALS	0.97 (0.68 - 1.38)	3.43 (2.52 - 4.67)	0.81 (0.54 - 1.22)	0.61 (0.36 - 1.01)
Cancer	1.19 (1.13 - 1.25)	3.32 (3.17 - 3.46)	0.95 (0.91 - 0.99)	0.87 (0.81 - 0.93)
Multiple sclerosis	0.83 (0.72 - 0.96)	0.68 (0.56 - 0.82)	0.96 (0.82 - 1.11)	0.53 (0.44 - 0.65)
HIV infection	1.36 (0.98 - 1.9)	0.84 (0.55 - 1.29)	0.51 (0.32 - 0.8)	0.74 (0.46 - 1.19)
Treatments and Therapies				
Tracheostomy, ventilator, respiator	1.68 (1.44 - 1.96)	0.97 (0.82 - 1.14)	0.93 (0.76 - 1.14)	1.37 (1.11 - 1.69)
Feeding Tube	1.76 (1.61 - 1.92)	1.11 (1.02 - 1.22)	0.8 (0.73 - 0.88)	1.58 (1.42 - 1.76)
Dialysis	3.05 (2.77 - 3.36)	1.8 (1.6 - 2.04)	1.02 (0.9 - 1.16)	1.01 (0.86 - 1.2)

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Variable	Acute Care	Expired in Facility	Residential Care	Other Settings
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
IV medication	1.31 (1.23 - 1.38)	1 (0.94 - 1.05)	0.55 (0.52 - 0.59)	0.78 (0.72 - 0.85)
Oxygen therapy	1.07 (1.02 - 1.13)	1.49 (1.42 - 1.56)	0.87 (0.83 - 0.91)	0.67 (0.62 - 0.72)
Radiation	0.91 (0.66 - 1.26)	1.53 (1.22 - 1.92)	0.5 (0.34 - 0.75)	0.75 (0.48 - 1.18)
Suctioning	1.07 (0.93 - 1.23)	1.06 (0.93 - 1.21)	0.45 (0.38 - 0.53)	0.85 (0.7 - 1.03)
Hospice Care	0.54 (0.49 - 0.6)	2.74 (2.55 - 2.94)	0.51 (0.46 - 0.56)	0.99 (0.87 - 1.13)
Community skills training	0.72 (0.69 - 0.75)	0.33 (0.32 - 0.35)	0.48 (0.46 - 0.49)	0.7 (0.67 - 0.73)

5.4 Psychometric Performance of the Q+ Algorithm

A receiver operator curve (ROC) is presented in Figure 4 to demonstrate the psychometric performance of Fries and James (2012) Q+ algorithm in this sample of Ontario CCC patients. The area under the curve (AUC) for this algorithm predicting successful community discharge in the next 90 days was 0.73. Based on the sensitivity and specificity statistics, the optimal Q+ score threshold for identifying strong candidates for community discharge is 12 and greater. At a score of 12, the corresponding sensitivity and specificity statistics are 0.67 and 0.68, respectively.

Table 30 shows the percentage of patients with Q+ index scores above and below the Q+ threshold of 12 on admission for the 'Overall' sample and the five discharge setting based subsamples. In the 'Overall' sample, a greater percentage of long-stay patients had Q+ index scores below 12 on admission. This was also true for patients belonging to the 'Acute Care' and 'Other Settings' discharge based subsamples.

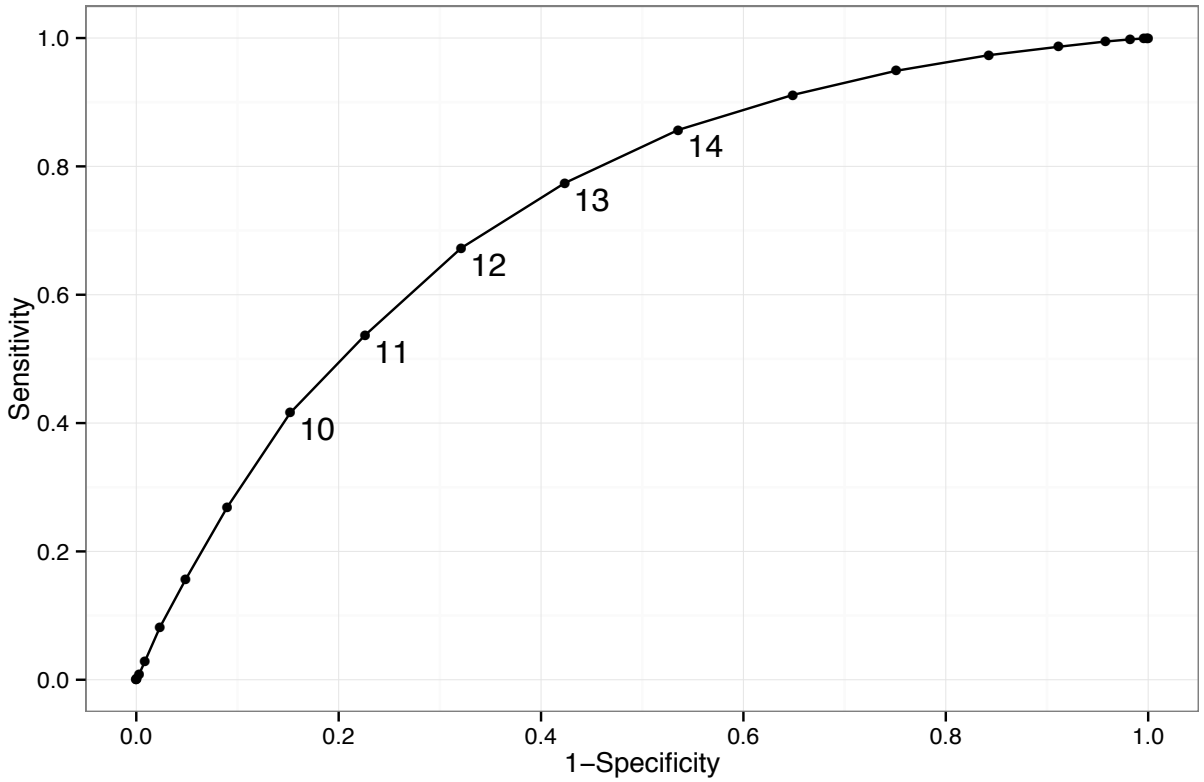

Figure 4: Receiver operating characteristic curve for the Q+ algorithm

Table 30: Percentage of patients with Q+ Index scores above and below optimal threshold by length of stay group and discharge sample for Ontario CCC patients, 2001-2013

Sample	LOS Group	Q+ <12	Q+ ≥ 12
Overall	Regular	39.5	60.5
	Long	47.6	53.5
Community	Regular	20.9	79.1
	Long	17.3	82.7
Residential Care	Regular	46.6	53.4
	Long	39.4	60.7
Acute Care	Regular	33.8	66.2
	Long	62.8	37.2
Expired in Facility	Regular	68.7	31.4
	Long	67.6	32.5
Other Settings	Regular	26.8	73.3
	Long	38.6	61.4

6 Discussion

The results of this research demonstrate that a large group of clinical characteristics operating in complex patterns across multiple discharge settings serve as barriers to access and discharge from Ontario CCC facilities. Further, using a similar set of clinical characteristics available to clinicians through an admission assessment, discharge setting can often be predicted with moderate success. Lastly, the results of this research study demonstrate that tools such as Fries and James's (2012) Q+ algorithm may be valuable to care planners in CCC settings for identifying patients that may be successfully discharged in order to initiate care planning processes and avoid potential discharge delays.

6.1 Identifying Long-Stay Patients

Literature examining length of stay in sub-acute care commonly defines long-stay patients as those with a length of stay of 90 days or greater. Ultimately, what is considered a protracted length of stay may vary based on contextual factors such as jurisdiction, availability of resources outside of the care facility, discharge setting and patient health status (Arling et al., 2011; Tan et al., 2010). Instead of selecting an arbitrary day of stay to differentiate regular and long-stay patients, this study identified long-stay patients by selecting patients in the 95th percentile for length of stay. Compared to other studies, this definition of long-stay patients is more stringent. By defining long-stay patients as those with a length of stay of 90 days or greater, Teare et al. (2004) identified 33% of patients as long-stay patients. Similarly, 29% of patients in Canadian Institute of Health Information (2006) and 32% of patients in Gassoumis et al. (2013) were long-stay patients. Although two reasonable approaches to identifying long-stay patients may have been to (1) select those patients with a length of stay of 90 days or greater or (2) select those in the top third of the length of stay distribution, the strict 95th percentile definition used in this study serves to identify those patients who are most likely to experience discharge barriers or be unable to transition without substantive intervention.

To date, studies investigating long-stay patients in sub-acute care settings have failed to differentiate patients by discharge setting. As shown in this study of Ontario CCC patients, there are large differences in the length of stay distribution for patients that are discharged to different settings (See Figure 2). For example, the median length of stay for patients discharged to residential care settings was 25 days greater than for patients that are discharged back to the community (62 vs. 37 days). These large group differences in length of stay for different discharge settings support the decision to identify long-stay patients as a proportion of patients within each discharge sample as opposed to selecting a universal length of stay cut point. Further, the decision to identify long-stay patients based upon the length of stay distribution for a given discharge setting allows care planners to apply findings from this research that are most applicable to the patient populations they serve.

6.2 Clinical Predictors of Protracted Length of Stay

Demographic and Social Characteristics

In the 'Overall' model, female patients had slightly lower odds of being long-stay patients than male patients. While some studies have shown that female patients had greater odds of prompt discharge, studies of patients with dementia, stroke and multiple sclerosis did not observe a gender effect on length of stay (Gassoumis et al., 2013; Sabbagh et al., 2003; Tan et al., 2010; Morley et al., 2012; Challis et al., 2013). While not necessarily a measure of length of stay, New et al. (2013b) found that male patients had greater odds of experiencing a discharge barrier in rehabilitation facilities. Gender was not a significant predictor of long-stay patient status in the discharge setting based models. Gender differences in the 'Overall' model are believed to be the result of differences in underlying social structure as opposed to biological differences. Marital status and community living situation were not included in this model; however it is possible that gender may be serving as a reflection of these factors.

In the 'Overall', 'Community Care' and 'Residential Care' models, all patients aged 65 years and older had lower odds of being long-stay patients. In these models, older patients tended to

have lower odds of being long-stay patients. Age was not a significant predictor of length of stay in the other models. As with gender, New et al. (2013b) found that patients aged 50 years and younger had greater odds of experiencing a discharge barrier from a rehabilitation facility. Other studies did not observe an age effect on delayed discharge (Tan et al., 2010; Challis et al., 2013). It is thought that younger patients may have greater odds of being long-stay patients as a result of a lack of long-term facility-based care settings that are oriented towards caring for younger individuals. Although advanced age is not a criteria for admission to residential care, few Ontario LTC patients are aged 65 and below (Hirdes et al., 2011).

In all multivariate models except those predicting length of stay in the 'Expired in Facility' models, the presence of a support person who is positive towards discharge is associated with lower odds of being a long-stay patient. This result is consistent with findings from several other studies. New et al. (2013b) found that discharge planning issues that were attributable to family negotiations acted a strong discharge barrier from Australian inpatient rehabilitation facilities. Gassoumis et al. (2013) found that nursing home residents with a support person who is positive towards discharged were more likely to be discharged to the community within 90 days of admission. Lastly, amongst community bound stroke patients in Singapore, the primary reason for delayed discharge cases was requests made by family for extension of stay, suggesting a lack of a support person that is positive towards discharge (Tan et al., 2010). The presence of a support person who is positive towards discharge may be an indicator of discharge readiness as it indicates that the support person believes that they are capable of providing the level of care necessary for the patient to be discharged back to the community. Patients who have not made sufficient functional gains are unlikely to have support person who is prepared to care for the individual in the community. Presence of a support person who is positive towards discharge may also indicate that the resources and supports to accommodate care for the patient in the community are available, and thus the support person feels as though they are prepared to provide care for the patient in the community.

The MDS 2.0 is limited in its ability to describe the types of caregiver support that would be available to the patient in a community setting. Marital status and living situation were not strong enough factors to be included in the multivariate models. However, at the bivariate model level,

married patients had greater odds of being long-stay patients if they belonged to the 'Residential Care' model. It is believed that patients with spouses may delay discharge to residential care with the hopes of returning back to the community to reside with their spouse. Patients that lived alone prior to entry had greater odds of being long-stay patients in the 'Overall' and 'Community Care' models, likely as a result of a lack of community based support person such as spouse or family member. In the literature, married patients had greater odds of community discharge (Thomas et al., 2010; Gassoumis et al., 2013).

Patients who desired to return to the community also had lower odds of being long-stay patients in the 'Overall', 'Community', 'LTC', 'Expired in Facility' and 'Other' discharge groups. This finding was also observed by Gassoumis et al. (2013) and Thomas et al. (2010) amongst nursing home patients. In the 'Overall' sample, an interaction effect was observed between 'desire to return to the community' and 'availability of a support person'. Patients who desired to return to the community and had a support person who was positive towards discharge had the lowest odds of being a long-stay patient. Wodchis et al. (2005) found a similar effect amongst stroke patients admitted to SNFs wherein those with both support and a desire to return to the community had better discharge prognosis on admission. In part, desire to return to the community may be a form of self-appraisal. Patients with a positive outlook and who have caregiver support may be more motivated to achieve outcomes and achieve successful discharge from the CCC facility.

Patients belonging to the 'Residential Care', and 'Expired in Facility' discharge samples whose primary language was not English of French had greater odds of being long-stay patients. For patients whose primary language is one other than that commonly spoken in a given geographic region, language is hypothesized to act as an admission barrier. Unfortunately, in the literature review, articles where language was an admission or discharge barrier were not found; however, Tan et al. (2010) did find that ethnicity was not associated with delayed discharge. It is important to note that this study conducted by Tan et al. (2010) was conducted in Singapore and may not be generalizable to this Canadian context. Ethnicity was not included as potential predictor in this research study. It is unclear why patients whose primary language is one other than English or French would have greater odds of being long-stay patients if they are discharged by expired in the

CCC facility. However, for patients discharged to residential care, patients of other ethnic origins may be waiting for place in a culture specific facility. More broadly speaking, formal care providers of patients whose primary language is not English of French may have difficulty recognizing and responding to care needs. This may result in poorer care outcomes or delays in organizing services and supports.

Patients with greater social engagement, as measured by greater scores on the ISE, had greater odds of being long-patients in the 'Overall' and 'Expired in Facility' multivariate models. In patients with dementia residing in residential care and assisted living facilities, lower social engagement is associated with cognitive impairment, behavioural symptoms, depression and ADL impairment. Increased social engagement in this population was also associated with greater family involvement including social engagement with the resident and participation in assessing the resident's care preferences (Dobbs et al., 2005). Kiely et al. (2000) and Kiely and Flacker (2003) have shown that increased social engagement amongst long-stay nursing home residents is associated with longer survival rates after adjusting for factors known to be associated with mortality. In part, this may explain why patients belonging to discharge samples where separation is attributable to poor health outcomes and mortality have greater odds of being long-stay patients as these patients are likely to experience prolonged time to mortality.

Activities of Daily Living

In the 'Overall Sample' and for patients that belonged to the 'Residential Care' and 'Community Care' discharge setting samples, patients with lower capacity to complete ADLs had greater odds of being long-stay patients. However, for those belonging to the 'Expired in Facility' and 'Other' discharge samples, lower ADL capacity was associated with lower odds of being long-stay patients. This difference in the effect of ADL capacity on length of stay for different discharge settings may be attributable to patient health status. For patients that are medically stable enough to be discharged back to community or residential care, functional impairment appears to act as a barrier to discharge as community bound patients returning to the community are likely to re-

quire supports and services. Organizing and implementing these supports and services may delay discharge (Challis et al., 2013). Conversely, patients that expire in the facility are likely to be more clinically complex or unstable. It is hypothesized that these patients are likely to experience accelerated mortality. Increased functional impairment in these patients is likely a reflection of their clinical complexity reducing the odds of being a long-stay patient.Hirdes et al. (2003a) have illustrated this point by finding that that ADL dependency is also predictive of mortality after controlling for clinical instability, as measured by CHESS.

Clinical Complexity

Clinical complexity, as measured by the CHESS scale is an important clinical predictor for inclusion in the long-stay patient group in nearly all of the multivariate models in this study. In all models where the CHESS scale is included, higher CHESS scores are associated with lower odds of being a long-stay patient. For patients belonging to the 'Acute Care' and 'Expired in Facility', the explanation follows that of the ADL-H scale, whereby increased clinical complexity results in accelerated time to separation as a result of death or the need for care in a higher acuity care setting (Lee et al., 2009; Hirdes et al., 2003a, 2014)

Pain

In the 'Expired in Facility' multivariate models, increased pain was negatively associated with inclusion in the long-stay patient group. These results mirror those found by Yoo et al. (2013) where pain was negatively associated with remaining in SNFs for more than 90 days. Although the Pain scale was negatively associated with inclusion in the long-stay patient group for all samples at the bivariate level, the effect was only strong enough for inclusion in the 'Expired in Facility' multivariate model. These cases may reflect the progression or severity of underlying illness leading to death. Caution should be taken when comparing results with Yoo et al. (2013) as this study only included SNF patients who expressed a desire to return to the community yet had poor participation in therapy sessions and were therefore at risk of remaining in the facility for extended periods of

time. Yoo et al. (2013) hypothesize that pain's negative association with length of stay is explained by therapy-related pain thereby reducing length of stay as a result of positive outcomes achieved through rehabilitation therapy. Interestingly, at the bivariate level, physical therapy is positively associated with inclusion in the long-stay group for in the 'Acute Care' sample, but negatively associated with inclusion in long-stay for all other samples.

Aggression

In this study, the presence of aggressive behaviours was associated with increased odds of being a long-stay patient in the 'Overall Sample', 'Residential Care' and 'Community' multivariate models. Although Challis et al. (2013) measured delayed discharge as opposed to protracted length of stay, they found that behavioural issues were significantly associated with delayed discharge from hospital. Further, Sabbagh et al. (2003) found that dementia patients receiving care in SNFs had a significantly longer length of stay compared to those without dementia, likely as a result of behavioural issues as opposed to physical impairment or medical needs. For patients that were discharged to residential care settings, the presence of aggressive behaviours may serve as an access barrier as patients with aggressive behaviours in residential care settings are resource intensive, a source of unit disruption and contribute to staff burnout (Evers et al., 2002; Perlman and Hirdes, 2008).

Mental Health

Several patient characteristics and therapies related to mental illness were significant predictors of long-stay patient status in this study. For patients in the 'LTC' and 'Expired in Facility' samples, a history of mental illness was associated with inclusion in the long-stay patient group. Psychological therapy was predictive of long-stay patient status for those in the 'Overall', 'LTC' and 'Acute Care' samples. Mental health evaluation was predictive of being a long-stay patient in the 'Community' sample. For 'Acute Care' patients, a previous stay in a psychiatric facility was associated long-stay patient status. Lastly, patients with a schizophrenia diagnosis on admission had

greater odds of being long-stay patient in the 'Overall' multivariate model. Taken together, these findings suggest that previous or current psychiatric disorder is predictive of prolonged length of stay in CCC facilities. Gassoumis et al. (2013) found that nursing home patients with a psychiatric disorder were more likely to be long-stay patients. Similar results were found for elderly patients discharged from hospital (Challis et al., 2013).

Although depression was not a strong predictor of length of stay in the 'Overall Sample', 'Residential Care' and 'Community Care' multivariate models, it serves as a predictor for patients belonging to the 'Expired in Facility' and 'Other' discharge samples. In these samples, patients demonstrating greater symptom severity associated with mood disorders and depression had greater odds of being long-stay patients. These results follow those reported by the Canadian Institute of Health Information (2006) whereby a greater proportion of CCC patients with a protracted length of stay had a DRS score of 3 and greater, suggesting the presence of a mood disorder. Although it was not included in the 'Community' discharge sample model, in the bivariate logistic regression DRS was positively associated with inclusion in the long-stay patient group. This finding mirrored results by Gassoumis et al. (2013) and Yoo et al. (2013) who found that depression was associated with decreased odds of community discharge within 90 days of admission.

Neurological Conditions

The majority of diseases that are strongly predictive of length of stay in Ontario CCC facilities are neurological conditions including: traumatic brain injury, multiple sclerosis, Huntington's chorea, aphasia, stroke, ADRD, Parkinson's, quadriplegia, and hemiplegia/hemiparesis. After controlling for demographic and clinical characteristics, inpatient rehabilitation patients with neurological conditions were found to have longer length of than those receiving musculoskeletal rehabilitation (Morley et al., 2012).

For patients belonging to the 'Overall', 'Acute Care' and 'Expired in Facility' samples, an ADRD diagnosis was strongly predictive of protracted length of stay. In accordance with other studies, SNF patients admitted with ADRD had dramatically longer mean lengths of stay compared

to those without an ADRD diagnosis (Sabbagh et al., 2003). ADRD was also associated with a longer length of stay in nursing home settings and reduced odds of community discharge within 90 days of admission (Gassoumis et al., 2013; Arling et al., 2010).

Stroke was predictive of protracted length of stay in the 'Community' discharge sample. Tourangeau et al. (2011) found that the mean length of stay for stroke patients residing in Ontario CCC facilities was 25 days longer for patients discharged to community settings compared to residential care facilities. SNF stroke patients that were discharged to the community most frequently had a discharge prognosis of less than 30 days (Wodchis et al., 2005).

Patients belonging to the 'LTC', 'Community', and 'Expired in Facility' had greater odds of being long-stay patients if admitted with a traumatic brain injury diagnosis. Compared to patients admitted to inpatient rehabilitation facilities for stroke and musculoskeletal rehabilitation, traumatic brain injury patients had both the longest mean length of stay and the greatest number of acute medical events per patient (Lew et al., 2002). Delayed discharge from inpatient rehabilitation beds occurred frequently for patients with brain injury; most commonly due to a lack of suitable placement or inadequate funding for post discharge support (Worthington and Oldham, 2006).

Multiple sclerosis was predictive of belonging to the long-stay patient group in the 'Overall', 'Acute Care', 'Expired in Facility' and 'Other' discharge groups. Mean length of stay for multiple sclerosis patients in a neurological rehabilitation unit was nearly two times greater for wheelchair bound patients compared to ambulatory patients (Gaber et al., 2012). Controlling for demographic and clinical characteristics, multiple sclerosis Medicare beneficiaries had a 0.4 day longer inpatient rehabilitation length of stay compared to all other beneficiaries (Morley et al., 2012).

Cognition, measured by the CPS, was excluded from the multivariate logistic regression models in favour of several neurological conditions to avoid multicollinearity between variables. Disease trajectories, including rate and severity of decline in cognition, vary between neurological conditions. Including several neurological conditions in the multivariate logistic regression models allows these differences in disease trajectories to be accounted for. This would not be possible using a single measure of cognition.

Skin Conditions

Across the multivariate regression models, the presence of pressure ulcer related clinical characteristics such as a history of resolved pressure ulcers, stage 3+ pressure ulcers, and PURS scores greater than 0 were associated with increased odds of being a long-stay CCC patient. The presence of open lesions other than ulcers, rashes and cuts, and surgical wounds were negatively associated with being a long-stay patient in the 'Community' and 'Other' models, respectively.

Presence of a stage 3 or greater pressure on admission was predictive of length of stay in the 'Community' and 'LTC' multivariate models. Previous studies have shown that patients with pressure ulcers admitted to rehabilitation facilities have been shown to have a longer length of stay and less likely to be discharged to community care settings (Wang et al., 2014; Safaz et al., 2008).

PURS scores greater than 0 were predictive of belonging to the long-stay patient group in the 'Overall', 'Community' and 'Other' multivariate models. Given that this study used admission characteristics as predictors of length of stay, although patients in these samples may not have a pressure ulcer at assessment, those with high PURS scores have strong odds of developing a pressure ulcer during the episode of care (Poss et al., 2010).

For patients in the 'Expired in Facility' multivariate model, a history pressure ulcers, where the pressure ulcer was resolved or cured within 90 days of admission, was associated with increased odds of being a long-stay patient. A history of pressure ulcers has been shown to be a risk factor for pressure ulcers (Poss et al., 2010; Allman, 1995).

In Ontario continuing care facilities a strong focus is placed on quality, especially with the recent introduction of publicly reported quality improvement measures and facility bench marking. From the perspective of adjacent care settings, administrators may be cautious to admit patients with a current or past pressure ulcer in fear of the impact it may have upon their facilities quality measures. It is in this regard that pressure ulcers and pressure ulcer risk may act as discharge barriers. Pressure ulcers may also be a proxy for clinically complexity, again acting as potential discharge barrier.

Treatments and Programs

In nearly all samples, presence of a feeding tube and administration of a planned weight change program were strongly associated with higher odds of being long-stay patients. Malnourishment is a common concern for patients in sub-acute care facilities as a result of stress from hospitalization, cognitive impairment and physical conditions such as a dysphagia or poor motor control. While there is some debate surrounding the ethics of feeding tube use in late-stage dementia, malnourishment is associated with increased risk of pressure ulcers as well as poorer rehabilitation outcomes, complications and mortality (James et al., 2005; Banks et al., 2010; Jaul, 2010). Finestone et al. (1996) found that stroke patients admitted to inpatient rehabilitation facilities with malnutrition or a feeding tube had a longer mean length of stay. Similarly, James et al. (2005) found that patients affected by severe stroke, as measured by Case Mix Group (CMG), on tube feeding for part of their rehabilitation episode of care had a longer mean length of stay. Interestingly, those who were fed by feeding tube for their complete episode of care and were discharged with a feeding tube had nearly the same length of stay as those without feeding tube (James et al., 2005). Although it may be thought that the use of feeding tubes with CCC patients prolongs length of stay by keeping those that are most impaired alive, Teno et al. (2012) have found that use of feeding tube was not associated with increased survival in nursing home residents. It is important to note that studies evaluating the impact of feeding tubes on length of stay in Ontario were not found and that the results of studies conducted in other settings may not be generalizable as a result of regulations in adjacent care settings.

Administration of therapies and treatments related to ventilation including tracheostomy, ventilator or respirator, and respiratory therapy were predictive of inclusion in the long-stay patient group. The proportion of patients in Ontario continuing care facilities requiring ventilator or respirator support is small. Only 0.2% of LTC patients and 1.3% of CCC patients required ventilator or respirator support (Hirdes et al., 2011). A survey of long-term ventilator patients in Ontario found that 62% of invasively ventilated patients received care in hospital based settings (Toronto Central Local Health Integration Network, 2008). The majority Chronic Assisted Ventilator Care

(CAVC) units provide care for ventilator-assisted individuals requiring complex medical care for whom community based care is either unavailable or unfeasible. In Ontario, CAVC beds are typically situated within CCC facilities. As of 2008, a total of six CCC facilities across the province offered CAVC services. While Community Care Access Centre (CCAC) provided services are available to mechanically ventilated patients, home based care remains challenging as the number of caregiver hours averages 11.4 hours each day (Toronto Central Local Health Integration Network, 2006). Under the RUG-III patients classification system, patients receiving tracheostomy and ventilator/respirator care are classified as *Extensive Services* patients. Interestingly, Arling et al. (2011) found that nursing home residents classified as *Extensive Services* patients had greater odds of returning to the community within 90 days admission.

End of life hospice care for terminally ill patients requiring palliation is frequently delivered in CCC facilities in Ontario. In the sample used in this study, 12% of patients received hospice care on admission. Overall, provision of hospice care was protective against inclusion in the long-stay patient group. Further, conditions such as a fever and insufficient fluid intake and acute condition monitoring were protective against inclusion in the long-stay patient group. Ontario CCC patients with advanced illness typically have very short lengths of stay. Using the CHESS scale to identify those CCC patients with advance illness, Gruneir et al. (2005) found that 83% of patients had a length of stay of less than 2 weeks. Episodes of care of less than 14 days were removed from the sample in this research because not all patients with a length of stay of that duration received an MDS 2.0 assessment, it is likely that this study failed to capture a substantial number of patients with advanced illness who would be typical hospice care patients. Gruneir et al. (2005) found that cancer patients were vastly more likely than other patient groups to be within the last 6 months of life. Further, cancer patients had very strong odds of receiving hospice care while in CCC. For patients in this study who belonged to the 'Overall'. 'Acute Care' and 'Expired in Facility' discharge samples, cancer diagnosis was protective against inclusion in the long-stay patient group. Arling et al. (2011) and Gassoumis et al. (2013) found similar results as nursing home patients with cancer had greater odds of returning to the community within 90 days of admission. Amongst patients receiving hospice care in US nursing homes, the largest proportion of patients deceased in

facility had been diagnosed with cancer, followed by heart disease, respiratory diseases and ADRD (Han et al., 2008). Compared to home hospice patients, the proportion of patients with ADRD, heart and respiratory diseases was substantially greater in nursing home based hospice care (Han et al., 2008). Further analysis of long-stay patients should look to compare mortality rates for Ontario CCC patients with a primary diagnosis other than cancer. Unlike Ontario CCC patients, 75% of hospice care nursing home patients had a projected length of stay of 90 days and greater (Buchanan et al., 2002). Miller et al. (2010) found that nearly a third of nursing home based hospice stays were seven days or less and that 16% of were over 181 days.

Provision of community skills training such as medication management, housework, shopping, use of transportation and activities of daily living was protective against inclusion in the long-stay patient group in all multivariate models except for patients belonging to the 'Community' and 'Residential Care' models. Although length of stay group differences in the percentage of patients receiving community skills training in these subsamples were significant, a large percentage of patients in both length of stay groups received community skills training. Amongst nursing home patients, community skills training was associated with community discharge within 90 days of admission (Gassoumis et al., 2013).

6.3 Predicting Discharge Destination on Admission

The results of the nominal logistic regression predicting discharge setting on admission indicate that a small set of clinical characteristics collected on admission may be used to predict discharge destination from an Ontario CCC facility. The intent of this analysis was to provide clinicians and discharge planners with the capacity to predict a patient's likely discharge destination upon hospitalization. Doing so may enable discharge planners to anticipate potential discharge barriers associated with particular discharge settings early in the episode and circumvent a potential delayed discharged.

The results of this analysis mirror those of Arling et al. (2000) and Wodchis et al. (2004) who conducted similar analyses for nursing home and skilled nursing facilities residents. A lack of

cognitive impairment was associated with discharge to community care settings. Wodchis et al. (2004) separated cognitive impairment into two independent variables, impaired (CPS 2-4) and totally dependent (CPS 5-6). Doing so reveals that patients who are totally cognitively dependent have greater odds of death within the facility than those with impaired cognition. CPS was treated as continuous variable in this portion of the research study and therefore differences the effect of particular levels of impairment were not considered. Conditions associated with cognitive impairment, including ADRD and traumatic brain injury, were generally protective against discharge to the community (Wodchis et al., 2004). ADRD patients had the best odds of discharge to residential care settings (Wodchis et al., 2004). Traumatic brain injury was strongly associated to discharge to the 'Other' discharge setting group likely as a result of patients discharged to neurological rehabilitation facilities. Patients with ADL impairment had the greatest risk of separation by expiration in facility followed by hospital (Arling et al., 2000; Wodchis et al., 2004).

Provision of advanced medical treatments such as oxygen therapy, dialysis, suctioning and IV medication were all associated with increased odds of discharge to an acute care hospital or death within the CCC facility. While few of these interventions were present in similar adjusted models found in the literature, oxygen therapy was associated increased odds of discharge to hospital and mortality within the facility (Wodchis et al., 2004). Arling et al. (2000) found that patients with emphysema, asthma or COPD had strong odds of dying in the facility. Given that many patients at the end of life who are affected by pulmonary diseases (e.g., emphysema or COPD) receive oxygen therapy, it is reasonable to think that provision of oxygen therapy may be acting as confounding factor for end-stage pulmonary disease in these analyses. Future studies should attempt to differentiate the effect of these two factors on discharge setting.

Treatments such as tracheostomy, ventilator or respirator and feeding tube were associated with the greatest odds of discharge to acute care facilities and "other" care settings. As previously discussed, patients with ventilation needs require extensive medical equipment, staff expertise and a substantive number of caregiver hours each day (Toronto Central Local Health Integration Network, 2006). These attributes may preclude patients with ventilation needs from admission to residential care facilities or discharge to community care. Stephens et al. (2014) found that 25% of nursing

home residents with feeding tubes required ED visit or hospitalization over the course of one year. This same study found that nearly a third of nursing home residents were comatose and that 42% of residents were dependent in all ADLs including eating, bathing, toileting, transferring and dressing (Stephens et al., 2014). Although feeding tubes may be managed successfully in community care settings and result in improved outcomes including reduced length of stay, hospital admissions and incidence of infections, those with poor ADL capacity have been shown to have reduced odds of community and residential care discharge (Klek et al., 2014; Wodchis et al., 2004).

As expected, cancer and hospice care were strongly associated with expiring in facility. Interestingly, amongst CCC patients, hospice patients had greater odds of returning to community care over acute and residential care facilities. This may be explained by patients who choose to return to the community to die at home. Han et al. (2007) found that amongst palliative care patients, younger, married patients, those with better cognitive and functional ability, and whose preference it was to return to the community, were more likely to return back to the community. Similarly, the results of this research study found those who desired to return to the community had the greatest odds of doing so.

Arling et al. (2011) found that extrinsic factors such as nearby LTC facility occupancy rates, population density and the availability of home care based supports had an effect on community and residential care discharge rates. The present analysis that was completed did not consider these facility and regional factors. Doing so may add valuable information to the model to improve the classification error rate, especially for patients discharged to residential care.

6.4 Q+ Algorithm

In this setting of Ontario CCC patients, Fries and James's (2012) Q+ algorithm performed well in identifying patients that are candidates for successful community discharge within the next 90 days. Q+ was originally created to identify long-stay nursing home residents suitable for discharge. Thus, it is only derived for those residents with a length of stay of 90 days and greater. Given that many CCC patients have a substantially shorter episode of care than nursing home

patients, for the purposes of this research study this stipulation was removed. Fries and James (2012) identified a Q+ score of 14 as the optimal threshold for identifying discharge candidates. A score of 12 was found to be the optimal threshold amongst CCC patients. This difference is largely a function of shorter episodes of care, as the bulk of CCC patients would not be eligible to receive two additional points towards their Q+ index score for a long length of stay. Regardless, Q+ appears to function well in this CCC patient population.

Although the Q+ algorithm is not yet available to CCC discharge planners as part of the standard set of interRAI approved MDS 2.0 outcome measures, the potential benefit to those responsible for organizing patient care in sub-acute care settings and adjacent settings is large. While those discharged to the community are less likely to experience discharge delays, many of the discharge planning issues surrounding community discharges are attributable to family negotiations, home modifications and organizing community based care (New et al., 2013b; Tan et al., 2010; Challis et al., 2013). For patients with strong discharge potential on admission, initiating discharge planning soon after admission may prevent some of these common discharge barriers. On the other hand, for patients whose discharge prognosis on admission is less certain, tools such as the Q+ algorithm may serve to identify those patients that would be strong candidates for community discharge on admission and alert discharge planners of longer-stay patients who have recently gained sufficient capacity to be eligible for community discharge within the next 90 days. In the context of Ontario CCC facilities, Q+ may be used as a signal to Community Care Access Centres (CCAC) to commence organizing community based care.

Future efforts should evaluate the Q+ index's ability to identify community-bound long-stay ALC patients that are prepared for discharge and investigate the feasibility of using this algorithm as means of prioritizing ALC patient discharge planning.

6.5 Strengths

To date, research investigating discharge barriers and predictors of length of stay of stay in Ontario CCC facilities has not been completed. Compared to other settings along the continuum

of care, CCC facilities in Ontario are relatively understudied. However, as previously discussed, optimizing patient flow requires a systems-level approach. Systems-level research is challenging given the poor availability of connected health databases fit for research. However, through the use of a province-wide administrative health database, this study approaches a system-level analyses of CCC, including limited information on the care patients have received in adjacent care settings. As the first study to consider CCC discharge barriers and predictors of length of stay, this research serves as valuable source of information to care planners in this sector.

While other studies have investigated factors associated with discharge outcomes for patients in sub-acute care settings located in other jurisdictions, this study is among the first to give consideration for the impact of discharge destination on both length of stay and discharge barriers. By differentiating patients by their eventual discharge destination, this study compares patients with similar discharge potential. For example, in this study, patients that expired in the CCC facility showed a vastly different clinical profile than those that were discharged to community or residential care settings. Further, given that the distribution of length of stay differs by discharge setting, studies that identify long-stay patients based on the overall sample distribution may fail to identify patients that are long-stay for a particular discharge destination. This study provides an illustration of this, as long-stay patients in the overall samples were those with a length of stay of 327 days or greater; however, long-stay community bound patients were those with length of stay of 149 days and greater. It should be acknowledged that discharge destination may largely be dependent on patient outcomes during the episode of care, and as demonstrated by the multinomial model predicting discharge destination, may be difficult to predict on admission. Future studies should consider discharge prognosis on admission as a means of grouping patients for comparisons.

6.6 Limitations

While this study has many strengths as a source of evidence for decision making in CCC, some limitations should be noted.

Many of the initiatives key provincial health care stakeholders are undertaking at this time

are focused on the reducing both the number of ALC patients and the proportion of total patient days that ALC patients consume in Ontario hospitals. At this time, ALC patient information is not available in the CCRS data repository. This study focused on identifying those patients that consume the greatest number of patient days and who were believed to be most likely to experience discharge barriers from CCC facilities. This approach was employed as it was believed that a large proportion of these long-stay patients are also ALC patients. While authors such as Mor et al. (2007) and Ikegami et al. (1997) have used resource intensity measures to identify "low-care" cases, without data linkages to ALC data sources, identifying patients that would best be cared for in a more appropriate setting is challenging. One way this research project attempted to circumvent this limitation was to differentiate long-stay patients that were discharged to lower acuity care settings such as community or residential care from those that expired in the CCC facility. It is presumed that for patients that expire within the facility that the CCC was the most appropriate setting for their medical needs. Future studies should focus on identifying the clinical characteristics and discharge barriers associated with ALC patient status.

Another limitation of this research study is the lack of consideration for the impact of geographic region on predictors of length of stay. As highlighted by Arling et al. (2011), market factors (e.g., population density and proximity to community based supports) can have an impact on rates of discharge and adjacent care setting admission rates. Geographically, Ontario is a diverse province with large urban centres surrounded by sparse rural land. It is reasonable to think that patients located in the most populated LHINs may experience a different set of discharge barriers than those in less populated areas. While stratifying these analyses by each of Ontario's 14 LHINs may be a significant undertaking, differentiating urban from rural facilities may be sufficient to observe the effect of facility location and proximity to other services has on length of stay. Those responsible for organizing continuing care services in their region are encouraged to consider the impact of market factors on patient flow in their respective jurisdiction. Further, intrinsic facility factors such as the number of patient beds, patient bed types, program offerings, case-mix, occupancy and staffing were not considered in this research project. Again, Arling et al. (2011) has shown that these factors may have an impact on patient transitions.

This research study used twelve years of MDS 2.0 assessment data as the primary source of patient information. Although the decision to include this large quantity of historical data was made to ensure that the sample size would be large enough to conduct analyses on the rare event of interest, the great number of years that this data spans may also be a limitation of this study. When interpreting health services research it's important to consider the context of the research and how it may differ from the specific context you are working within. By including a large amount of historical data in this sample this research fails to consider temporal changes, such as the types of services offered in CCC facilities, the availability of care in adjacent care settings, and how these factors may have changed over time. This is a particularly important for research that is intended to serve as a source of evidence for care planners and system administrators that will be acting with the intentions of reducing CCC patient days in the future. Future research in this area should limit the sample to assessments from the most recent years to ensure that the results reflect the state of the system as it is today. For similar reasons, policy makers in other Canadian provinces and other countries worldwide should take caution when considering the generalizability of these results to their own jurisdiction, as the results of this research are a reflection of Ontario between the years 2001 and 2013 and contextual factors in other jurisdictions may not operate in the same fashion. With that mind, it is still believed that many of the patient attributes that are predictive of protracted length of stay, such as ADL impairment and aggressive behaviour, operate independently of contextual factors.

Although the purpose of this research study was to identify admission characteristics that were associated with protracted length of stay, the results of this research study may have be strengthened had the analyses also considered change in health status over time. Given that CCC patients are assessed using the MDS 2.0 assessment on 90 day intervals, the CCRS data repository includes multiple longitudinal assessments for a large portion of patients. As shown by Banaszak-Holl et al. (2011), over the course of an episode of care, different patient groups have been shown to have distinct trajectories of change in common domains of health and well-being. Making use of additional assessments would allow analyses of this type to be conducted, enabling discharge planners to anticipate the length of stay of patients based on both their clinical characteristics

on admission and their trajectory of clinical change. While this research project has laid the groundwork for these analysis, knowledge of more advanced analytic techniques are required.

6.7 Implications

The identification of clinical characteristics and discharge barriers associated with protracted length of stay are expected to contribute to care and discharge planning for both patients in CCC facilities and those receiving similar levels of care in other settings along the continuum of care, such as in-patient rehabilitation. The findings of this research highlight several patient characteristics associated with protracted length of stay such as mental illness, neurological diseases conditions, aggressive behaviours and the availability of supportive caregivers in the community. It also highlights several necessary therapies and treatments that act as discharge barriers from CCC including ventilation therapies and tube feeding. Knowledge of these factors associated with protracted CCC discharge provides discharge planners with the capacity to anticipate potential delayed discharges and intervene before patients are designated ALC.

The results of this research study paint a complex picture with respect to the number of clinical factors that are associated with delayed discharge and the specific impact of these clinical factors on certain patient groups. For example, pressure ulcer risk was associated with increased odds of delayed discharge in all discharge setting based subsamples except for those discharged to acute care, where it was associated with lower odds of delayed discharge. This research project has demonstrated the delayed discharge is multifactorial and that predictors of delayed discharge are rooted in a large number of health domains. For patients receiving care in CCC facilities, a comprehensive clinical assessment such as the MDS 2.0 is required to gather sufficient information to make care planning decisions, including discharge planning. Although a large proportion of the care that is offered in Ontario CCC facilities is rehabilitative in nature, CCC patients have complex clinical needs that may only be addressed through a comprehensive clinical assessment focused on decision-support (Hirdes et al., 2011).

Broadly speaking, length of stay group differences were greater for process oriented clinical

characteristics such as provision of treatments and therapies as opposed to patient attributes such as ADL capacity or health conditions. This indicates that the availability of services in adjacent care settings such as home and residential care play a role in CCC patient flow. From a policy perspective, this suggests that in order to achieve a reduction in the number of delayed discharges or ALC patient days in CCC, it is necessary that adjacent care settings gain the capacity to care for patients with specialized therapy and treatments needs such as feeding tubes, ventilators and respirators.

In addition to identifying factors associated with protracted lengths of stay, this research project also demonstrates that "low-care" cases, such as those in the least intensive RUG-III groups (Impaired Cognition, Behaviour Problem and Reduced Physical Function) account for a small percentage of both the long-stay patient groups and CCC patients as a whole (Ikegami et al., 1997; Mor et al., 2007). This finding is consistent with the recommendations of the HSRC, which broadly defined those patients in the upper RUG-III groups as CCC patients, and reinforces that delayed discharges are not the result of poor placement patterns along the continuum of care (Ontario Health Services Restructuring Commission, 1998).

Today, the Q+ index has value in identifying long-stay CCC that would be strong candidates for discharge to the community. This tool should be used by facility administrators to focus discharge planing efforts on those patients that are prepared to be discharged to the community. The potential advantages Q+ may bring to CCC discharge planners have already been discussed (see section 6.4); however, Q+ also serves as a broader illustration of the potential for discharge planning decision-support algorithms and the role they may have in continuing-care settings. Given the large degree of attention that ALC patient days are presently receiving amongst system planners and stakeholders, discharge planning tools with the purpose of reducing barriers and preventing delayed discharges should be considered as worthwhile additions to the MDS 2.0 assessment. It is hypothesized that many of the non-process oriented variables such as behaviour, social engagement, ADL impairment and availability of caregiver support may also serve as predictors of length of stay in other care settings. Future efforts should evaluate the impact of these clinical characteristics on ALC patient days in other settings to investigate the feasibility of developing cross-setting decision

support tools that are able to predict ALC patient status.

In addition to discharge decision-support tools, the results of this research may also be used as quality improvement measures in CCC facilities. The results of the multivariate binary logistic regression models may serve as the foundation for risk-adjusted discharge planning benchmarks. This would allow system administrators to compare facilities based on their discharge planning effectiveness while taking into consideration hard to place patients residing in the facility. The results of risk-adjusted bench marking could potentially be added to the current offering of publicly reported performance measures, providing additional incentive to reduce ALC patient days. As previously discussed (see section 6.6), market factors may have an impact on patient transitions. Prior to the development of the facility bench marking measures, an evaluation of the market factors that affect CCC transitions should also be conducted. It is critical that facility bench marking also take into account market factors such as residential care facility proximity and occupancy to ensure that facilities can be compared fairly.

6.8 Future Directions

As briefly discussed, this study investigated prolonged lengths of stay in CCC facilities as it was thought to be related to ALC patient status in the absence of ALC data(see section 6.6). With the assistance of health organizations in the province, efforts to link ALC patient data to CCRS records are underway and future studies will look to use these new linked data sources to identify clinical predictors of ALC patient status amongst CCC patients. Similar studies are currently underway to identify clinical predictors of ALC patient status in psychiatric care facilities. Future studies should also make comparisons between this CCC based research and studies of mental health patients to identify common discharge barriers, predictors of prolonged length of stay and ALC patient status.

Research evaluating predictors of length of stay and discharge barriers in other jurisdictions across Canada, the United States and internationally should also be considered. Studies that consider multiple jurisdictions may be used to isolate universal patient attributes that serve as

predictors of length of stay from regional factors. Doing so may highlight a group of clinical attributes that can be used in risk-adjusted quality measures that control for regional variation and serve as fair method of bench marking facilities in their ability to prevent delayed discharges.

It is hoped that this research will serve as the first step towards developing an algorithm to identify probable long-stay patients in subacute care. As touched upon earlier, additional research considering the effect of facility and regional variations on discharge barriers are necessary. Further, research that replicates the analyses completed in this study for other care settings and countries is necessary to develop an algorithm that is suitable for use with a variety of interRAI instruments in care settings around the world. Additional research investigating the needs of discharge planners and the ways a decision-support algorithm may augment their ability to organize care and services would also provide useful information in developing the algorithm.

This research only considered admission characteristics when completing analyses; however, CCRS is a longitudinal data set with multiple assessment records for each patient that receives care for over 90 days. Future research should take advantage of this rich source of patient data to complete research that considers trajectories of change and the effect of time dependent covariates on delayed discharge and ALC patient status. The results of this research may serve as starting point for these studies requiring more sophisticated research methodologies as it greatly reduced the number of clinical characteristics to consider.

Lastly, the results of this research study may be used to identify a series of clinical interventions that may be implemented to reduce the number of delayed discharges and ALC patient days in Ontario CCC facilities and similar care settings. Researchers interested in conducting outcome oriented research (e.g., randomized clinical trials) should consider testing the effect of interventions aimed at modifying clinical characteristics that are associated with delayed discharge. Examples may include interventions aimed at reducing the incidence of pressure ulcers or programs for patients lacking community based support.

7 Conclusion

Overall, the results of this research indicate that a number of patient attributes and process variables serve as both predictors of length of stay and discharge barriers from CCC facilities. Although the manner in which these variables operate is complex and the length of time associated with delayed discharge differs by discharge setting; a set of common clinical characteristics are associated with delayed CCC discharge. Examples include feeding tube, tracheostomy, ventilator and respirator care, pressure ulcers, neurological conditions, aggressive behaviours, and ADL impairment. End-stage disease conditions such as cancer and hospice care are universally protective against long-stay patient status in addition to social aspects such as a desire for discharge back to the community and the presence of a support person who is positive towards discharge. This research also found that a similar set of clinical characteristics may also be used to predict discharge destination using admission characteristics and that a new decision-support tool, the Q+ Index, performs well in this CCC patient population.

As the first study to investigate CCC discharge barriers, the results of this research may serve as a foundation for the development of discharge planning decision-support algorithms, facility bench marking tools and clinical interventions that may reduce the number delayed discharges and ALC patient days in subacute care settings.

A Ethics

UNIVERSITY OF WATERLOO
OFFICE OF RESEARCH ETHICS

Feedback on Ethics Review of Application to Conduct Research with Humans

All research involving human participants at the University of Waterloo must be carried out in compliance with the Office of Research Ethics Guidelines for Research with Human Participants and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.

ORE File #: 18228

Project Title: Secondary data analysis of information collected using interRAI instruments

Principal/Co-Investigator: John P. Hirdes **Department/School:** Health Studies & Gerontology

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The above research application has undergone ethics review through the Office of Research Ethics and received the following ethics review category:

☑ **Ethics Clearance.** The application is considered acceptable on ethical grounds and complies with ORE Guidelines for Research with Human Participants and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. No revisions are required.

CONDITIONS ASSOCIATED WITH ETHICS CLEARANCE:
1. Ethics clearance is valid for five years from the date ethics clearance is granted.
2. Projects must be conducted in accordance with the description in the application for which full ethics clearance is granted. All subsequent modifications to the protocol must receive prior ethics clearance through the Office of Research Ethics.
3. An annual progress report (ORE Form 105) must be submitted for ethics review for each year of an ongoing project.
4. Any events, procedures, or unanticipated problems that adversely affect participants must be reported to the ORE using ORE Form 106.

☐ The application is considered acceptable on ethical grounds and complies with ORE Guidelines for Research with Human Participants and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. * **Minor/editorial revisions are required** as outlined in a transmitted email. Revised materials must be provided for the ORE file.

☐ Acceptance of the application on ethical grounds is **conditional on revisions and/or additional information**. The following revisions and/or additional information must be provided for ethics review and are requested within **10 days**. A study may not begin until it receives ethics clearance.

- ☐ Information Letter was not provided and is required for ethics review.
- ☐ Information Letter provided is incomplete and requires revisions outlined in the email message.
- ☐ Information Letter and Consent Form were not provided and are required for ethics review.
- ☐ Information Letter and Consent Form provided are incomplete and require revisions outlined in the email message.
- ☐ Copy of interview/survey questions was not provided and is required for ethics review.
- ☐ Other revisions/information are required as outlined in the email message.

☐ Due to the level and/or number of questions and concerns raised during the ethics review process the

application is considered not acceptable on ethical grounds at this time . Comments are summarized in the attached ethics review feedback. A new application is required.

Maureen Nummelin, PhD
Director, Office of Research Ethics

6/29/2017
Date

OR
Susanne Santi, MMath
Senior Manager, Research Ethics

OR
Julie Joza, MPH
Manager, Research Ethics

B Summary of Literature

Table 31: Summary of literature examining predictors of subacute care length of stay

Author	Purpose	Sample	Methods	Findings
(Teare et al., 2004)	Describe difference between short, regular and long-stay Ontario CCC patients	Ontario CCC patients. Long-stay patients had LOS of 90+ days, regular-stay LOS was 14-90 days, short-stay was less than 14 days.	Descriptive statistics of group differences. Statistical tests not used.	Long-stay patients represented 1/3 of sample. 14% long-stay discharged to community, 24% to LTC. Long-stay patients more cognitively and functionally impaired.
(Canadian Institute of Health Information, 2006)	Describe difference between regular and long-stay Ontario CCC patients	Ontario CCC patients. Regular-stay patients had LOS of 1-92 days, long-stay had LOS of 92+ days.	Descriptive statistics of group differences Means calculated.	Long-stay patients had greater ADL-H, CPS, DRS. Long-stay patients had more 0-64 year olds. Little difference with respect to ABS and Pain Score.
(Banaszak-Holl et al., 2011)	Report functional change trajectories for long-stay nursing home residents.	5% sample of Michigan nursing home residents from 1999-2003.	Hierarchical linear modelling.	Short-stay patients (LOS less than 180 days) more likely to be male, younger than 85 years old, educated, have cancer, heart disease or hip fracture, lower CPS and higher ADL-H

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Table 31 – continued from previous page

Author	Purpose	Sample	Methods	Findings
(Gassoumis et al., 2013)	Describe clinical characteristics of nursing home residents that transition to community.	Southern California nursing home patients. Long-stay patients were those with LOS of 91-365 days.	K-M survival estimates and logistic regression.	68% of sample had LOS less than 90 days, 18% remained in facility 1 year or more. Long-stay patients more likely to be unmarried, older, less educated, functionally dependent, incontinent, cognitively impaired, ADRD diagnosis, have psychiatric disorder, cancer, more likely to have fallen, temporarily discharged to acute care and have low care needs. Those with a support person are more likely to be discharged to the community within 90 days.
(Sabbagh et al., 2003)	Determine whether a dementia diagnosis is associated with increased SNF LOS.	Arizona, USA SNF discharges. Dementia and non-dementia groups created using ICD-9 codes.	Mann-Whitney U test.	Dementia patients had significantly longer length of stay (93 vs. 30 days). Gender did not affect LOS.
(Tourangeau et al., 2011)	Describe outcomes of slow-stream rehab patients recovering from stroke across 6 facilities.	Ontario CCC patients across 6 facilities. Used MDS 2.0.	Descriptive statistics. K-W and Fisher's exact tests to compare outcomes across facilities.	48% discharged to community, 35% to LTC. Overall mean LOS was 113 days, 123 for community discharges, 98 for LTC discharges and 115 for acute care discharges.

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Table 31 – continued from previous page

Author	Purpose	Sample	Methods	Findings
(Wodchis et al., 2005)	To determine the effect of rehabilitation therapy on time to discharge home.	Michigan, Ohio and Ontario SNF stroke patients, including CCC facilities. All patients had stroke diagnosis on admission.	Cox proportional hazards models.	Community discharges most frequently had a discharge prognosis of less than 30 days. Desired to return to the community and availability of support person led to better discharge prognosis.
(Guerini et al., 2010)	To determine the impact of clinical instability and delirium on rehabilitation outcomes at discharge.	Patients of a rehabilitation and aged care unit.	ANOVA	Clinical instability and delirium were associated with poor functional recovery. Mean length of stay was greater for patients that were clinically unstable.
(Arling et al., 2011)	Identify facility and market factors affecting rates of nursing home transitions to the community.	First time Minnesota nursing home patients.	Hierarchical linear modelling.	Community discharge rates were greatest for facilities located in more populated areas and regions with a greater ratio of community based supports to nursing home residents.

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Author	Purpose	Sample	Methods	Findings
(New et al., 2013b)	Identify discharge barriers for patients in inpatient rehabilitation facilities.	Australian inpatient rehabilitation patients.	Multivariate logistic and linear regression models.	Discharge barriers included non-weight bearing after limb fracture, discharge planning issues with family, waits home modifications, accommodation availability. Patients 50 years old and less and males had greater odds of experiencing discharge barriers.
(Tan et al., 2010)	Determine factors associated with delayed discharge for stroke patients in inpatient rehabilitation.	Singapore Inpatient rehabilitation patients with stroke.	K-W tests, ANOVA, multivariate logistic regression.	Age, gender and ethnicity did not differ for patients with and without delayed discharge. Nursing home discharges more likely than community discharges to experience a delay. Largest proportion of delayed discharges attributable to requests for extension of stay by family.

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