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Older Adult Care Transition Experience Following Inpatient Rehabilitation

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Abstract

The internationally used 15 item Care Transition Measure (CTM-15) has been primarily used to assess the care transition experience among adults transitioning from acute care to home. Although the CTM-15's psychometric properties have been established in this population, the ability of the CTM-15 to reliably discriminate a good from a bad care transition experience among older adults (60 or more years of age) moving from an inpatient rehabilitation setting to home is unclear. The purpose of this prospective observational cohort study was to: 1) evaluate the psychometric properties of the CTM-15 when used among older adults transitioning from an inpatient rehabilitation setting to home, 2) identify the factors associated with this care transition experience, and 3) explore and compare the care transition experience of patients discharged from two different specialized clinical treatment units.

Baseline data were collected via face-to-face interviews prior to discharge, and by telephone at both 2 to 6 days and at 28 to 32 days post discharge directly from patients. Although 64 patients were consented, complete data were available from 50 patients (mean age: 80.4 years). The CTM-15 demonstrated both internal consistency (Cronbach's alpha = 0.91 at 2 to 6 days post discharge) and test retest reliability ($ICC_{2,2}$ = 0.78). Increased age, decreased function (as measured by the Functional Independence Measure), and increased length of stay were significantly associated with a poorer care transition experience. However, only 20% of the overall variance in averaged CTM-15 scores was explained. In addition, the relationship between length of stay and care transition experience differed significantly by unit.

Subject to two administrations, the CTM-15 is a reliable and valid discriminative measure of care transition experience when used with older adults transitioning from an

inpatient rehabilitation setting to home. Future studies exploring such a care transition need to account for age, function, and length of stay either in the study design and/or the analysis. The observed interaction between length of stay and unit should also be further investigated.

Key words: Care transition experience, CTM-15, inpatient rehabilitation, older adults, reliability, validity

Summary for Lay Audience

Moving from one health care setting to another may be a challenging experience for a patient. The 15 item Care Transition Measure (CTM-15) was designed to assess the care transition experience among patients going home from an acute care hospital. However, it was unknown if the CTM-15 could also be used to assess the care transition experience of older adults going home after being in a rehabilitation hospital. The goal of this observational study was to see if the CTM-15 could reliably identify the characteristics associated with a good care transition experience among older adults going home after an inpatient rehabilitation admission.

Patients were contacted three times; just before going home, and at both 2 to 6 days and at 28 to 32 days after discharge. Data on 50 people with an average age of 80.4 years showed that the CTM-15 provided reliable information on the care transition experience. People who were older, had a longer hospital admission, and who had more difficulty with their activities of daily living tended to have a worse care transition experience as measured by the CTM-15. However, on one unit, a shorter length of stay was associated with a worse care transition experience while on the other unit a longer hospital admission was associated with a poorer care transition experience. This study showed that the CTM-15, when used among older adults discharged home following an admission to a rehabilitation hospital, could reliably distinguish between those who are likely to have a good transition care experience and those who are unlikely to have a good experience. But additional research is needed to identify the reasons why the relationship between duration of hospitalization and care transition experience differed by unit.

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LIST OF ABBREVIATIONS/ACRONYMS

ANOVA	Analysis of variance
b	regression coefficient
CI	Confidence interval
CRIC	Clinical Research Impact Committee
CTM-15	Care Transition Measure 15
CTMT1	CTM-15 scores at 2 to 6 days post discharge
CTMT2	CTM-15 scores at 28 to 32 days post discharge
CTMAv	CTM-15 scores averaged across Time 1 and Time 2
ED	Emergency department
EST	Equipment and services telephone survey
FIM	Functional Independence Measure
GRU	Geriatric Rehabilitation Unit
HCAHPS	Hospital Consumer Assessment of Health Plan Survey
HCP	Health Care Provider
HSREB	Health Science Research Ethics Board
ICC	Intraclass correlation coefficient
IPR	Inpatient rehabilitation
IQR	Interquartile range
LOI	Letter of information
LOS	Length of stay
MSK	Musculoskeletal
NRS	National Rehabilitation Reporting System
OR	Odds ratio

p	p-value
QMCDS	Quality Measurement and Clinical Decision Support team, St. Joseph's Health Care London
r	Correlation coefficient
SCQ	Self-Administered Comorbidity Questionnaire
SD	Standard deviation
SEM	Standard error of measure
Time 0	48 to 72 hours prior to discharge
Time 1	2 to 6 days post discharge
Time 2	28 to 32 days post discharge
VIF	Variance inflation factor
α	Alpha value or type I error
β	beta value or type II error

CHAPTER 1

INTRODUCTION

Older adults, those aged 65 years and over, are the fastest growing segment of the Canadian population (Public Health Agency of Canada, 2005). According to the 2016 Canadian census, the proportion of adults aged 65 or more increased by 20% from the previous census in 2011 (Statistics Canada, 2017). As well, in 2019 it was estimated that 7.4% of the Canadian population (2,789,244 Canadians) was aged 75 years or more (Statistics Canada, 2019). Older adults are also living longer, some with chronic and complex medical conditions (Wister, 2005), making them the heaviest users of health care resources including hospital admissions (Shih et al., 2015). While older adults (those aged 65 or more years) make up only 17% of the total population, they make up 34% of hospital cases and 58% of hospital days (CIHI, 2017). Further, medical complexity often increases with age with 74% of older adults having at least one chronic health condition (CIHI, 2017). Almost one-quarter (24%) of all Canadian older adults reported having three or more chronic conditions (CIHI, 2012) and those older adults accounted for 40% of the use of health care services (CIHI, 2017).

Older adults living with chronic conditions may need care from multiple providers in multiple locations, often resulting in care transitions from health care provider (HCP) to HCP and from location to location (Health Quality Ontario [HQO], 2012). Care transitions occur when patients move between health care settings and/or health care service providers (Coleman et al., 2002; Coleman et al., 2005). Following an acute event, older adults may need additional care and be transferred from acute care to a second

facility for rehabilitation. With the increasing number of older adults, the number of older adults attending rehabilitation hospitals will continue to increase (Piraino, et al., 2012).

Transitions between health care settings can be challenging for patients in general, however, they present greater risks for older adults (Coleman & Boult, 2003; Coleman & Berenson, 2004; Manderson, et al., 2012). Each care transition brings with it the potential for complications and adverse outcomes (Coleman et al., 2005) including miscommunication between patients, families, and HCPs and use of health care resources (Cawthon et al., 2012). Patients may be sent home without adequate instruction on medication management, follow-up appointments, and other information needed to be successful post-discharge (Cawthon et al., 2012; Rustad et al., 2016). Adverse events and unplanned hospital readmissions are common, each affecting approximately 20% of patients during the first few weeks after discharge (Jencks et al., 2009).

HCPs across all health care settings share the responsibility of ensuring the best transitional care experience for any one individual. Unfortunately, care transitions often lack continuity and may be poorly coordinated, resulting in poor quality of care, compromised patient safety, and unfavourable experiences of care (HQO, 2012). When patients or family caregivers are not given the appropriate information as they move from one care location to another, they may become overwhelmed, distressed or confused; all of which leads to a suboptimal care transition experience and often the need for additional health care (Coleman et al., 2002; Coleman & Boult, 2003; Coleman & Berenson, 2004; Coleman et al., 2005; Naylor, 2000).

The 15-item Care Transition Measure (CTM-15) was designed to measure the care transition experience of adults and older adults who transition from an acute care hospital

to home or an assisted living environment (Coleman et al., 2002). The CTM-15 is a self-report experience measure designed to capture the quality of the care transition experience from the patient's perspective (Coleman et al., 2005). While several studies have used the CTM-15 to assess transitions from acute care to home, there are few studies regarding the use of this tool to measure transitions from a rehabilitation setting to a home environment.

Health measures can be used for one of three purposes: discriminating between subjects, predicting prognosis, and evaluating change over time (Kirshner & Guyatt, 1985). The literature related to the assessment of the psychometric properties of the CTM-15 has primarily used this measure in a discriminative capacity, where the CTM-15 has been used to discriminate between patients who will or will not have a good care transition. This dissertation will also focus on the CTM-15 as a discriminative measure.

Previous research has examined the care transition experience between various locations such as acute care hospitals, post-acute nursing facilities, and the patient's home (Coleman & Boult, 2003). However, there is limited information on the care transition experience of older adults transitioning from inpatient rehabilitation to a home environment. There are some differences in the acute care patient population compared to an inpatient rehabilitation population that could affect the care transition experience. An inpatient rehabilitation hospital population tends to have patients with a compromised level of function and multiple comorbidities as well as patients who are older than those in an acute care hospital (Coleman & Boult, 2003; Shih et al., 2015; Shih et al., 2016).

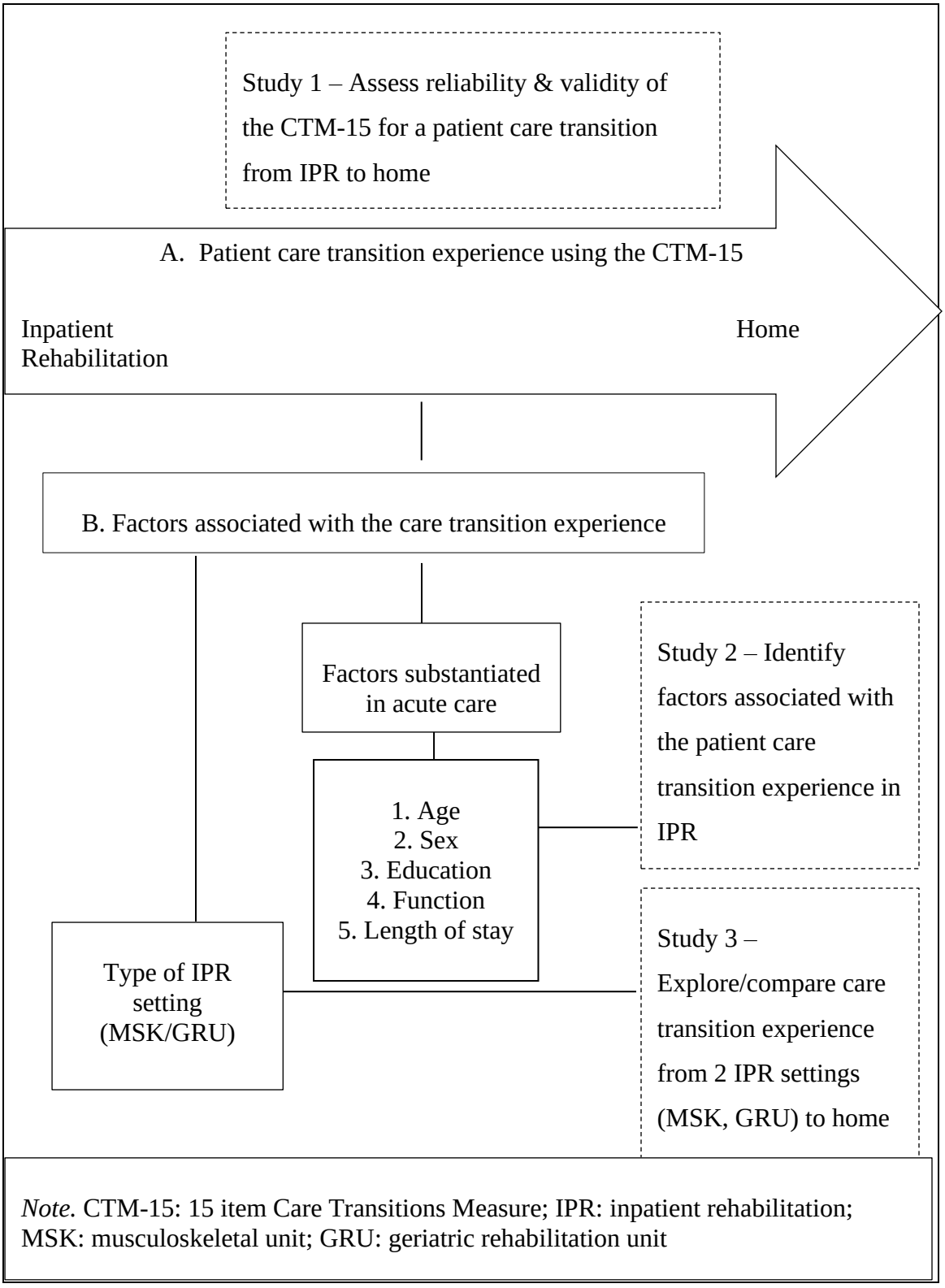
The existing literature confirms that the care transition experience can be impacted by many factors including, but not limited to, age, sex, function, number of

comorbidities, length of stay, education, living arrangements, and health status (Anatchkova et al. 2014; Coleman et al., 2005; McLeod et al., 2013). However, the factors identified in the literature are mainly from research on patients transitioning from an acute care environment to home. It is not known if the factors associated with a patient transition from acute care are the same as those for patients transitioning from an inpatient rehabilitation hospital to home.

The conceptual framework developed for this thesis is presented in Figure 1.1. While a detailed review of the literature is provided later in this document, a brief description of the conceptual framework follows. The figure (A in Figure 1.1) shows that the central focus of the thesis is the care transition experience of older adults returning home after discharge from an inpatient rehabilitation treatment setting. Directly below the large central arrow in the figure, factors and type of setting thought to be associated with the care transition experience (B in Figure 1.1) are identified and divided into two sections: factors identified previously in the acute care literature and factors postulated (in this thesis) to be associated with the care transition experience from inpatient rehabilitation to home.

Figure 1.1

Conceptual Framework: Care transition experience after inpatient rehabilitation



Note. CTM-15: 15 item Care Transitions Measure; IPR: inpatient rehabilitation; MSK: musculoskeletal unit; GRU: geriatric rehabilitation unit

The three thesis studies are also shown in Figure 1.1. Study 1 evaluates the psychometric properties of the CTM-15 for use in an inpatient rehabilitation hospital for patients transitioning to a home environment. Factors associated with the patient care transition experience that have been established in the acute care transition literature are examined in Study 2. Study 3 explores the care transition experience of patients discharged from two distinct inpatient rehabilitation treatment units, the musculoskeletal (MSK) and geriatric rehabilitation unit (GRU).

This dissertation is presented in the "integrated article" format as outlined by the Faculty of Graduate and Postdoctoral Studies at Western University. Because this dissertation is in an integrated manuscript form, the reader will notice some duplication. Chapter 1 introduces the dissertation subject and conceptual framework. Chapter 2 contains a narrative literature review of the care transition literature. Chapter 3 outlines the study objectives for each of the three studies. Chapter 4 contains the overall methodologies for each of the dissertation objectives as well as data sources, variables, data procedures and analyses. Chapter 5 (Study 1) summarizes the evaluation of the reliability and validity of the CTM-15 for use in an inpatient rehabilitation sample. Chapter 6 (Study 2) is an analysis of factors associated with the care transition experience among older adults discharged from inpatient rehabilitation to home. Chapter 7 (Study 3) compares the care transition experience of patients discharged from a GRU to that of older adults discharged from the MSK unit of a local rehabilitation hospital. Chapter 8 is a discussion of the thesis findings, implications, study limitations, and future directions.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This literature review is divided into five sections. The first section outlines the following key terms: care transition, transitional care, and patient care transition experience. Section two introduces measurement of the patient care transition experience and a detailed description of the 15 item Care Transition Measure (CTM-15). Section three summarizes the research evidence supporting the psychometric properties the CTM-15. Section four presents a review of studies that have examined factors associated with the patient care transition experience. Finally, section five is a statement of the problem and rationale for this dissertation.

2.2 Key terms

2.2.1 Care transition

Research into the experience of "transitions" was first introduced in the literature through the work of William Bridges beginning in the 1980s in the field of social science. Bridges (1980) developed a model focusing on the psychological processes of adapting to change and emphasized the significance of understanding transitions. Building on the work of Bridges, Afaf Meleis further developed the concept of transitions and adapted this work to the health care field (Meleis, 1985), specifically from a nursing perspective. Meleis (1985) states that a transition signifies a change in a patient's health status and abilities that requires a change in the patient's needs as they move from one setting to another. Meleis (1985) suggests that contextual and environmental factors (i.e., care setting, living arrangement) should be considered as patients encounter changes in health

care settings. The transition itself provides a context in which a period of increased risk for adverse events can occur.

In subsequent work, a care transition has been defined as the period of time during which a patient moves within or between health care settings and/or between health care providers (HCP). Transitions are often precipitated by a change in functional or health status thus requiring a different level of care (Coleman & Boult, 2003). For example, when an older adult experiences a fall that results in a hip fracture, this will lead to a transfer from their personal residence to an emergency department at an acute care hospital. Following a transfer from the emergency department to an inpatient unit, the patient will likely undergo surgery and an inpatient acute care hospital stay. In some cases, a patient will then be transferred to a rehabilitation hospital for further treatment, on an inpatient or outpatient basis. After discharge a patient will have follow up with their family physician, as well as HCPs. In this scenario, the patient has moved or transitioned between several care settings encountering different HCPs along their journey.

2.2.2 Transitional care

Transitional care has been formally defined as the actions carried out by HCPs to ensure coordination and continuity of care for patients transferring between different care settings or levels of care (Coleman & Boult, 2003). Transitional care encompasses both the sending and receiving aspects of the transfer, including logistical arrangements for care at both sites, education of the family/caregiver, and coordination of care provision among health care professionals involved in the transfer (Coleman & Boult, 2003). Transitional care is primarily concerned with the brief time interval that begins with the

preparation of a patient and their family to leave one setting and concludes when the patient arrives at the next setting (Coleman & Berenson, 2004). The time frame that encompasses a care transition involves activities done in preparation for the transition, activities during the transition, and activities for a period after the transition.

Patient complexity can make a care transition experience more challenging and many factors can impact the patient's care transition experience (Coleman & Boult, 2003). While there are several studies that have focused specifically on care coordination and care continuity, this dissertation will focus on measuring the patient experience during a care transition.

2.2.3 Patient care transition experience

Patient care transition experience is impacted by the systematic processes of care, physical settings of care, relationships of care, as well as patient expectations of care (Health Quality Ontario [HQO], 2016). Patient care transition experience encompasses the broad range of interactions that patients have with all HCPs (e.g., physicians, nurses, social workers, therapists) irrespective of where they are providing care (e.g., acute care facilities, rehabilitation hospitals, the community). As an integral component of health care quality, patient experience includes several aspects of health care delivery that patients value highly when they seek and receive care, such as getting timely appointments, easy access to information, and good communication with health care providers (Agency for Health Care Research and Quality, 2017).

The patient care transition experience has been measured both directly and indirectly. Using the idea that patients who have had a good care transition would not need to be hospitalized soon after discharge, 30-day rehospitalization rates have been

used as a proxy measure of the patient care transition experience (Misky et al., 2010; Fisher et al., 2016; Shih et al., 2015; Shih et al., 2016). In an effort to better understand the preferences of patients and to incorporate a patient-centered philosophy, investigators have shifted their focus from health administration measures to directly consulting patients about their experience (Rustad et al., 2016). Further, both quantitative and qualitative methods have been used to study factors associated with the patient care transition experience.

As hospitals implement interventions to improve discharge transitions, it is important to understand patients' perspectives on which interventions are most beneficial. A better understanding of patients' views on possible and implemented strategies could help guide both the development and implementation of future care transition interventions as well as better measures of the patient care transition experience (Cawthon et al., 2012; Malley & Kenner, 2016). Understanding the patient care transition experience is important when focusing on patient-centered care. By addressing various aspects of patient experience, researchers, clinicians and hospital administrators can assess the extent to which patients are receiving care that is specific to the needs of the individual patient.

Although the terms patient experience and patient satisfaction have been used interchangeably, they are different concepts. To evaluate the patient experience, researchers need to find out from patients whether measures, such as clear communication, that should have happened in a health care setting actually happened and/or how often they happened. Satisfaction, on the other hand, concerns itself with whether a patient's expectations surrounding a health care encounter were met. Two

people who receive the same care but with different expectations about how that care was supposed to be delivered, can give different satisfaction ratings because of their different expectations (Agency for Health Care Research and Quality, 2017).

2.3 History and assessment of the patient transitional care experience

Section 2.3 outlines the history of care transition research and subsequently the development of the CTM-15 followed by a detailed description of the use of the CTM-15.

2.3.1 History of transitional care research

Building on evidence that both the quality of care and patient safety could be compromised during a care transition (Coleman et al., 2002; Parrish et al., 2009), researchers began developing tools to measure the effectiveness of strategies aimed at improving patient care transition experience (Coleman et al., 2002; Grimmer & Moss, 2001). Grimmer and Moss designed and tested an instrument for obtaining feedback from patients and caregivers regarding discharge planning (Grimmer & Moss, 2001). The PREPARED tool addressed the following eight domains of discharge planning: Prescriptions, Readiness to re-enter the community, Education, Placement arrangements, Assurance of safety, Realistic expectations, Empowerment and Direction to the appropriate services. While this instrument was designed for use in patients aged 65 years and over transitioning from an acute care setting, the specific intent of this tool was to obtain feedback from patients and their caregivers regarding discharge planning activities. It was not designed to measure the care transition experience. As a result, when the focus of care transition interventions and research became more than just discharge activities, the PREPARED tool did not meet the needs of clinicians and researchers.

Considerable research has been focused on the evaluation of interventions designed to improve the patient care transition experience. For example, both Eric Coleman and colleagues (Parry et al., 2003; Parry et al., 2009) and Mary Naylor and colleagues (Naylor, 2000; Naylor, 2006; Naylor et al., 2011) showed that patients who were connected with a HCP who served as a transition coach or a health care liaison in an effort to ensure care coordination and continuity of services, had lower rehospitalization rates. However, the measurement of the patient care transition experience has not had as much attention in the literature. This dissertation will focus on measurement of the patient care transition experience, specifically using the CTM-15 for an inpatient rehabilitation population. While other care transition tools specific to older adults have been developed and incorporate various dimensions (Oikonomou et al., 2019), the following sections will describe in detail the development and then testing of the 15-item care transition measure developed by Coleman et al. (2002).

2.3.2. Development of the CTM-15

The 15 item Care Transition Measure (CTM-15) was developed by Eric Coleman and colleagues in the early 2000s (Coleman et al., 2002). The goal at that time was to create a tool that could measure the outcome of a quality improvement initiative to improve the transitional care experience of a patient. In the 2002 study, the target population was older adults with chronic illness who were returning home from an acute care hospital. The concept of this tool was different from previous measures in that it focused on the patient's care transition experience as opposed to a single aspect of a care transition, such as discharge planning. One key driver in the development of the CTM-15 was the United States of America federally initiated Hospital Consumer Assessment of

Health Plan Survey (HCAHPS) (Agency for Health care Research and Quality, 2003). This document encouraged hospitals to focus on how patients were being prepared to receive care in the next setting. Another driver was the American Institute of Medicine report, Crossing the Quality Chasm: A New Health System for the 21st Century (Institute of Medicine, 2001). This document promoted greater emphasis on patient-centered care throughout the health care delivery system and better coordination of care among services and across settings (Institute of Medicine, 2001).

Development and testing of the CTM-15 is outlined in detail in Coleman et al. (2002) and Coleman et al. (2005). These investigators conducted focus groups with older adults aged 65 years and over to obtain a greater understanding of their experience during a hospital to home transition. Six focus groups with a total of 49 patients revealed that information transfer, patient and caregiver preparation, self-management support and empowerment to assert preferences were essential to a good care transition experience. Additional information from medical health care professionals (Coleman et al., 2006) showed that medication self-management, access to a patient-centered record, timely primary care and specialist follow up, and patient goals impacted the care transition experience. The CTM-15 underwent additional changes based on further testing and the initial domains were amended to include the following four domains: patient understanding of their health condition, patient preferences included in the care plan, patient self-management preparation, and development of a comprehensive care plan.

2.3.3 Description and scoring protocol of the CTM-15

The CTM-15 is a 15 item self-report patient experience questionnaire. As a self-report tool, the CTM-15 assesses the experience of a care transition from the perspective

of the patient (Coleman, 2005a). The CTM-15 was designed to be completed by either the patient or their proxy. The CTM-15 items are answered using a four-point Likert scale (Strongly agree [4], agree [3], disagree [2], strongly disagree [1]) with an additional option for "Don't know/don't remember/not applicable"). Codes are assigned for any missing data as well as the "Don't know/don't remember/not applicable" option. These responses are not counted as answered questions for the overall CTM-15 score, however, this provides for a count of the number of items/questions that were not answered. Mean scores for each respondent are based only on the questions answered. A mean score is obtained by adding up the answered question responses divided by the number of questions answered. Scores from each item are summed and then undergo a linear conversion to a scale from 0 to 100 (Coleman, 2005b). Lower scores indicate a poorer quality care transition and higher scores indicate a better-quality care transition. A copy of the CTM-15 and scoring protocol are included in Appendix B and C respectively.

Initially there were two versions of the CTM-15; one version was for in-person administration, and the second for telephone administration. The final version was designed for telephone administration (Coleman et al., 2002). Initial development of the CTM-15 was based on a test administration of 6 to 12 weeks after discharge (Coleman et al., 2002). Subsequent studies have administered the CTM-15 between one week and three months post discharge (Coleman et al., 2004; Coleman et al., 2007; Deutsch et al., 2019; LaManna et al., 2015; McLeod et al., 2013).

2.4 Review of the literature

The following sections are a review of the literature summarized by type of study conducted. Section 2.4.1 includes studies that evaluated the psychometric properties of

the CTM-15. Section 2.4.2 summarizes studies that addressed factors associated with the care transition experience through quantitative methods, qualitative methods, and 30-day readmission rate methods. As we were interested in the English version of the CTM-15, studies that used CTM-15 versions that has been translated into another language were excluded.

2.4.1 Psychometric properties of the CTM-15

2.4.1.1 Reliability and validity studies

Table 2.1 presents studies that have evaluated the reliability and validity of the CTM-15. The search strategy for sections 2.4 is summarized in Appendix D. A brief review of each study follows the table.

Table 2.1

Reliability and validity studies of the Care Transition Measure 15

Study	Setting	Reliability[b]		Validity	
		Inter-rater	Test retest	Construct Convergent	Construct discriminant
Coleman et al., 2002[a]	Acute care	No	No	Yes	No
Coleman et al., 2005	Acute care	No	No	Yes	Yes
Parry et al., 2008	Acute care	No	No	No	No
McLeod et al., 2013	IPR	Yes	No	Yes	No
Anatchkova et al., 2014	Acute care	No	No	Yes	Yes

Note. [a] Face validity was assessed during the development phase of the CTM-15; [b] Internal consistency was evaluated by each of the studies; IPR = inpatient rehabilitation unit.

2.4.1.2 Article summaries

Coleman et al. (2002) developed and tested the CTM-15 for patients being discharged from an acute care hospital to home. The focus of their study was on tool development and initial validity testing. Face and content validity were established through consultation with national experts in the field of care transitions. Focus groups were conducted to identify the domains from which the survey items were developed, pilot tested, revised, and tested again. Construct validity was then established via a comparison of items from the CTM-15 to a satisfaction of care measure developed by Hendricks and colleagues (Hendriks et al., 2001). Coleman et al. (2002) hypothesized the CTM-15 would have reasonable construct validity if inter-item correlations with the measure of Hendriks et al. (2001) were between 0.25 and 0.75. Inter-item Spearman correlations varied from 0.39 to 0.59 confirming their a priori hypothesis.

Coleman et al. (2005) used data from Coleman et al. (2002) to assess internal consistency. Cronbach's alpha coefficient (α) was found to be 0.93 for the CTM-15 measure. Construct validity was based on the ability of the CTM-15 to discriminate between patients who had and not had an emergency department visit or rehospitalization for the index condition. The authors studied patients who were 18 years of age and older and who were discharged from an acute care hospital. Study participants completed the CTM-15 by telephone 6 to 12 weeks after discharge. Results showed that the CTM-15 could discriminate between patients who had and not had a subsequent emergency department visit or rehospitalization for their index condition. Coleman et al. (2005) also hypothesized that the CTM-15 should be able to discriminate between patients thought to differ on their care transition experience because of age, sex, and length of stay. A small

negative correlation (Colton, 1974) was found between CTM-15 and age ($r = -0.16$, $p = 0.03$), a small positive correlation (Colton, 1974) was found between CTM-15 and length of stay ($r = 0.14$, $p = 0.05$) and there was no significant correlation between CTM-15 and sex.

Parry et al. (2008) focused on the use of the CTM-15 within different populations: African American, Hispanic and rural dwelling. Cronbach's α was calculated to evaluate internal consistency reliability of the CTM-15 for each of the three different subsamples and by demographic and health status characteristics. Internal consistency reliability was found to be high in all three subsamples; African American ($\alpha = 0.94$), Hispanic American ($\alpha = 0.93$), and rural dwelling ($\alpha = 0.96$). Additionally, internal consistency remained high when data were split by age group (<65, 65-74, and 75+), sex (female/male), educational status (<high school, high school, some college, college degree), and self-reported health status (poor, fair, good, very good/excellent). Cronbach's α values varied from 0.93 to 0.95.

McLeod et al. (2013) focused on the assessment of CTM-15 reliability among an older adult population with musculoskeletal disorders. In their study the CTM-15 demonstrated acceptable inter-rater reliability; the intraclass correlation coefficient (ICC) was 0.77 ($p = 0.03$). As well, Cronbach's α was 0.94. Construct validity of the CTM-15 was also assessed. Length of stay was negatively correlated with the CTM-15 score ($r = -0.53$, $p = 0.04$) and age was not significantly correlated with CTM-15 score ($r = -0.01$; $p = 0.97$). This study identified some concerns with the validity of the CTM-15, specifically with construct validity. Recommendations for scale improvement included adding questionnaire items related to care continuity and home care services. A revision

of the response format was also suggested, moving from a 4-point Likert scale (strongly disagree, disagree, agree, strongly agree) to a numeric rating scale from 0 to 10, with 0 indicating no agreement with the item and 10 indicating complete agreement with the item.

Anatchkova et al. (2014) found the CTM-15 to have good internal consistency (α=0.95); however, they also noticed acquiescence bias (patients tended to respond to the positive or agree category) and limited score variability. Construct known groups validity was assessed and the following variables were found to be significantly associated with a positive care transition: lower age, female sex, higher level of education, and better health status. Some performance issues with the CTM-15 were identified including a left skewed distribution and a ceiling effect that was higher than that reported by Coleman et al. (2005) (8% vs. 1.1%)

2.4.1.3 Summary of findings

A review of the studies presented in Table 2.1 suggests that there is evidence of internal consistency for the CTM-15. However, there is minimal evidence of other forms of reliability with only one study that evaluated inter-rater reliability (McLeod et al., 2013). No studies that evaluated the test retest reliability of the CTM-15 could be found. With respect to validity testing, there is evidence of face validity, content validity, and convergent construct validity, and some limited and contradictory findings using known-groups or discriminant construct validity. The studies presented in Table 2.1 generally support construct validity of the CTM-15; however, some issues were raised regarding measurement performance of the tool itself. Only one study was conducted in an inpatient rehabilitation care setting.

2.4.2 Factors associated with the older adult patient care transition experience

2.4.2.1 Introduction

The following section reviews the literature that identifies factors that affect the patient care transition experience. The search strategy is summarized in Appendix C. The results of the literature search were grouped into three categories. The first grouping (Section 2.4.2.2) contains articles that identified care transition factors from studies that evaluated the psychometric properties of the CTM-15. The second grouping (Section 2.4.2.3) is comprised of studies that used a qualitative or mixed methods design. These papers represent the patient or health care professional perspective. The third grouping (Section 2.4.2.4) includes studies of factors associated with 30-day hospital readmissions in older adults, a health care system perspective.

2.4.2.2 Findings from quantitative psychometric studies of the CTM-15

2.4.2.2.1 Introduction

Table 2.2 presents factors associated with the patient care transition experience as reported in quantitative studies that evaluated the psychometric properties of the CTM-15. The primary purpose of these studies was to evaluate the validity of the tool. A brief review of each study follows the table. While many demographic and care transition factors were addressed in the study articles, only factors found to have a statistically significant relationship ($p < 0.05$) with the CTM-15 are reported in the table.

Table 2.2

Factors that affect the patient care transition experience identified in quantitative studies of the Care Transition Measure 15

Study	Sample size	Age (y)	Transition From[a]	Validated Care Transition Factors
Coleman et al., 2005	200	≥18	Acute	Age, length of stay
Parry et al., 2008	225	≥18	Acute	Self-rated health status
McLeod et al., 2013	15	≥65	Rehab	Length of stay
Anatchkova et al., 2014	1,545	≥18	Acute	Age, care transition indicators[b], education, self-rated health status, sex

Note. [a] all transition destinations were to a community setting; [b] includes patient access to medical records at discharge, prescheduled follow up visits, and patients "know who to contact if symptoms get worse" (yes/no question format); Rehab = rehabilitation.

2.4.2.2.2 Article summaries

Coleman et al. (2005) used a cross-sectional design to sample 200 patients who were discharged from an American acute care setting to a home environment. Patients were administered the CTM-15 by telephone within 6 to 12 weeks of discharge. Several factors were investigated for their relationship with CTM-15 scores. Only age and length of stay were found to be significantly associated with CTM-15 scores. Age showed a weak (Colton, 1974) negative correlation ($r = -0.16$, $p < 0.05$) with CTM-15 scores (i.e., older patients had worse (lower) CTM-15 scores). Length of stay also showed a weak correlation with the CTM-15 scores ($r = 0.14$, $p < 0.05$). Increased length of stay was associated with a better (higher) CTM-15 score.

Parry et al. (2008) used a cross-sectional design to recruit 225 patients aged 18 to 90 years who were discharged from an American acute care setting to a home environment. Analysis of variance tests were used to identify between-group differences in CTM-15 scores across groups of several health and demographic factors. Only self-rated health status, grouped into poor, fair and good/excellent groups, was found to be significantly associated with CTM-15 scores ($p = 0.003$). Patients who rated their health status as good/excellent had a significantly better ($p < 0.05$) mean CTM-15 score (75.6) than those who rated their health status as fair (69.1), followed by those who rated their health status as poor (66.9).

McLeod et al. (2013) evaluated the CTM-15 in patients over the age of 60 with musculoskeletal disorders (hip and knee replacement, hip fracture) who were discharged home from a rehabilitation facility in Ontario, Canada. Fifteen patients were contacted after a chart review and interviewed via telephone 3 to 4 weeks after discharge. The only factor found to be significantly associated with CTM-15 scores was length of stay. However, in contrast to Coleman et al. (2005), length of stay was negatively correlated with the CTM-15 total score ($r = -0.53$; $p = 0.04$). Patients who had a longer length of stay reported a worse (lower) CTM-15 score.

Anatchkova et al. (2014) surveyed 1545 patients who were discharged from a unit focused on cardiac rehabilitation located in an American acute care hospital. The CTM-15 was administered one-month post discharge via telephone. Known-groups analysis evaluated at a $p < 0.05$ level, revealed between-group differences in the CTM-15 score by age group, sex, level of education, self-reported health status, and three care transition indicators. Patients in an older age group had a worse (lower) CTM-15 score. Male

patients had a worse (lower) CTM-15 score than females. Patients who reported a higher level of education (college or higher) had a better CTM-15 score than those with less education. Patients who reported excellent health status had the best CTM-15 score, with successively worse scores for those who reported very good, good, fair, and poor health status, respectively. Patients who had access to their medical records had a better CTM-15 score than those who did not. Patients who had prescheduled follow-up visits had a better CTM-15 score than those who did not. Patients who knew who to contact if their symptoms got worse had a better CTM-15 score than those who did not.

2.4.2.2.3 Summary of findings

There are three key messages from Table 2.2. First, there were only four studies identified that provided a quantitative validation of the English version of the CTM-15. Second, only one of those studies recruited older adults who transitioned from an inpatient rehabilitation environment. Third, the most consistently validated care transition factors were age, length of stay and self-rated health status, with length of stay showing only a weak and inconsistent relationship with the CTM-15.

2.4.2.3 Findings from qualitative research studies

Table 2.3 presents studies identified from the literature that used a qualitative or mixed methods approach to understand the patient care transition experience. A brief review of each study follows the table.

2.4.2.3.1 Grouping of study themes

To assist this part of the literature summary, the themes identified in the studies have been grouped into four domains: themes related to the care plan, themes related to

patient independence, themes related to information communication, and themes related to patient-centered care.

The care plan domain includes all themes associated with the care plan including care coordination, care continuity, follow-up care appointments, health care system and hospital level care components, as well as the patient's need for coordinated community care and resources. Specific examples of themes grouped under this domain include: family caregivers who felt they were left to coordinate a care plan which negatively affected the patient care transition experience, a lack of availability and access to medical notes negatively affected care coordination, a lack of care capacity and quality affected the care transition, a comprehensive care plan and patient assessment improved the care transition, having a follow up care plan in place improved the care transition, and system and resource constraints negatively affected the care transition. Specific items included in care plans were: a list of follow up appointments, a list of medications, a list of equipment such as assistive devices to be delivered and installed in the home, and a list of services such as personal care or physiotherapy to be started or resumed in the home.

The theme of patient independence is comprised of patient function and patient self-management activities that provide for patient independence during and after the care transition from hospital to home. For example, the need for self-management programs, support, and the ability to adapt and care for oneself after discharge are factors identified as important to the patient upon return to the community. Studies have also identified the need for equipment and services to maintain a patient's independence after returning home.

The theme of information communication focuses on information exchange, understanding, knowledge, and communication between the patient and health care providers. Specific examples of themes grouped under the information domain include: patients seeking information and communication about discharge plans, and clarity of the roles and responsibilities in the collection and sharing of information.

The theme of patient-centered care focuses on the patient's relationship with caregivers and HCPs with a goal of ensuring the patient's goals and preferences are included in all aspects of care planning. Specific examples of themes grouped under the patient-centered care domain include: the creating of co-constructed care plans, identifying holistic care goals, and fostering mutually beneficial relationships that can improve the patient care transition experience.

Table 2.3

Factors that affect the patient care transition experience identified in qualitative studies from both the patient and health care professional perspective

Study	Sample size	Age (years)	Transition From[a]	Identified Care Transition Themes
Toscan et al., 2012	30	≥65	Acute care	Care plan[b], Independence[c], Information[d], Patient-Centered Care[e]
Johnson et al., 2013	43	≥65	Acute care	Care plan[b], Information[d]
Harvey et al., 2017	19	≥65	Acute geriatric unit	Care plan[b], Independence[c], Information[d]
Allen et al., 2018	26	≥70	Acute care & Rehabilitation	Care plan[b], Independence[c], Information[d], Patient-Centered Care[e]
Mitchell et al., 2018	248	≥18	Acute care	Care plan[b], Independence[c], Patient-Centered Care[e]

Note. [a] all transition destinations were to a home in the community; [b] Care plan includes all components of the written care plan, care coordination and care continuity activities; [c] Independence includes the patient's need to be independent upon return home and self-management knowledge to implement care plan; [d] Information includes information exchange between all health care providers and the patient as well as communication between all parties of the care plan; [e] Patient-Centered Care includes patient/caregiver/health care provider relationships, co-constructed care goals, and holistic care goals.

2.4.2.3.2 Article summaries

The studies in this section used a qualitative design and the participants were a mix of patients and HCPs, including family caregivers. Five of the studies interviewed patients and their family caregivers; however, two studies had a mix of patients, carers,

and HCPs. These studies were included as they provided information that assisted in identifying and supporting thematic areas. Data analysis in these studies consisted of interview transcription and qualitative data analysis. Four of the five studies focused on an older adult population (65 years of age and older) who were returning to a home environment.

Toscan et al. (2012) used an ethnographic approach to understand the factors related to poorly integrated care coordination when patients with hip fracture transitioned home from acute care in Ontario, Canada. Forty-five interviews were conducted with six patients, six family caregivers, and 18 health care providers. Four themes emerged that described poor transitional care experiences: confusion with communication about care, unclear roles and responsibilities, diluted personal ownership over care and role strain due to system constraints. These results were grouped into the following domains: care plan, patient independence, information and patient-centered care.

Johnson et al. (2013) used an ethnographic approach to understand information exchange between physiotherapists during care handoffs for patients with a hip fracture in a rural health care setting in Ontario, Canada. Semi-structured interviews and site observations were used to study 11 patients who had sustained a hip fracture, eight family caregivers and 24 health care providers. These data were supplemented by health care records and policy documents. Results revealed that physiotherapists expressed a need to provide and retrieve up-to-date medical information to facilitate handoffs between practitioners during patient transitions. Furthermore, an inadequate handoff process negatively affected care continuity, delayed rehabilitation progress, and resulted in

missing information for families. These results were grouped into the following domains: care plan and information.

Harvey et al. (2017) used an exploratory, longitudinal case study design to describe the care transition experiences of older adults in Australia. They used repeat interviews with patients and family caregivers, patient chart audits and focus groups with service providers to identify personal, systemic, and local factors that affect care transitions. Nineteen patients were recruited and 97 semi-structured interviews were conducted (56 with patients and 37 with family caregivers). The main study findings were that the experience of transferring between care settings was unpredictable because of multiple disconnected providers and unspecified care paths. The need for education, better communication and information exchange, and self-help initiatives for patients in the community was recommended by the authors. These results were grouped into the following domains: care plan, patient independence, and information.

Allen et al. (2018) used an exploratory design within a constructivist framework to understand how older adults with chronic health conditions and their caregivers' transition from hospital to home in Australia. Nineteen patients and seven family caregivers participated in semi-structured interviews. Six main themes were identified that described patients' transitional care experience: the patient's desire to be independent; their need for supportive relationships with family caregivers; their desire for caring relationships with health care providers; their need for information; their need for discussing and negotiating the transitional care plan; and their desire for learning to self-care. These results were grouped into the following domains: care plan, independence, information, and patient-centered care.

Mitchell et al. (2018) used a qualitative approach to describe the patient and caregiver experience during the care transition process. The study's purpose was to understand the desired outcomes related to health services associated with the care transition from an acute care hospital in the United States. They interviewed 138 patients and 110 caregivers using a semi-structured interview guide and conducted 34 focus groups. Results revealed three desired outcome areas including: feeling cared for by medical providers, having accountability from the health care system, and feeling capable and prepared to implement their discharge care plan. Five positive care transition services and provider service behaviours were identified including, empathetic language from providers, anticipating patients' need for self-care at home, collaborative discharge planning, providing actionable information and, providing uninterrupted care with minimal handoffs. These results were grouped into the following domains: care plan, independence, and patient-centered care.

2.4.2.3.3 Summary of findings

There are two key messages from Table 2.3. First, like the quantitative literature, the qualitative studies focused primarily on the transition from acute care to home. Second, the age focus of sampled study participants in qualitative studies was generally older than in quantitative studies.

2.4.2.4 Findings from studies of factors associated with 30-day readmissions

2.4.2.4.1 Introduction

Table 2.4 presents care transition factors identified by quantitative studies that used a proxy approach for the assessment of the patient care transition experience. All studies used a 30-day readmission rate as their proxy measure. For example, if a patient

did not return to hospital in the first 30 days post discharge, this was considered a good care transition. Conversely, a higher rehospitalisation rate within 30 days of discharge indicated a poorer care transition. Factors identified include (in no order of importance): comorbidities, functional status, self-reported health status, length of stay, and sex. A brief review of each study follows the table.

Table 2.4

Factors identified from studies of factors identified from 30-day readmissions in older adults in quantitative proxy[a] approach studies

Study	Sample size	Age (years)	Transition From [b]	Validated Care Transition Factors[c]
Misky et al., 2010	65	≥18	Acute care	Primary care follow-up
Shih et al., 2015	120,957	≥18	Acute care	Comorbidities, functional status, sex
Fisher et al., 2016	25,908	≥18	Rehabilitation	Functional status, length of stay
Shih et al., 2016	4.2 million	≥18	Rehabilitation	Comorbidities, functional status

Note. [a] all studies used a 30-day readmission rate as their proxy; [b] all care transitions were to a residence in the community; [c] factors found to be statistically significant.

2.4.2.4.2 Article summaries

Misky et al. (2010) evaluated the characteristics and outcomes of discharged patients who lacked timely primary care provider follow up. A prospective sample of 65 patients over the age of 18 years was included in the study. Post discharge telephone calls determined the extent of primary care provider follow-up and readmission status. Both 30-day readmission rate and hospital length of stay were compared in patients with and without timely primary care provider follow up. Only 49% of patients received timely

follow up with a primary care provider. Further, patients lacking timely primary care provider follow up were 10 times more likely to be readmitted than those without timely primary care follow-up.

Shih et al., (2015) examined the association between functional status and other factors and acute care readmissions in medically complex patients. Their study was a retrospective database review and included 120,957 medically complex patients admitted to an inpatient rehabilitation facility between 2002 and 2011. The authors used logistic regression to predict the odds of 3, 7, and 30-day readmission to acute care from inpatient rehabilitation facilities. Sex, functional status and number of comorbidities were significantly associated with 30-day readmission. Functional status was a better indicator of patient readmission than medical comorbidities.

Fisher et al. (2016) aimed to identify variables in the administrative patient record that could help clinicians discriminate between patients who were and were not likely to be readmitted to an acute care hospital within 30 days of rehabilitation discharge. This observational cohort study included patients who were deconditioned, had medically complex diagnoses, and had received post-acute inpatient rehabilitation in 2010 and 2011. Results showed that change in functional outcomes, rehabilitation length of stay (less than 9.5 days), and discharge function were the best predictors of 30-day rehospitalization.

Shih et al. (2016) wanted to know if functional status was a better predictor of 30-day acute care readmission rate than traditionally investigated variables including demographic factors and comorbidities. This study was a retrospective analysis of 4.2 million records of patients over the age of 18 years from 1,158 inpatient facilities across

the United States. Logistic regression models predicting 30-day readmission were developed based on age, sex, comorbidities, and functional status. Functional status was the best predictor of 30-day readmission.

2.4.2.4.3 Summary of factors associated with 30-day readmissions

Factors significantly associated with 30-day readmissions included comorbidities, functional status, self-reported health status, length of stay, and sex. Although all of the studies included patients who were 18 or more years of age, none of the studies focused primarily on older adults. As well, only two studies were located in a rehabilitation setting.

2.4.2.5 Summary of factors associated with the older adult care transition experience

The quantitative studies section identified only four papers that used the CTM-15 and only one study was set in an inpatient rehabilitation setting. Further, only one quantitative study recruited older adults. Factors significantly associated with the patient care transition experience included age, education, length of stay, self-rated health status, and sex. The qualitative studies section identified only five papers, only one of which was located in an inpatient rehabilitation setting. Four of the five studies recruited older adults. Multiple factors were identified that impacted the patient care transition experience including functional independence, communication, and relationship with HCPs. Four studies looked at factors associated with 30-day readmissions. Two studies were located in an acute care setting and two involved patients attending inpatient rehabilitation. As well, these studies used participants who were 18 years of age and older and so were not specific to older adults. Factors associated with 30-day readmission included number of comorbidities, function, length of stay, and sex.

2.5 Statement of the problem

There was not an abundance of literature about the care transition experience of older adults from inpatient rehabilitation to home as measured via the CTM-15; only one such study was identified (McLeod et al., 2013). Also, there was not a wealth of research into the psychometric properties of the CTM-15, especially test retest reliability. Within an inpatient rehabilitation setting, there are several kinds of specialized clinical treatment units. Some rehabilitation units focus on people with musculoskeletal issues while other units focus on older adults or those living with strokes or spinal cord injuries. The factors associated with a positive and/or negative care transition may be different for these specialized clinical treatment units within an inpatient rehabilitation setting. The ability of the CTM-15 to discriminate between the care transition experience of patients from each specialized clinical treatment units has received little attention in previous research. While the literature has identified factors associated with the care transition experience of older adults transitioning from acute care to home, whether these factors are also the same for inpatient rehabilitation patients has not been established.

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CHAPTER 3

OBJECTIVES

3.1 Study Objectives

The specific objectives of this dissertation were:

1. to evaluate: 1) the internal consistency of the 15 item Care Transition Measure (CTM-15), 2) the test retest reliability of the CTM-15, and 3) the construct validity of the CTM-15 when used in a sample of older inpatients transitioning from a rehabilitation setting to home.

2. to identify the factors associated with the care transition experience among older adults transitioning from an inpatient rehabilitation hospital to home; and

3. to explore and compare the care transition experience of patients discharged from two specialized clinical treatment units within a single rehabilitation hospital.

CHAPTER 4

METHODS

4.1 Introduction

This methods section outlines the methods (i.e., study participants and procedures) that are common to all three studies within this dissertation. Within each manuscript chapter (Chapters 5, 6 and 7), an additional methods section provides details specific to each study.

4.2 Ethics and Patient Consent

The project was approved by the Health Sciences Research Ethics Board (HSREB) at Western University. Additional project approvals were obtained from the Clinical Research Impact Committee (CRIC) through the Lawson Health Research Institute and the Parkwood Institute. See Appendix A for copies of the HSREB, Lawson Health Research Institute, and CRIC approvals.

Patients were invited to participate in this research by the Resource Nurse on each of the Geriatric Rehabilitation unit (GRU) and the Musculoskeletal (MSK) unit at the Parkwood Institute in London, Ontario, Canada. Patients who agreed to hear more about the study were then approached by the investigator (PV) to review the letter of information and, if in agreement, to participate in this study, sign the consent form, and be formally enrolled in the study. Appendix E contains the study recruitment letter for the Resource Nurses and Appendix F contains the letter of information and consent form.

4.3 Study Design

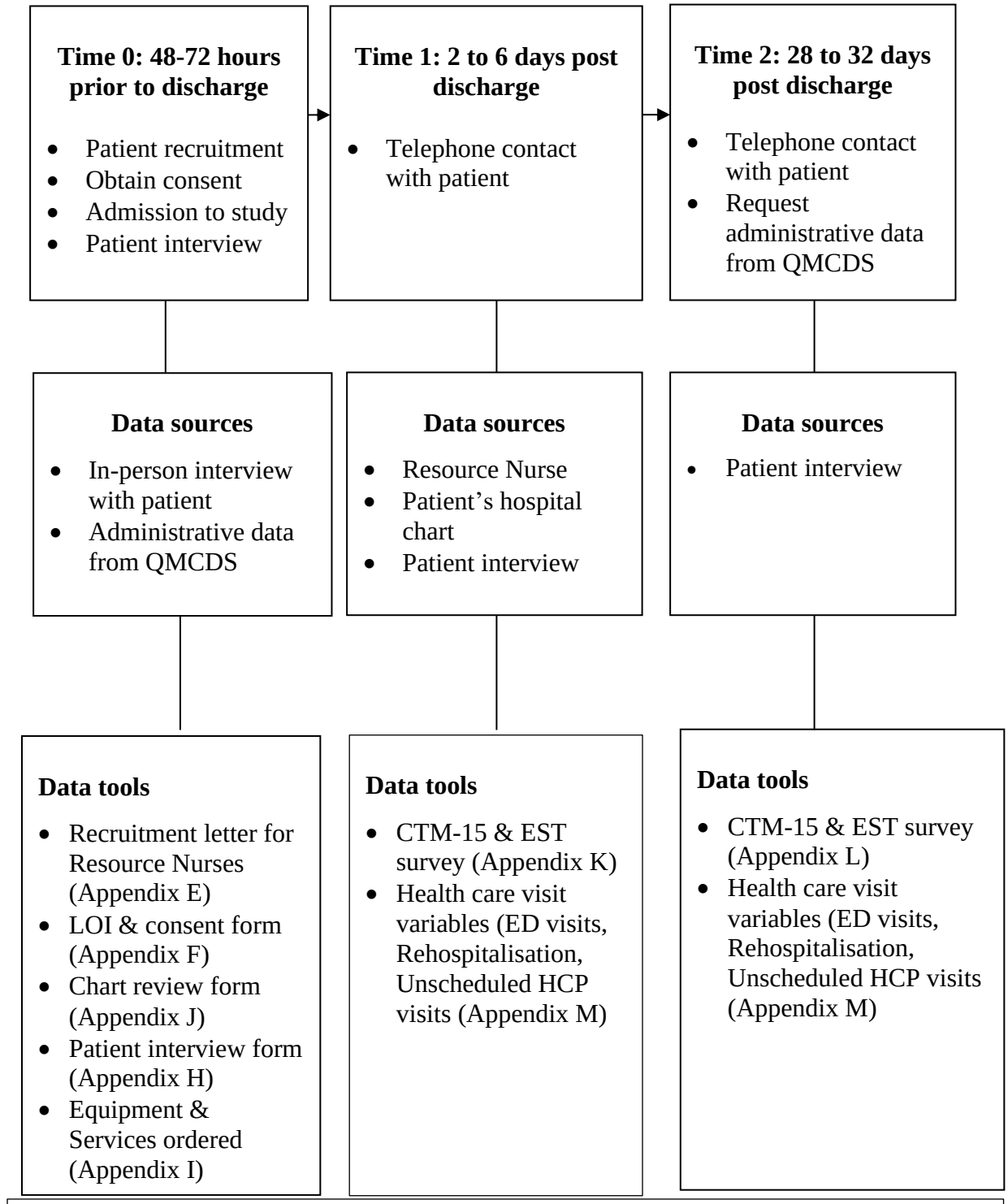
This study used a prospective observational cohort research design to measure the care transition experience of older adult patients after discharge from either the MSK or

the GRU, at the Parkwood Institute. Study participants were patients admitted to either the MSK or GRU for inpatient rehabilitation after hospitalization at an acute care hospital. This prospective study followed patients discharged from the MSK or the GRU at the Parkwood Institute for 28 to 32 days.

A repeated measures design was used to evaluate the test retest reliability of the study's outcome measure, the 15 item Care Transition Measure (CTM-15) (Chapter 5). Following the initial in-person patient interview prior to discharge (Time 0), the CTM-15 was administered to patients via telephone at two points in time: at 2 to 6 days after discharge (Time 1), and at 28 to 32 days after discharge (Time 2). Linear regression was used to model the relationship between the CTM-15 and factors shown in the literature to be associated with the care transition experience (Chapter 6). The same data file data was also used to explore and compare the care transition experience of patients discharged from two specialized clinical treatment units (MSK and GRU) (Chapter 7). Data were collected between September 2016 and April 2017. See Figure 4.1 for details.

Figure 4.1

Data Collection Procedures



Note. LOI = letter of information; CTM-15 = 15 item Care Transition Measure; EST = equipment and services telephone survey; ED = emergency department visits; HCP = health care provider; QMCDS = Quality Measurement and Clinical Decision Support team, St. Joseph's Health care London.

4.4 Study setting

The GRU is a 30-bed inpatient unit, led by Geriatricians, for patients living with multiple, complex health problems (e.g., physical, emotional, cognitive) requiring a comprehensive interdisciplinary rehabilitation approach. The admission goals are to promote the patient's health, to increase their functional independence, and quality of life. Length of stay typically ranges from 2 to 6 weeks. Admission criteria to the GRU during the study period included patients with impairments and disability who required an inpatient rehabilitation admission, who had clear rehabilitation goals typically (defined as improving mobility and functional independence), who were medically stable so that they could fully participate in rehabilitation, who had the medical and cognitive/emotional ability to participate in rehabilitation, who were motivated to actively participate in the program, and who had an agreed upon discharge destination. Patients, who were typically over the age of 65 years, had to be at least 50% weight-bearing, have an age-related health issue, and reside either in the Erie St. Clair Local Health Integration Network or the South West Local Health Integration Network catchment area (St. Joseph's Health care London, Geriatric Rehabilitation Unit, 2020).

The MSK unit is a 20-bed inpatient unit for patients living with musculoskeletal conditions who also require an interdisciplinary approach. The MSK is led by Physical Medicine and Rehabilitation specialists. The program is designed to meet the rehabilitation needs of adult and older adult patients with complex musculoskeletal issues. Length of stay typically averages 3 to 4 weeks. At the time of this study, admission criteria to the MSK unit included patients with impairments and disability who required an inpatient rehabilitation admission, had clear rehabilitation goals (defined as

improving mobility and functional independence), who were medically stable to allow for participation in rehabilitation, who were medically and cognitively/emotionally able to take part in rehabilitation, who were motivated to actively participate in rehabilitation, and who had an agreed upon discharge destination. Common admission problems included hip fracture, total joint replacement, generalized deconditioned state, neuromuscular disorders, and trauma (St. Joseph's Health care London, Musculoskeletal Unit, 2020).

4.5 Study participants

Inclusion criteria were all patients admitted to either the GRU or the MSK unit at the Parkwood Institute who were expected to be discharged to a community residence (i.e., either a private home or a retirement home). All patients had received care from a local acute care hospital prior to their admission to the Parkwood Institute for inpatient rehabilitation. Patients who were 60 years of age and older were eligible for this study.

Exclusion criteria included patients deemed cognitively unable to participate in the study as they may have faced challenges in responding to the telephone survey. This was determined by their performance on the Mini-Mental State Examination (Molloy & Standish, 1997) and/or the Montreal Cognitive Assessment (Nasreddine et al., 2005) tests and through a discussion with the Resource Nurse allocated to each unit. If patients were deemed incapable of completing the CTM-15 independently, a proxy respondent was not used (e.g., a caregiver or a substitute decision maker). In addition, those patients whose first language was not English were excluded. Similar to other studies that have used the CTM-15 to measure care transition experience (McLeod, et al., 2013; Parry et al., 2008), people either returning to long-term care or who were being admitted to long-term care

following rehabilitation were excluded from the study. The Resource Nurse from each unit assisted the investigator (PV) in determining whether the patient met inclusion/exclusion criteria and consulted the investigator (PV) if unsure of suitability. The CONSORT diagram for this dissertation is contained in Appendix G.

4.6 Data collection and protocol

After informed consent was obtained, the patient was interviewed prior to discharge to obtain demographic and baseline data. Specifically, the investigator administered a brief study questionnaire that asked consented patients to state their level of education and their ability to access transportation needed to attend appointments (Appendix H). The Self-Administered Comorbidity Questionnaire (SCQ) (Sangha et al., 2003) was then completed and a mutually convenient time for a follow-up phone call after discharge was determined (Appendix H). Information on needed equipment and services was collected from notes on the patient chart from the Occupational Therapists on the MSK unit and the GRU (Appendix I) just prior to the patient's discharge. Admission and discharge dates used to calculate length of stay were collected from the patient's chart (Appendix J).

The second point of contact with patients (Time 1) was by telephone, between 2 to 6 days after discharge. This time period was selected because the CTM-15 focuses on how prepared patients feel at the point of leaving the hospital and not on what happened following discharge (McLeod et al., 2013). Participants completed the CTM-15 and answered questions regarding health care equipment and services and any health care professional visits (Appendix K). A mutually convenient 30-day follow-up telephone interview was then booked.

The third point of contact with patients (Time 2) was between 28 and 32 days after hospital discharge. The CTM-15 was again administered by phone and study participants were asked about health care equipment and services received and the use of any health care professional services (Appendix L). This time point was selected for a number of reasons. First, unplanned hospital readmission within 30 days of discharge has been used as a performance indicator of quality of care during the hospital admission and during the transition from hospital to home (Wish, 2014; Shih et al., 2015). Thus, similar to Anatchkova et al. (2014), 30-day readmission was selected as a measure of CTM-15 construct validity. As well, McLeod et al. (2014) also re-administered the CTM-15 6 to 10 days after their first assessment which was conducted at 3 to 4 weeks post discharge, that is to say at 27 to 38 days post discharge.

4.7 Data sources and data tools

The following section describes the study data and the tools used for data collection.

4.7.1 Data sources

Data sources included the patient's hospital chart which included the Occupational Therapy discharge summary notes, patient in-person interviews (prior to discharge), patient follow-up telephone interviews, and the National Rehabilitation Reporting System (NRS) database (Canadian Institute of Health Information).

4.7.1.1 Chart review

A chart review (Appendix J) was conducted after informed consent was obtained to extract patient demographic data that included patient year of birth, sex, date of admission, expected date of discharge, primary admission diagnosis, discharge destination, forward sortation area (FSA), and needed patient services and equipment

(e.g., occupational therapy, physical therapy, mobility aids, assistive devices). After the patient was discharged, the chart was reviewed again to confirm the date of discharge so the length of stay could be determined (this was also confirmed through data submitted by the Parkwood Institute to the Canadian Institute of Health Information (CIHI) – (National Rehabilitation Reporting System database below).

4.7.1.2 Patient interviews (phone and in-person)

An in-person patient interview was conducted prior to patient discharge to administer the demographic survey (Appendix H), to obtain the patient's education level, their ability to access transportation to attend follow up medical appointments, follow up contact information, and information regarding their chronic health conditions. Data regarding the patient's chronic health conditions were collected at this time by having patients complete the Self-Administered Comorbidity Questionnaire (SCQ) (Sangha et al., 2003) (See below for SCQ details).

Two telephone interviews were conducted, one at 2 to 6 days post discharge and another at 28 to 32 days post discharge to administer the CTM-15, the equipment and services questionnaire, and the health service use questionnaire. At 28 to 32 days post discharge patients were also asked to rank their overall care transition experience. The investigator (PV) contacted patients at a pre-determined mutually acceptable date and time.

4.7.1.3 Occupational Therapy discharge summary

Information on needed equipment and services (Appendix I) was collected from the Occupational Therapists' chart notes. Just prior to discharge, the Occupational Therapist completed a patient discharge note that detailed requested equipment and

services for the patient. Equipment such as assistive devices, mobility aids, and needed services such as personal support worker assistance is listed on this form. This information was used in determining whether patients subsequently received the required equipment and services.

4.7.1.4 National Rehabilitation Reporting System (NRS) database

The NRS is a Canada-wide reporting system that collects standardized data from adult in-patient rehabilitation hospitals (Canadian Institute for Health Information, 2002). These data were retrieved through a formal request to the Quality Measurement and Clinical Decision Support unit at St. Joseph's Health care London, Parkwood Institute. Requested data included Functional Independence Measure (FIM) (Granger et al., 1986) scores on admission and at discharge, length of stay (LOS) and information regarding recidivism (emergency department visits, hospital readmissions for any condition within 30 days of discharge).

4.7.2 Data tools

Data tools used in this study included the CTM-15 (Coleman et al., 2002), the Equipment and Services Questionnaire, the FIM (Granger et al., 1986), the SCQ (Sangha et al., 2003), and a health care service use measure. The CTM-15, SCQ and FIM are existing tools whose psychometric properties have been described in the literature. The Equipment and Services Questionnaire and the Health Care Service Use Questionnaire were developed specifically for this study. Table 4.1 contains a list of the study tools, their corresponding appendix, and at what time point they were administered.

Table 4.1

Study Tools

Tools	Appendix	Time point
Study information letter (for Resource Nurse)	E	Time 0
Letter of information and consent form (for patient)	F	Time 0
Chart data and demographic information	J	Time 0
Hospital patient interview and SCQ	H	Time 0
CTM-15 and Equipment and Services Questionnaire	K	Time 1
CTM-15 and Equipment and Services Questionnaire	L	Time 2
Equipment and services from patient chart	I	Time 0
Health Care Service Use Questionnaire	M	Time 1 and 2

Note. SCQ = Self-administered comorbidity questionnaire; CTM-15 = Care Transition Measure.

4.7.2.1 The Care Transition Measure-15

The CTM-15 is a 15 item self-report patient experience questionnaire. As a self-report tool, the CTM-15 assesses the experience of a care transition from the perspective of the patient. The CTM-15 was designed to be completed by either the patient or their proxy. The CTM-15 items are answered using a four-point Likert scale (Strongly agree [4], agree [3], disagree [2], strongly disagree [1]) with an additional option for "Don't know/don't remember/not applicable". Codes are assigned for any missing data as well as the "Don't know/don't remember/not applicable" option. These responses are not counted as answered questions for the overall CTM-15 score; however, this provides for a count of the number of responses that were not answered. Mean scores for each respondent are based only on the questions answered. A mean score is obtained by adding up the answered question responses divided by the number of questions answered. Mean scores then undergo a linear conversion to a scale from 0 to 100 (Coleman, 2005a

& 2005b). The CTM-15 was administered at Time 1 and Time 2 via telephone. A copy of the CTM-15 is provided in Appendix A along with the scoring sheet (Appendix B).

4.7.2.2. Equipment and Services Questionnaire

The Equipment and Services Questionnaire was administered at 2 to 6 days after discharge (Time 1) (Appendix K) and again at 28 to 32 days after discharge (Time 2) (Appendix L). Data collected were based on the equipment and services requested by the Occupational Therapist prior to patient discharge (Appendix I). The questionnaire consisted of items that asked patients about equipment and services that were needed to attain maximal independence in the home. Equipment included such things as assistive devices for personal care, mobility and home safety (e.g., crutches, walkers, canes). Services included personal support worker care, nursing care, physiotherapy, occupational therapy, and home making services. Patients were asked to indicate if they had received all, most, some or none of their equipment or services, or if they already had these equipment and services.

4.7.2.3 Functional Independence Measure (FIM)

The FIM was developed to offer a standard system of measurement of disability and to estimate the subsequent burden of care for patients and their need for assistance with activities of daily living (Linacre et al., 1994). The FIM instrument is an 18-item measure that evaluates six areas of function within two domains on a 7-point ordinal scale. The scale scores range from 1 (total assistance in all areas) to 7 (total independence in all areas). The six areas of function include self-care, sphincter control, transfers, locomotion, communication and social cognition. These areas then fall under two domains (motor and cognitive). Scores can range from 18 to 126 (worst to best state)

(Guide for the Uniform Data Set for Medical Rehabilitation including the FIM instrument, 1997). The FIM is routinely collected on all patients in the MSK and GRU units at the Parkwood Institute.

4.7.2.4 Self-Administered Comorbidity Questionnaire (SCQ)

The SCQ is a measure of comorbidity. The SCQ is a self-administered questionnaire (Appendix H) that records the number of medical conditions, and for each condition asks whether or not the condition requires treatment, and whether or not the condition limits function. There are 15 conditions listed in the SCQ. Patients respond "yes" or "no" for the presence of each condition. They then respond "yes" or "no" to whether they received treatment for the condition, and then "yes" or "no" to whether the condition limited their activities. Scores can range from 0 to 45. The higher the score the more functional impairment due to medical comorbidities. Previous work has found the SCQ to be reliable and valid (Sangha et al., 2003).

4.7.2.5 Health care service use questionnaire

Information regarding health care visits after discharge was also collected (Appendix M). Specifically, during each follow up telephone contact (Time 1 and Time 2), the investigator (PV) inquired about health care provider visits the patient may have attended. This included scheduled and unscheduled health care provider visits, visits to the emergency department, and any rehospitalization since discharge. After study completion, information regarding admissions to local hospitals or to local emergency departments was collected through the St. Joseph's Health Care London, Quality Measurement and Clinical Decision Support Unit.

4.7.2.6 Global assessment question

Study participants were asked to rate their overall care transition experience. The global assessment question was “Overall, on a scale of 1-10, how would you rate your transition from the unit to home?” It was expected that patients who reported a higher rating of their care transition would have a higher CTM-15 score compared to those who reported a lower rating (Coleman et al., 2005).

4.7.3 Sample size

The study sample size calculation was based on the number of participants required to determine the test retest reliability of the CTM-15 (Chapter 5 – Study 1) using the intraclass correlation coefficient. The required sample size was calculated using tables provided by Walter et al. (1998). The estimated sample size of 40 participants was based on $\alpha = 0.05$, $\beta = 0.20$ and an expected test retest coefficient equal to 0.80 (ρ_1), with the lowest acceptable reliability coefficient set at 0.60 (ρ_0). Using an estimated loss to follow up of 20%, a sample size of 50 was determined.

Further calculations showed that a sample size of 50 was also sufficient for Study 2 and Study 3. Based on the need to have at least 10 observations for each predictor variable in a linear regression model (Cohen, 1992; Austin & Steyerber, 2015), it was determined that with a sample size of 50, relationships amongst five study independent variables and the CTM-15 scores could be examined in Chapter 6 (Study 2). Study 3 was an exploratory study that compared the care transition experience of patients discharged from two specialized clinical treatment units. Based on findings from Chapters 5 and 6, it was determined that with a sample size of 25 per unit, a 9-point difference in CTM-15 scores could be identified.

4.7.4 Data management and storage

The de-identified data and paper copies of questionnaires and data collection forms were kept in a locked filing cabinet located at the Parkwood Institute. The master datafile is stored in the PhD student's home on a password protected encrypted external hard drive that is stored in a locked cabinet. The password protected laptop that holds the de-identified study data file has VeraCrypt encryption ensuring that all files on the computer are encrypted. Once publications have been completed, the data will be stored at the study PI's home office on a password protected, encrypted external hard drive until the hard drive is sent to Command Services. Command Services will retain all study-related information for 15-years as per Lawson policy and then destroyed. Data on the PhD student's laptop and external hard drive will be destroyed as per Western University's guidelines at the time of data destruction.

4.7.5 Data quality and analysis

First, a study database was created in Microsoft Excel. The primary investigator (PV) entered the study data and was responsible for data cleaning and error checking. A data dictionary was then created that included variable names, variable codes, and any special instructions. The Excel database was then imported into an SPSS database and all subsequent analyses were done using SPSS statistical software (SPSS v.25, IBM). Initially frequencies were run to ensure variable scores were within valid limits. Frequency tables for categorical variables and descriptive statistics and plots for continuous variables were generated to identify the presence of any possible outliers. Any missing CTM-15 data from each of the two follow up points resulted in that patient's data being removed from any further analyses.

Study population characteristics were determined using the appropriate parametric or nonparametric statistic. When non-normal distributions were encountered, both means and medians and their respective indicators of variation were reported. The different data analysis protocols used in each subsequent study are described in detail in their respective chapters.

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CHAPTER 5

STUDY 1

Psychometric properties of the Care Transition Measure 15 among older adults transitioning from rehabilitation to home

5.1 Introduction

The Care Transition Measure 15 (CTM-15) was developed to assess the care transition experience from the perspective of a patient transitioning from an acute care hospital to home (Parry et al., 2008). The reliability and validity of the CTM-15 have previously been evaluated for transitions from acute care hospital stays to home (Coleman et al. 2005). In this study, the CTM-15 was found to have "high" internal consistency and face validity when used with adults who were 18 years of age and older who had been discharged from a private, non-profit, vertically integrated American health care system. The measure was able to discriminate between those who were and were not re-hospitalized. However, there was no information regarding test retest or inter-rater reliability.

Only two studies could be found that evaluated the psychometric properties of the CTM-15 when used among people transitioning from a rehabilitation setting to home. McLeod et al. (2013) evaluated the CTM-15 among 15 patients attending an inpatient rehabilitation hospital for those with musculoskeletal issues and concluded that the CTM-15 demonstrated "high" internal consistency (Cronbach's alpha = 0.94). As well, the CTM-15 demonstrated "acceptable" inter-rater reliability. A study by Anatchkova et al. (2014), among 1545 patients receiving cardiac rehabilitation albeit in an acute care-based specialized coronary care unit, concluded that the CTM-15 had "good" internal consistency (Cronbach's alpha = 0.95). However, they also found that scores were

"severely" left skewed with few scores in the lower half of the tool's range, thereby limiting variance and the ability to discriminate between subjects. As well, validity was questioned. While hypothesized differences in the known-groups validity analysis were supported, only 3 to 4-point differences on a scale with a standard deviation of 16 were found.

A psychometric assessment of the CTM-15 is needed to determine its usefulness among older adults transitioning from an inpatient rehabilitation hospital to a home setting.

5.1.1 Objectives

The objectives of this study were to evaluate: 1) the internal consistency of the CTM-15, 2) the test retest reliability of the CTM-15, and 3) the construct validity of the CTM-15 when used in a sample of older inpatients transitioning from a rehabilitation setting to home.

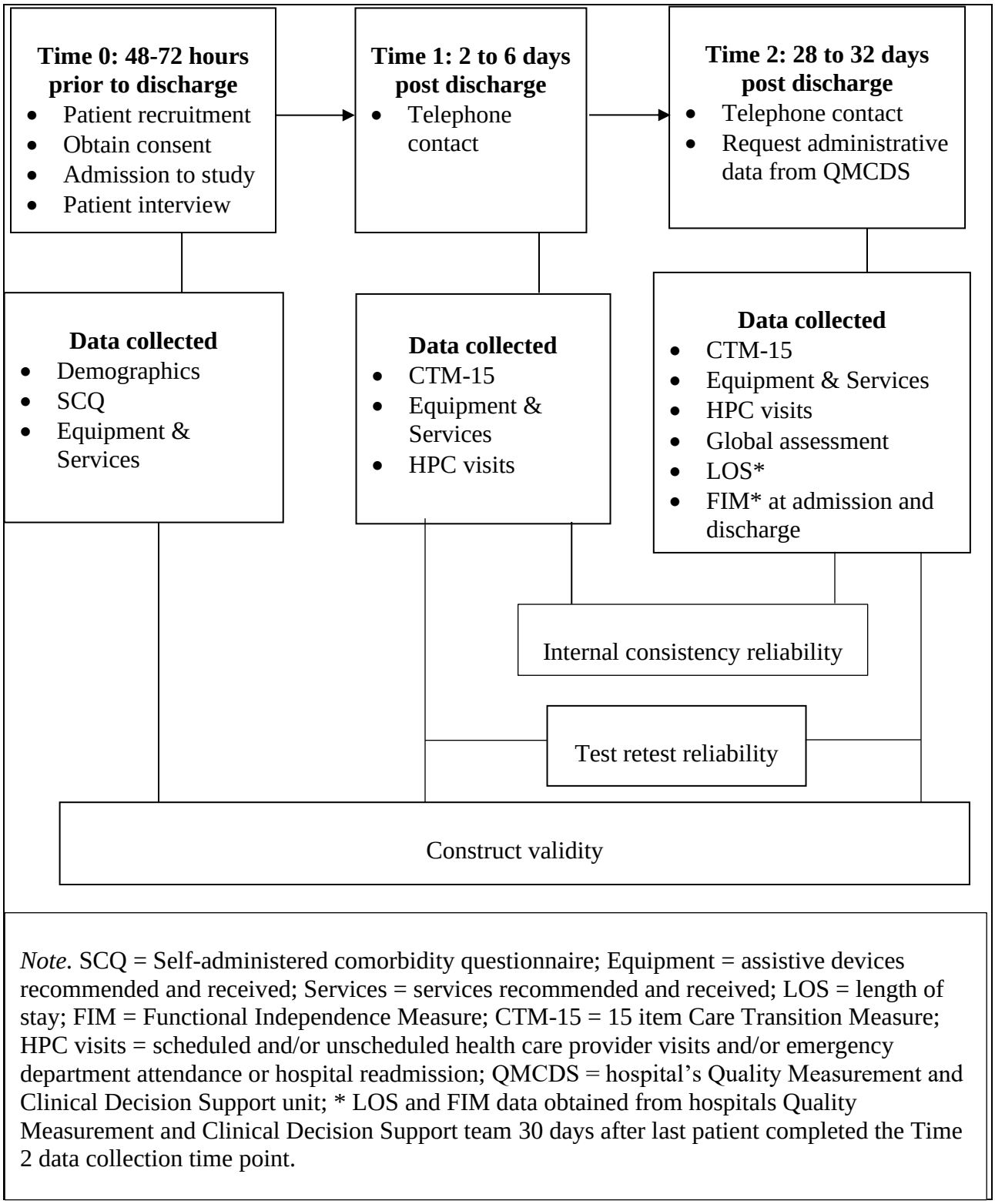
5.2 Methods

5.2.1 Study Design

This study used a repeated measures design. Figure 5.1 outlines the study timeline, study objectives, and when data were collected to achieve the study objectives. Data were collected at: the initial patient interview, prior to discharge (Time 0) for construct convergent validity and construct discriminant validity; at 2 to 6 days after discharge (Time 1) and 28 to 32 days after discharge (Time 2) for test retest reliability; and at Time 1 and Time 2 for construct convergent validity.

The study received ethics approval from Western University's Health Sciences Research Ethics Board and additional approvals from Lawson Health Research Institute (Appendix A). All participants gave written informed consent.

Figure 5.1. *Study timeline and objectives*



Note. SCQ = Self-administered comorbidity questionnaire; Equipment = assistive devices recommended and received; Services = services recommended and received; LOS = length of stay; FIM = Functional Independence Measure; CTM-15 = 15 item Care Transition Measure; HPC visits = scheduled and/or unscheduled health care provider visits and/or emergency department attendance or hospital readmission; QMCDS = hospital's Quality Measurement and Clinical Decision Support unit; * LOS and FIM data obtained from hospitals Quality Measurement and Clinical Decision Support team 30 days after last patient completed the Time 2 data collection time point.

5.2.2 Study participant recruitment

From September 2016 to March 2017, participants were recruited from an inpatient rehabilitation hospital in Southwestern Ontario. Participants were recruited from two specialized clinical treatment units within the hospital, the Geriatric Rehabilitation Unit (GRU) and the Musculoskeletal (MSK) Unit. Participants were older adults discharged to a home environment in the community from either of the two inpatient rehabilitation hospital units.

Inclusion criteria were: patients who were at least 60 years of age, able to read/understand English, able to provide written consent, able to make health care decisions independently without the need of a Substitute Decision Maker, and who had a planned home discharge (within the next seven days) from the inpatient unit. Patients who were not cognitively able to participate in follow-up telephone discussions, as deemed by the unit's Resource Nurse were excluded from this study. Similar to other studies (McLeod, et al., 2013; Parry et al., 2008), people either returning to long-term care or who were being admitted to long-term care were excluded from the study.

Patients matching study eligibility criteria were first approached by each unit's Resource Nurse, a member of the patient's circle of care, to assess interest in study participation. Names of those who were interested in hearing more about the study were then securely provided to the study's principal investigator who then obtained written informed consent.

5.2.3 Data collection

Data collection is summarized in Figure 5.1. At Time 0, demographic data were collected including age (year of birth), sex, education, (less than high school, high school,

some college/university, college/university), and discharge location (home alone, home with spouse/partner, home with family, retirement home). Comorbidity data were collected with the Self-administered Comorbidity Questionnaire (Sangha et al., 2003). Equipment and service needs upon discharge as documented by the Occupational Therapist were abstracted from the patient chart.

At 2 to 6 days after discharge (Time 1) and 28 to 32 days after discharge (Time 2) data collected included the CTM-15 questionnaire, equipment ordered and received, services (i.e., home care and community services including physiotherapy, occupational therapy, nursing or Meals on Wheels) ordered and received, any scheduled health care provider visits (HCP), any unscheduled HCP visits, any emergency department visits, and any rehospitalizations. The method of collecting CTM-15 data by telephone has previously been reported and is supported by the literature (Coleman et al., 2005; Parry et al., 2008; McLeod et al., 2013).

At Time 2 participants were asked to rate their overall care transition experience. The global assessment question was “Overall, on a scale of 1-10, how would you rate your transition from the unit to home?” A score of one represented a poor care transition experience and a score of 10 represented an excellent care transition experience. It was expected that patients who reported a higher global rating of their care transition would have a higher CTM-15 score compared to those who reported a lower global rating (Coleman et al., 2005).

After all study data were collected, length of stay and Functional Independence Measure (FIM) data were obtained from the hospital’s Quality Measurement and Clinical

Decision Support unit, as well as information regarding hospital readmission and emergency department visits in the 30 days following hospital discharge.

5.2.4 Study Measure – The Care Transition Measure 15

The patient care transition experience was measured using the CTM-15. The CTM-15 is a self-report patient care transition experience questionnaire. Responses are scored on a four-point Likert scale (strongly agree [4], agree [3], disagree [2], strongly disagree [1]) with an additional option for "Don't know/don't remember/not applicable". A mean score is obtained by adding up the answered question responses and dividing by the number of questions answered. Mean scores then undergo a linear conversion to a scale from 0 to 100 (Coleman, 2005a). The transformed score reflects the overall quality of the care transition, with a lower score indicating a poorer quality transition and a higher score indicating a better transition (Coleman, 2005b). For this study, this variable was treated as a continuous variable. A copy of the CTM-15 and the scoring guide is included as Appendix B and C respectively.

5.2.5 Sample size calculation

The sample size calculation for this study was based on the number of participants required to determine the test retest reliability of the CTM-15, using the intraclass correlation coefficient (ICC). The required sample size was calculated using tables provided by Walter et al. (1998). The estimated sample size of 40 participants was based on $\alpha = 0.05$, $\beta = 0.20$ and an expected test retest coefficient equal to 0.80 (ρ_1), with the lowest acceptable reliability coefficient set at 0.60 (ρ_0). Using an estimated loss to follow up of 20%, a sample size of 50 was recruited (Walter et al., 1998).

5.3 Data analysis

All data analyses were performed using IBM SPSS Statistics Version 25. The data analysis utilized methods as described by Portney and Watkins (2015) and Kirshner and Guyatt (1985).

5.3.1 Sample characteristics

Each sample characteristic was summarized by the appropriate statistical measure given the distribution of each variable. Statistical tests (parametric or nonparametric) were performed as appropriate for the nature of the distribution. Appendix N contains a summary of the variables used in this study.

5.3.2 Reliability assessment

Reliability was assessed by evaluating internal consistency reliability and test retest reliability.

5.3.2.1 Internal consistency reliability

Cronbach's alpha was used to assess internal consistency (Portney & Watkins, 2015). Internal consistency assesses the degree to which a set of items in an instrument all measure the same trait (Portney & Watkins, 2015). With respect to the CTM-15, this is the extent to which the instrument measures the patient care transition experience.

5.3.2.2 Test retest reliability

Bland Altman plots were used to visually inspect and understand the score distributions and any changes in CTM-15 scores between Time 1 and Time 2. The Bland Altman plot, ICC, and standard error of measurement (SEM) were used to evaluate the stability of inter subject variation (Kim, 2003).

A Bland Altman plot, also called a difference plot, is a graphical technique that can be used to examine agreement either between two measurements or the same measurement at two time points (Bland & Altman, 1986; Bland & Altman, 1999). In this study, the differences between the CTM-15 scores at the two time points were plotted against the averages of the two time points (Streiner et al., 2015). This plot was also used to explore the variability of study data. Rankin and Stokes (1998) suggest Bland Altman plots and the ICC be used together to provide a more thorough understanding of the tool's reliability.

Test retest reliability measured via the ICC is a ratio of the variance due to true score variance divided by the sum of all sources of variance (Shrout & Fleiss, 1979). There are several versions of the ICC and both the $ICC_{2,1}$ (single measures) and $ICC_{2,2}$ (corresponding average measures) were calculated (Shrout and Fleiss, 1979). The formulas and calculations for the ICCs are contained in Appendix O.

The standard error of measurement (SEM) is a measure of response stability that estimates the standard error in a set of repeated scores (Portney & Watkins, 2015). The SEM increases as test retest reliability decreases and has been called the within-subject standard deviation (Bland & Altman, 1986). The SEM is indicative of the range of scores that can be expected on retesting (Portney & Watkins, 2015; Weir, 2005).

Test retest reliability requires two administrations of a measure during a period of time when no change in the target concept, in this case the personal assessment of the care transition experience, has occurred (Watson & Petrie, 2010). However, LaVela and Gallan (2014) note that patient experience measures might be impacted by a person's subjective assessment of their current health status, regardless of their actual experience.

As a result, a person's assessment of their care transition experience may change if health status continued to improve or became worse post discharge. With this in mind, the association between CTM-15 scores and proxy health status measures (i.e., unplanned health care provider use, as well as receipt of needed equipment and services) was evaluated. If patients who required new equipment or new services received all versus most, some or none of the recommended equipment and services, it is possible that they would consider themselves as having a better health status and so recall a better care transition experience. If patients had unplanned health care provider use (i.e., any unscheduled health care provider visits, emergency department visits, and/or rehospitalization), they would likely feel that their health status had deteriorated and recall a worse care transition experience.

5.3.3 Validity assessment

The validity of the CTM-15 was assessed using construct convergent validity and construct discriminative validity.

5.3.3.1 Construct convergent validity

Construct convergent validity is an approach to construct validation that assesses the degree to which two different instruments or methods can measure the same construct (Portney & Watkins, 2015). This was evaluated in two ways. Similar to previous studies, the construct convergent validity of the CTM-15 was evaluated by examining the correlation between a global assessment question and the CTM-15 score at Time 2 (Coleman et al., 2005; McLeod et al., 2013). Patients who report higher ratings on the global assessment question should have higher (better) CTM-15 scores. The correlation between these two continuous variables was generated. Construct convergent validity was also evaluated by examining the relationship between unscheduled health care

provider use and CTM-15 scores. Patients with unscheduled health care provider visits and/or visits to the emergency department and/or hospital readmissions should have lower (worse) CTM-15 scores (McLeod et al., 2013; Shih et al., 2015; Shih et al., 2016). A Mann Whitney U test was done to assess the significance of this relationship.

5.3.3.2 Construct discriminant validity

Construct discriminant validity is an approach to construct validation that assesses the degree to which an instrument has different results when measuring two different constructs such that it can discriminate between the constructs (Portney & Watkins, 2015). Variables of interest for the discriminant construct validity analysis included age, FIM score at discharge and length of stay. These variables were selected based on the literature (Coleman et al., 2005; Parry et al., 2008; McLeod et al., 2013; Anatchkova et al., 2014).

Older patients were hypothesized to have lower CTM-15 scores, indicating a worse care transition experience, as they may be more likely to have more health issues that may make the transitional care experience more challenging. Patients who are more functionally challenged (lower FIM score at discharge) were hypothesized to have a lower (worse) CTM-15 score, as they may be more likely to have mobility limitations and require assistance during the care transition. Patients with a longer length of stay were hypothesized to have lower CTM-15 scores, indicating a worse care transition, as they may be more complex medically and require additional rehabilitation time to return to their home environment. Statistical tests (parametric or nonparametric) were performed as appropriate for the nature of the distribution.

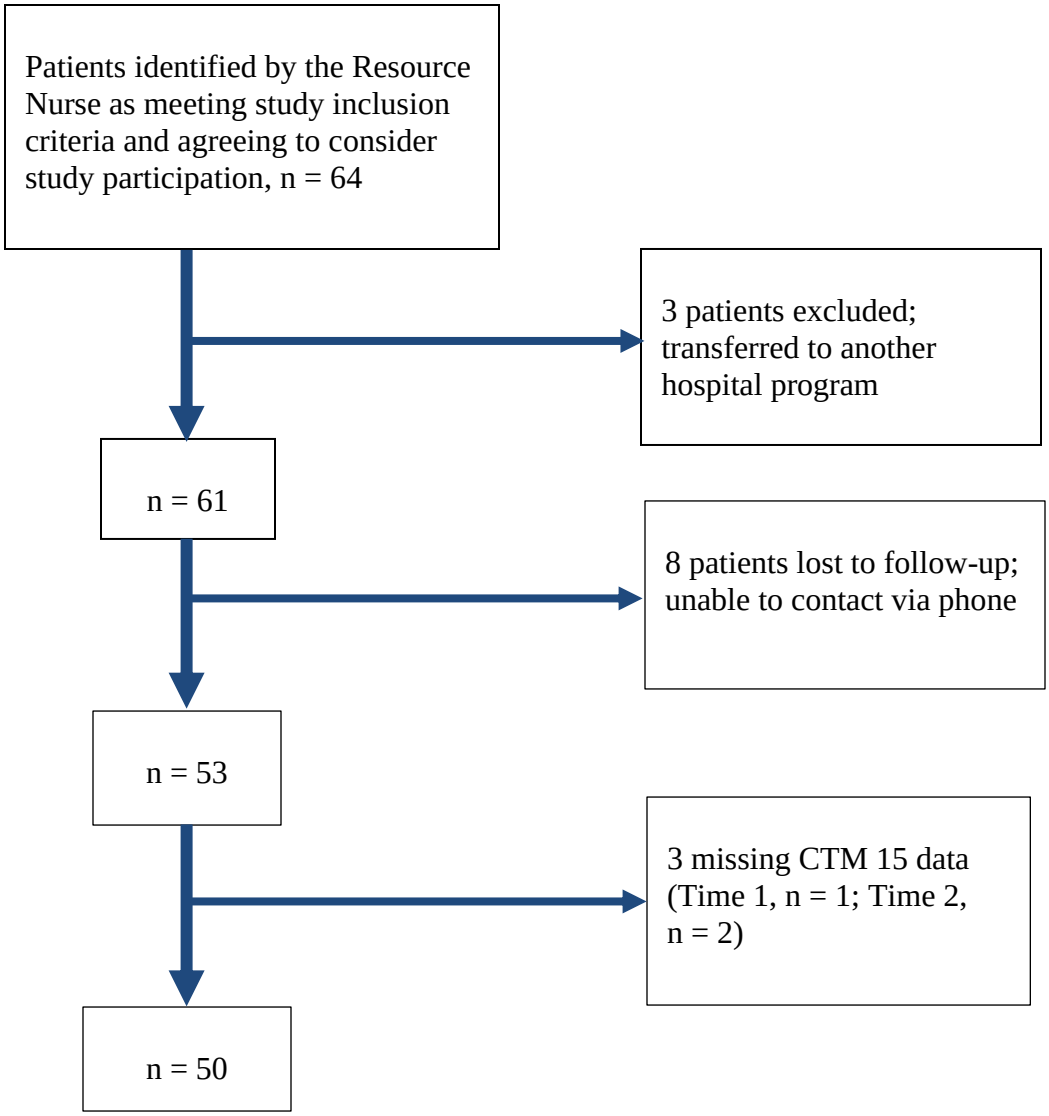
5.4 Results

5.4.1 Sample Characteristics

The generation of the study sample is summarized in Figure 5.2. Although 64 patients were identified as eligible by the unit Resource Nurse, three were excluded because they were transferred to another program in the hospital. Of the 61 study enrolled patients, eight were unavailable for follow up and three had only one set of CTM-15 scores, leaving 50 patients with complete data for analysis. The demographic and health-related characteristics of these 11 excluded patients is shown in Appendix P. Although excluded patients did not significantly differ from the study sample by age, length of stay, number of comorbidities, discharge location, level of education, sex, or FIM on admission, they did have significantly lower FIM scores at discharge. A summary of descriptive characteristics by sample type is contained in Appendix Q.

Figure 5.2

Flow Chart – Generation of study sample



Note. CTM-15 = 15 item Care Transition Measure.

Table 5.1 presents the study sample's demographic and health-related characteristics. The study sample was predominantly older females with a mean age [standard deviation (SD)] of 80.4 (8.5) years. Details regarding study variable type (categorical/continuous) and variable scale ranges are provided in Appendix N. While

age was normally distributed, the other continuous variables were not. Median and interquartile range (IQR) scores are therefore also reported.

Table 5.1

Study participant demographic and health-related characteristics at initial assessment (n=50)

Sample Characteristics	Frequency [a] (Percent)
Sex	
Female	38 (76)
Male	12 (24)
Education	
Some college/university or less	35 (70)
College/university degree	15 (30)
Discharge living arrangements	
Home alone	29 (58)
Home with spouse, family, retirement home	21 (42)
Age in years	
Median (IQR)	81 (13)
Mean (SD)	80.4 (8.5)
Minimum – maximum	63–97
Length of stay in days	
Median (IQR)	27 (10)
Mean (SD)	25.7 (9.2)
Minimum – maximum	8–54
SCQ	
Median (IQR)	8.50 (8)
Mean (SD)	9.3 (5.4)
Minimum – maximum	2–27
FIM at discharge	
Median (IQR)	111 (8)
Mean (SD)	108.7 (8)
Minimum – maximum	84–120

Note. [a] unless otherwise stated; SCQ = Self-administered Comorbidity Questionnaire; IQR = interquartile range; SD = standard deviation; FIM = Functional Independence Measure, range 18–126, worst to best.

Table 5.2 illustrates the characteristics of the CTM-15 scores at Time 1 (test) and Time 2 (retest). The median CTM-15 score at Time 1 was 65.6 and was 67.0 at Time 2.

There were no floor effects or ceiling effects based on a 15% threshold (McHorney & Tarlov, 1995). No one had a score of 0 and only 6% had a score of 100 at either time point. Further, no one ever selected "don't know" as an item response; for all items all respondents provided a score from 1 to 4.

Table 5.2

Care Transition Measure 15 (CTM-15) scores at Time 1 and Time 2 (n=50)

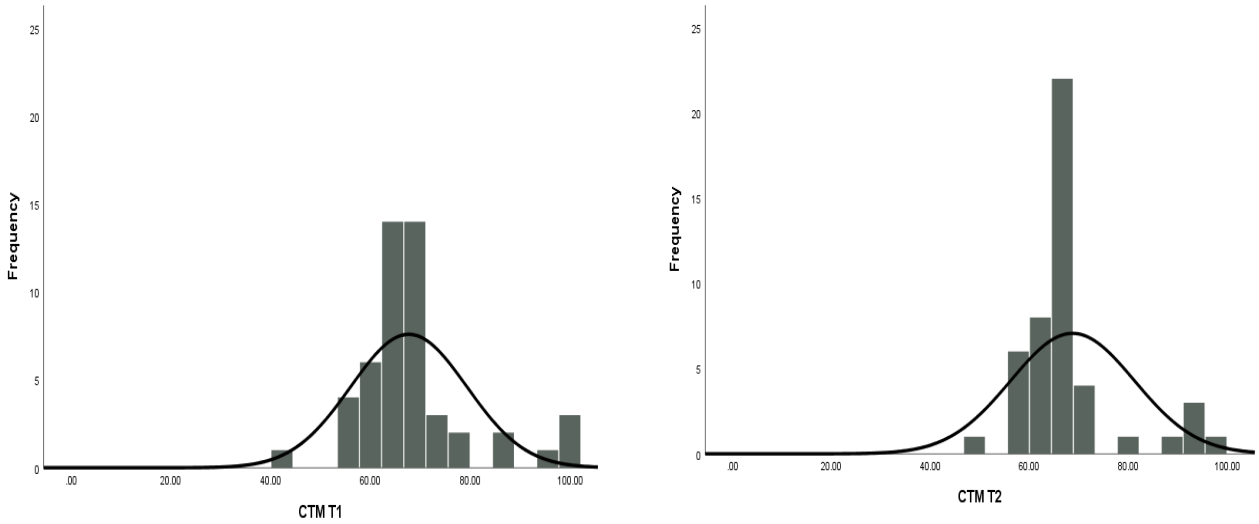
	CTM-15 scores*	
	Time 1	Time 2
Median (IQR)	65.6 (6.7)	67.0 (6.7)
Mean (SD)	67.6 (11.7)	68.7 (12.5)
95% CI	64.3–71.0	65.1–72.3
Mode	66.7	66.7
Minimum–maximum (range)	42.2–100 (57.8)	48.9–100 (51.1)

Note. Time 1 = 2 to 6 days after discharge; Time 2 = 28 to 32 days after discharge; IQR = interquartile range; SD = standard deviation; CI = confidence interval; * CTM-15 score range is 0–100 from worst to best transition.

Figure 5.3 illustrates the distribution of CTM-15 scores at Time 1 and Time 2. The figure shows the majority of CTM-15 scores varied from 60 to 70. At both time points only one person had a score below 50. Further, CTM-15 scores were not normally distributed at either time point.

Figure 5.3

Distribution of Care Transition Measure (CTM-15) scores at Time 1 and Time 2

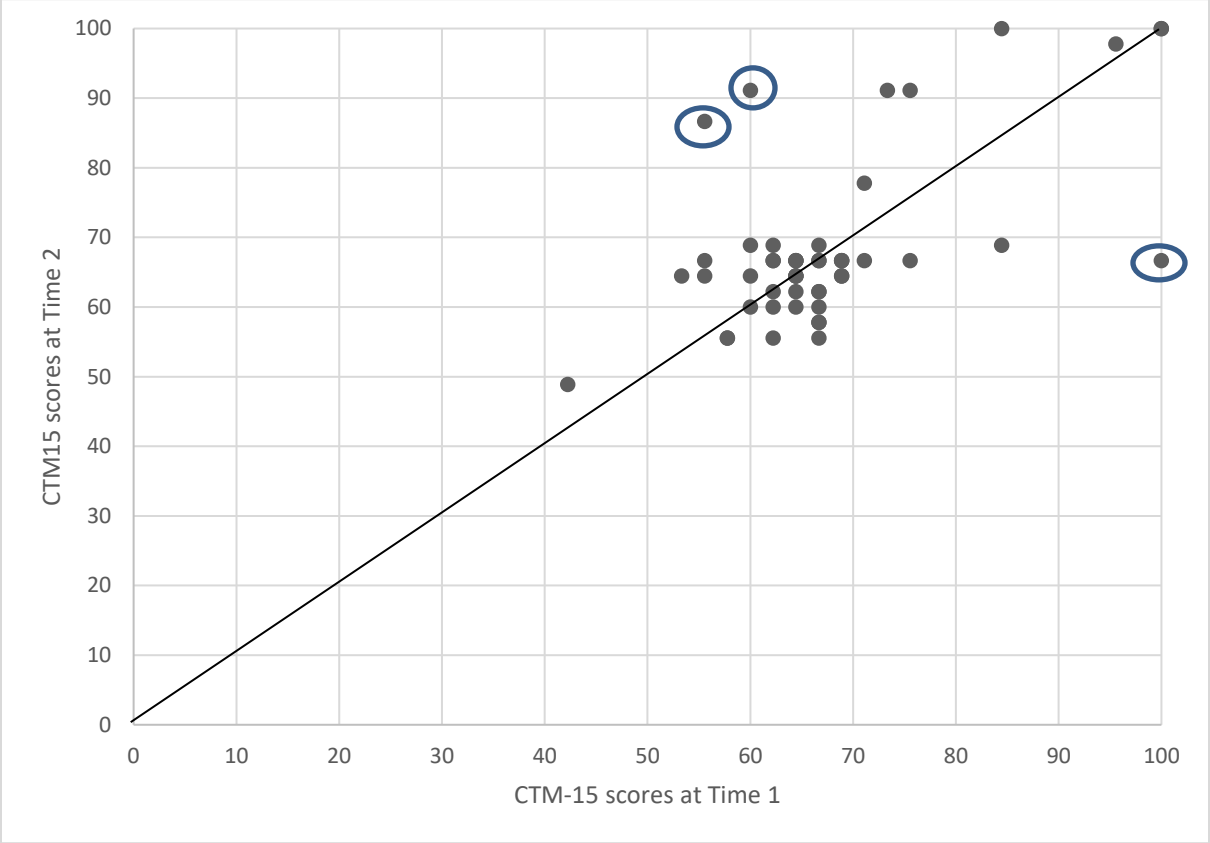


Note. CTMT1= CTM-15 scores at 2 to 6 days post discharge; CTMT2= CTM-15 scores at 28 to 32 days post discharge; normal curve has been superimposed on the histogram.

Figure 5.4 illustrates the distribution of the CTM-15 scores using a scatterplot. In nine cases (18%) the score at Time 1 was exactly the same as the score at Time 2. In three cases the difference between Time 1 and Time 2 scores was more than 30 points.

Figure 5.4

Scatterplot of Care Transition Measure score at Time 1 and Time 2

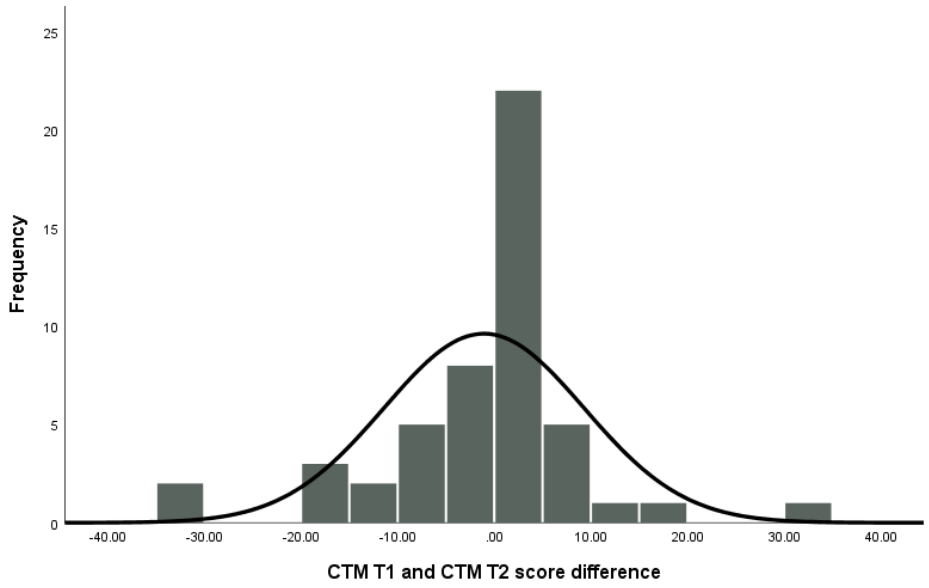


Note. CTM-15 = Care Transition Measure; the dots on the line show cases where there was perfect agreement between Time 1 and Time 2 scores; circles denote when scores differed by more than 30 points.

Figure 5.5 below presents a histogram of the Time 1 to Time 2 change scores. The mean change (SD) score was -1.1 (10.4).

Figure 5.5

Histogram of change scores



Note. CTM T1= Care Transition Measure 15 at Time 1, 2 to 6 days post discharge, CTM T2= Care transition measure at Time 2, 28 to 32 days post discharge; normal curve has been superimposed on the histogram.

5.4.2 Internal consistency

At Time 1 Cronbach's alpha for the CTM-15 was 0.91. At Time 2, Cronbach's alpha was 0.95.

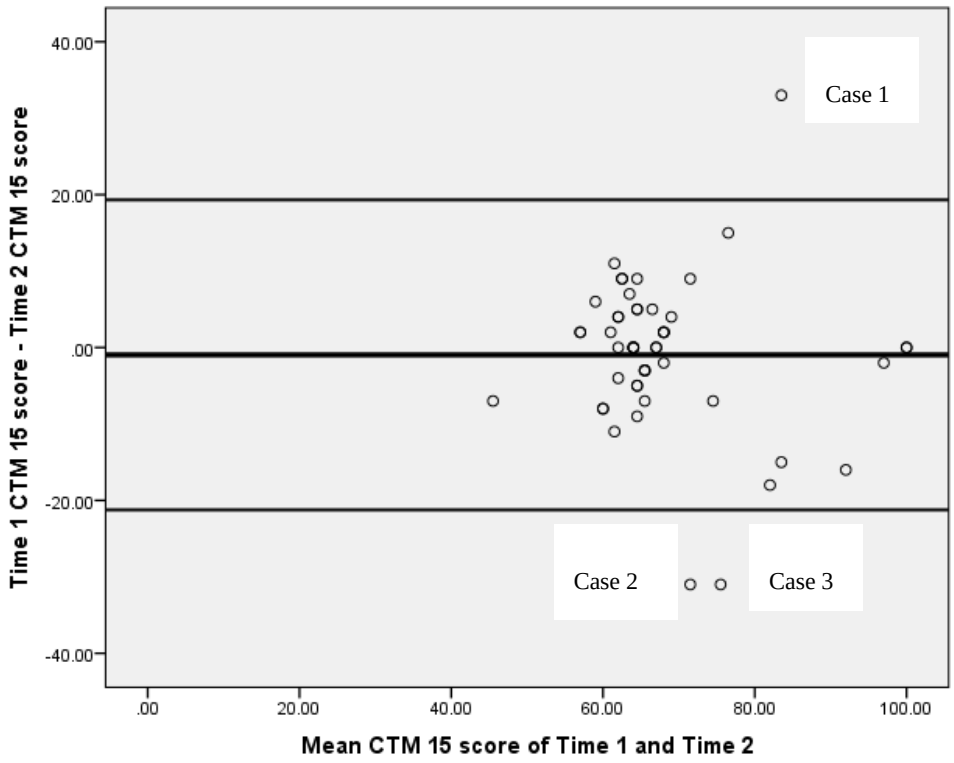
5.4.3 Test retest reliability

5.4.3.1 Bland Altman plot and limits of agreement

Figure 5.6 shows the Bland Altman plot of CTM-15 scores. The plot shows that between timepoint difference scores (y-axis) are centered around zero with a mean change score of -1.1 (i.e., about 1% of the CTM-15 scale's range). The plot also shows there is no systematic pattern of change across the CTM-15 scale. Further, the 95% limits of agreement indicate that a measurement taken at Time 2 will be between 21.4 units less and 19.2 units more than a measurement taken at Time 1.

Figure 5.6

Bland Altman Plots for the difference in Care Transition Measure 15 scores (y-axis) versus the mean (x-axis)



Note. CTM T1 = Care Transition Measure 15 at Time 1, 2 to 6 days post discharge; CTM T2 = Care transition measure at Time 2, 28 to 32 days post discharge; SD = standard deviation; three cases exceeding the limits of agreement were identified.

5.4.3.2 Influential Observations

The Bland Altman plot as well as the scatter plot of CTM-15 scores at Time 1 versus Time 2 identified three potential influential observations (i.e., observations beyond the limits of agreement). A review of all the demographic and health-related variables associated with these three cases revealed no obvious reason for these large change

scores. To understand the impact of these three cases, additional analyses were done. See appendix R for a graphical representation of item by item scores for each of the three influential observations.

For Case 1, the respondent chose “strongly agree” for all 15 items at Time 1 and “agree” for all 15 items at Time 2 (mean item scores: Time 1: 4.0; Time 2: 3.0). This resulted in a Time 1 score of 100 and a Time 2 score of 66.7, for an overall drop of 33.3 points in the total transformed CTM-15 score.

In Case 2, the responses to 11 questions went from 3 (agree) to 4 (strongly agree), while for one question the response changed from disagree to strongly disagree and for another question the response changed from disagree to agree. This resulted in a Time 1 score of 60.0 (mean item score: 2.80) and a Time 2 score of 91.1 (mean item score: 3.7), for an overall increase of 31.1 points in the overall transformed CTM-15 score.

For Case 3, the scores for seven questions went from 3 (agree) to 4 (strongly agree), while for three questions the scores went from disagree to agree and the scores for two questions went from disagree to strongly agree. This resulted in a Time 1 score of 55.6 (mean item score: 2.7) and a Time 2 score of 86.7 (mean item score: 3.6), for an overall increase of 31.1 points in the overall transformed CTM-15 score.

5.4.3.3 Intraclass correlation coefficient

The analysis of variance (ANOVA) tables for the ICC calculations are shown in Table 5.3. Using the full study sample of 50, the single measure absolute agreement $ICC_{2,1}$ (95% CI) was 0.63 (0.43, 0.77), $p<0.001$ and the average measures $ICC_{2,2}$ was 0.78 (0.61, 0.87), $p<0.001$. Both the single measure 2-way random effects, absolute agreement ICC and the corresponding average measures $ICC_{2,2}$ changed considerably

when the three influential cases were removed (single measure: 0.82 (0.70, 0.89); average measures: 0.90 (0.82, 0.94). See appendix O for the analysis of variance table and ICC calculations. As seen in Table 5.3, the mean square error was cut in half, from 53.6 to 24.5 when the three influential observations were removed.

Table 5.3 a and b

ANOVA tables for ICC calculations

Table 5.3a *Using ALL 50 participants*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11750.898	50	235.018	4.382	.001
Intercept	464825.332	1	464825.332	8666.417	.001
Between subject	11722.414	49	239.233	4.460	.001
Time	28.484	1	28.484	.531	.470
Error	2628.127	49	53.635		
Total	479204.357	100			

Table 5.3b *Using 47 participants*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11115.632	47	236.503	9.654	.001
Intercept	430017.243	1	430017.243	17552.371	.001
Between subject	11109.256	46	241.506	9.858	.001
Time	6.375	1	6.375	.260	.612
Error	1126.958	46	24.499		
Total	442259.833	94			

Note. df = degrees of freedom.

5.4.4 The standard error of measurement (SEM)

The SEM (95% CI) was 7.3 (6.1, 9.1) using the 50-patient sample, and 5.0 (4.1, 6.2) using the 47-patient sample.

5.4.5 Impact on variance estimates

To assist in understanding the impact of influential observations on the reliability measures, additional analyses were performed to calculate variance estimates (Appendix S). As seen in Table 5.4, the three cases with large CTM-15 difference scores had a substantial impact on the assessment of reliability. As well, the proportion of the total variance attributable to error (error variance/total variance) changed from 36.3% (53.64/147.93) when the full study sample was used to 18.5% (24.50/132.62) when the influential cases were removed. Further, using the 50-patient sample, for 95% of individuals a measurement taken at Time 2 would be between 21.4 units lower and 19.2 units greater than a measurement taken at Time 1. However, after removing the three influential observations the 95% limits of agreement were -14.2 and 13.2.

Table 5.4

Summary of findings from reliability analyses both with and without the influential cases

Analysis of Variance	n=50	n=47
Between-subject mean square (p-value)	239.23 (<0.001)	241.51 (<0.001)
Time mean square (p-value)	28.48 (0.47)	6.38 (0.61)
Error mean square	53.64	24.50
Variance due to time	-0.50	-0.39
Variance due to between-subject	94.79	108.50
Total variance	147.93	132.62
F statistic (p-value)	4.46 (<0.001)	9.86 (<0.001)
ICC and SEM	n=50	n=47
ICC $_{(2.1)}$	0.63 (0.43-0.77)	0.81 (0.70-0.89)
SEM	7.3 (6.1, 9.1)	5.00 (4.1, 6.2)

Note. n = 47 is with the three influential cases removed; $ICC_{(2,1)}$ = 2-way random effects, absolute agreement, intraclass correlation coefficient; SEM = standard error of measurement.

5.4.6 Impact on CTM-15 scores

As seen in Table 5.5, the removal of the three influential cases had little impact on estimates of scale internal consistency reliability at either time point. Further, measures of central tendency were only minimally impacted.

Table 5.5

Care Transition Measure 15 scores by time period

	CTM-15 scores Time 1		CTM-15 scores Time 2	
	n=50	n=47	n=50	n=47
Cronbach's alpha	0.91	0.90	0.95	0.95
CTM-15 mean (SD)	67.6 (11.7)	67.4 (10.8)	68.7 (12.5)	67.90 (12.2)
CTM-15 median (IQR)	65.6 (6.7)	66.7 (6.7)	66.7 (6.7)	66.7 (4.4)
CTM-15 min-max (range)	42.2–100 (57.8)	42.2–100 (57.8)	48.9–100 (51.1)	48.9–100 (51.1)

Note. CTM = Care Transition Measure 15; Time 1 = 2 to 6 days post discharge; Time 2 = 28 to 32 days post discharge; SD = standard deviation; IQR = interquartile range; min = minimum score; max = maximum score.

5.4.7 Possible changes to self-assessed health care needs during the study period

As seen in Table 5.6 the health care needs of the study sample may have changed between Time 1 and Time 2. While, the proportion of patients who received new equipment that was suggested by the Occupational Therapist in the rehabilitation hospital increased from Time 1 to Time 2 (65.8% vs 78.9%) and the proportion of people who required unscheduled health care use (i.e., at least one unscheduled health care provider visit and/or an ED visit and/or a hospital admission) increased (6.0% vs 14.0%), these proportional changes were not statistically significant. Those who already had needed equipment (n=13) or who were receiving needed services (n=1) were excluded from this analysis. However, there was a significant increase in the proportion of people who received all new needed services.

Table 5.6

Proportion of patients receiving new needed equipment (n=38), services (n=49) and who attended an unplanned health care provider visit at Time 1 (test) and Time 2 (retest) (n=50)

	Frequency T1	Frequency T2	p-value [b]
Equipment [a]			
All	25 (65.8%)	30 (78.9%)	0.06
Most/some/none	13 (34.2%)	8 (21.1%)	
Services [a]			
All	24 (49%)	40 (81.6%)	<0.001
Most/some/none	25 (51%)	9 (18.4%)	
Unplanned health care use [c]			
No	47 (94.0%)	43 (86.0%)	
Yes	3 (6.0%)	7 (14.0%)	0.29

Note. [a] = only includes those who needed new equipment or new services and excludes if equipment or services = not applicable or had already; [b] = McNemar test; [c] = any emergency department visit, rehospitalization, and/or unscheduled health care provider visits; T1 = Time 1, 2 to 6 days post discharge; T2 = Time 2, 28 to 32 days post discharge.

Validity

5.4.8 Construct Convergent Validity

Table 5.7a presents the construct convergent validity findings using the global assessment question. A significant positive correlation was found between the CTM-15 score at Time 2 and the global assessment question. However, CTM-15 scores did not significantly differ by unplanned use of health care providers at either time point (Table 5.7b).

Table 5.7a

Construct convergent validity, correlation coefficient with 95% CI, n=50

	Correlation with CTM-15 Time 1	Correlation with CTM-15 Time 2
Global assessment question	N/A	0.53*** (0.30, 0.70)

Note. ***Spearman rho correlation significant at $p < 0.001$.

Table 5.7b

Any unplanned health care provider use

	CTM-15 score Time 1		CTM-15 score Time 2	
Any unplanned health care provider use[a]	Yes	No	Yes	No
Median	66.7	64.4	64.4	66.7
Mean	63.0	67.9	63.5	69.6

Note. a = unplanned health care provider use includes emergency department visit, any rehospitalization, and/or any unscheduled health care provider visit; no significant differences at either Time 1 or Time 2; Mann Whitney U test performed.

5.4.9 Construct Discriminant Validity

Table 5.8 presents the construct discriminant validity results using the CTM-15 at Time 1 and age, FIM at discharge and length of stay. Results indicate that as age increased the CTM-15 scores decreased and as FIM scores at discharge increased (patient function improved) the CTM-15 scores increased.

Table 5.8

Construct discriminant validity at 2 to 6 days post discharge, n=50

Variable	Correlation coefficient (95% CI)
Age	- 0.32* (-0.55, -0.05)
FIM score at discharge	0.35* (0.08, 0.58)
Length of stay (days)	0.13 (-0.15, 0.34)

Note. *Spearman rho correlation significant at $p < 0.05$; CI = confidence interval.

5.5 Discussion

This study aimed to determine the internal consistency of the CTM-15, the test retest reliability of the CTM-15 and the construct validity of the CTM-15 when used in an older inpatient rehabilitation sample who were transitioning to a home environment.

When using the full sample of 50 participants, Cronbach's alpha was high (Time 1: 0.91; Time 2: 0.95) (Portney & Watkins, 2015, Streiner et al., 2015). These findings are similar to those previously reported in the literature. For example, Anatchkova et al. (2014) reported a value of 0.93 when the CTM-15 was used to evaluate the care transition experience of American adults hospitalized for acute coronary syndromes and Coleman et al. (2005) reported a value of 0.93 as they examined care transitions of adults hospitalized for chronic obstructive pulmonary disease, congestive heart failure, stroke or hip fracture. The only study to examine the psychometric properties of the CTM-15 in an inpatient rehabilitation sample was McLeod et al. (2013), who found a Cronbach's alpha of 0.94.

Everyone was able to provide a quantitative response to each CTM-15 item during both administrations suggesting that the items are clearly worded and understandable. Although 6% of the study sample selected the highest response (strongly agree, [4]) for all of the CTM-15 questions, similar to the 8.7% reported by Anatchkova et al. (2014), according to criteria provided by McHorney & Tarlov (1995), the CTM-15 does not demonstrate ceiling or floor effects. However, as also noted by Anatchkova et al. (2014), only 2% of the study sample provided scores in the lower half of the scale's range possibly suggesting responders may have a tendency to recall their transitional care experience positively (i.e., acquiescence bias).

The ICC, absolute agreement, is the ratio of the between subject variability to the total variability (between subject variability, variability due to repetition, and measurement error) (Kim, 2003). Our estimate of the single measures $ICC_{2,1}$ was lower than expected (0.63). Portney & Watkins (2015) have suggested that one reason for a lower than anticipated ICC is a lack of variability between subjects. However, as seen in the ANOVA tables, the F ratio for between subject variability (4.5) was significantly different from zero ($p<0.001$), suggesting the CTM-15 did discriminate between subjects. As well, the F ratio for variability due to time (28.8) was not significantly different from zero ($p = 0.47$), suggesting the CTM-15 scores were stable across time. These two findings support the discriminative ability of the CTM-15. However, the error findings in the analysis suggest a more plausible explanation for the lower than expected $ICC_{2,1}$. This was revealed by our exploration of the three influential observations identified in the Bland Altman plot. The error mean square was 53.6 in the full sample (n=50) and dropped 54% to 24.5 with the removal of the three influential observations. This changed the proportion of the total variance attributable to error from 36.3% (n = 50 sample) to 18.8% (n = 47), causing the single measure $ICC_{2,1}$, to change from 0.63 (n = 50) to 0.81 (n = 47). With no logical underlying explanation for the occurrence of the three influential observations upon repeated testing, we concluded that there was no rationale for their exclusion from the data set. Furthermore, their identification suggests that substantial error can exist in CTM-15 scores that is attributable to large fluctuations in raw scoring, that are within normal limits, on repeated testing. The error associated upon repeated testing with the CTM-15 is easily conveyed by large limits of agreement and the

SEM, which was 7.0. This value is comparable to the value reported by McLeod et al. (2013) of 7.8.

Finally, the average measures $ICC_{2,2}$ finding (0.78) suggests better agreement can be attained if an averaged CTM-15 score were to be used; but this should only be done for operational reasons and not simply to obtain a higher ICC (Shrout & Fleiss, 1979; Streiner et al., 2015). The patient care transition experience is a complex concept that is challenging to measure (LaVella & Gallan, 2014). As there is no universally accepted operational definition or an established set of key dimensions (LaVella & Gallan, 2014), any patient care transition measure will likely provide an inexact assessment of the actual care transition experience. Further, it has been postulated that recall of the care transition experience can change over time as health status changes (LaVela & Gallan, 2014) and may be impacted by such factors as mood and salience (Stull et al., 2009). Further, patients may gain insight into their health status over time and/or they may physically and emotionally adjust to their health condition, thereby changing their recollection of their earlier experience (Stull et al, 2009). As a result, a single evaluation may not provide an accurate assessment of the care transition experience; using the average of two test administrations may provide a more stable picture of the care transition experience. Additionally, Portney & Watkins (2015) state:

> *There are times when, however, the mean of several raters or ratings may be used as the unit of reliability. … Using mean scores has the effect of increasing reliability estimates, as means are considered better estimates of true scores, theoretically reducing error variance.*

In the current study, we found a large error component, and by using the mean of two measures we were able to reduce error variance thereby providing a more reliable estimate of the patient care transition experience (Portney & Watkins, 2015).

As well, in the current study, there were three influential cases; however, there was no substantial reason to remove these cases. This may indicate fluctuations in recollection of the underlying phenomena. While the proposed strategy of averaging two CTM-15 scores may add increased complexity to future studies, the remaining analyses in this dissertation should use the average of Time 1 and Time 2 CTM-15 scores to optimize the reliability of the current study findings.

The findings from the assessment of construct validity were mixed. While the current study findings echo those of McLeod et al. (2013) who also found that the CTM-15 was significantly correlated with a global assessment of patient experience, these authors examined the correlation between CTM-15 scores taken at 3 to 4 weeks post discharge and a global assessment. Similar to this study's findings, Anatchkova et al. (2014) found a significant negative relationship between three age categories (less than 64, 64 to 75 and 75+) and CTM-15 scores taken at 3 to 4 weeks post discharge among 1545 patients receiving hospital-based cardiac rehabilitation ($F: 4.3$, $p<0.05$). As well, Coleman et al. (2005) found a significant negative correlation with age ($r = -0.16$, $p=0.03$) among 200 people recently discharged with a primary diagnosis of chronic obstructive pulmonary disease, congestive heart failure, stroke or hip fracture. However, Parry et al. (2008) did not find a significant association between age categorized as less than 65 years, 65 to 74 years and 75 or more years (mean age: 67 years) and CTM-15 scores among adults aged 18 to 90 years who had been hospitalized within the last 12

months and did not live in a long-term care home (sample size: 223). These discrepant findings may be due to differing sample sizes, sample characteristics, and unmeasured confounders.

The current study did not find a statistically significant relationship between CTM-15 scores and unplanned health care provider use (a measure likely indicating a challenging recovery). This finding is in contrast to that of Anatchkova et al. (2014), who found a significant negative relationship between CTM-15 scores and emergency department readmissions (another measure suggesting a challenging recovery) within one month of hospital discharge (lower CTM-15 scores with a reported emergency department readmission) ($F: 3.8$, $p<0.05$). However, CTM-15 scores only differed by 2.3 points (mean CTM-15 scores: no emergency department visit: 74.3 versus at least one emergency department visit: 72.0) and the current study was underpowered to detect such a difference. With our sample size ($n = 50$), we were only able to detect a 6.5 point difference in known groups, while Anatchkova et al. (2014) were able to detect 2 to 3 point differences with a larger sample size ($n = 1545$).

This study is the only study to date that has determined the test retest reliability of the CTM-15. Limitations include that the inpatient units selected for this study were from a single specialty hospital. This study also excluded those with cognitive deficits and those who resided in long-term care thus prohibiting generalization of the study findings to this groups of patients. As well, this study used only a quantitative approach and future studies may indicate the need for accompanying qualitative comments to fully capture the patient care transition experience. McLeod et al. (2013) captured, through qualitative analysis, their participant's comments, which were related to the scale administration,

scale responses and relationships with staff. Further qualitative research could assist with understanding the complex experience of care transitions.

In addition, patients may mean different things when selecting a particular response option to a CTM-15 item such as “strongly disagree”. Such variability in interpretation may lead to increased measurement error limiting the tool’s use as a discriminative index. Future studies could use cognitive interviewing following tool administration to identify any variability in interpretation. Additionally, when the 11 patients for whom we had only demographic, and not CTM-15 data, were reviewed, they had lower FIM at discharge scores, which may have impacted the range of CTM-15 scores and may have increased score variability.

5.6 Conclusion

Based on a review of CTM-15 scores at Time 1, Time 2 and averaged across Time 1 and Time 2, the averaged CTM-15 score based on the full study sample demonstrates both internal consistency and test retest reliability. As a result, for Study 2 (Chapter 6) and Study 3 (Chapter 7) of this dissertation, averaged CTM-15 scores were used. This study also provided some evidence of convergent and discriminant validity.

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CHAPTER 6

STUDY 2

Factors associated with care transitions from rehabilitation to home

6.1 Introduction

The patient care transition experience is a complex phenomenon (Coleman et al., 2002; Coleman & Boult, 2003; Coleman & Berenson, 2004; Coleman et al., 2004) that is challenging to measure (LaVela & Gallan, 2014). Despite these challenges, factors associated with the patient care transition experience have been identified in the literature among patients receiving care in both acute care and in rehabilitation settings. In studies among acute care patients and in studies among patients receiving cardiac rehabilitation in an acute care setting that used the 15 item Care Transitions Measure (CTM-15) to assess the patient care transition experience, increased age, lower education, and poor self-rated health status have been shown to be associated with lower CTM-15 scores (Anatchkova et al., 2014; Coleman et al., 2005; Parry et al., 2008). The relationship of patient sex to the care transition experience has been mixed. Some studies have found that male patients have a worse care transition experience (Coleman et al., 2005), while other studies have noted that females have a worse care transition experience (Anatchkova et al., 2014). The association between length of stay and the CTM-15 score also remains unclear. It was found to be positive in one study set in an acute care setting (Coleman et al., 2005) but negative in another study set in a rehabilitation setting (McLeod et al., 2013).

In studies using a qualitative approach, several themes associated with a positive care transition experience have been identified, including the patient's need to have a

positive relationship with caregivers and to maintain independence and function upon returning home (Toscan et al., 2012; Harvey et al., 2017; Allen et al., 2018; Mitchell et al., 2018). In studies that used 30-day readmission rates as a proxy for care transition experience, female sex, increased length of stay, poor physical function and number of comorbidities were significantly associated with greater recidivism (Misky et al., 2010; Shih et al., 2015; Fisher et al., 2016; Shih et al, 2016). However, in both acute care and inpatient rehabilitation, functional measures (as assessed with the admission motor Functional Independence Measure [FIM]) outperformed a count of comorbidities in predicting 30-day readmission rates (Shih et al., 2015; Shih et al., 2016).

6.1.1 Objectives

The objectives of this study were to identify the factors associated with the care transition experience among older adults transitioning from an inpatient rehabilitation hospital to home.

6.2 Methods

6.2.1 Study Design

A prospective observational research design was used for this study. Data were collected at the initial patient interview, which was conducted up to seven days prior to discharge (Time 0), then at 2 to 6 days after discharge (Time 1) and again at 28 to 32 days post discharge (Time 2). This study received appropriate institutional approvals from Western University's Health Sciences Research Ethics Board (HSREB) and Lawson Health Research Institute (Appendix A for the HSREB number). All participants gave written informed consent.

6.2.2 Study participants

From September 2016 to March 2017, participants were recruited from an inpatient rehabilitation hospital in Southwestern Ontario. Participants were recruited from two specialized clinical care units within the hospital, the Geriatric Rehabilitation Unit (GRU) and the Musculoskeletal Unit (MSK). Participants were older adults discharged to a home environment in the community from either of the two inpatient rehabilitation hospital units.

Inclusion criteria were: patients at least 60 years of age, able to read/understand English, able to provide written consent, able to make health care decisions independently without the need of a Substitute Decision Maker, and soon (within seven days) to be discharged from the inpatient GRU or MSK unit to a non-institutional environment. Patients who were deemed by the unit's Resource Nurse as not cognitively able to provide follow up via telephone were excluded. Similar to other studies (McLeod et al., 2013; Parry et al., 2008), people either returning to long-term care or who were being admitted to long-term care were excluded from the study.

6.2.3 Data collection

Prior to discharge, demographic data were collected including, age (year of birth), sex, education, (less than high school, high school, some college/university, college/university), and discharge location (home alone, home with spouse/partner, home with family, retirement home). Comorbidity data were collected with the Self-administered Comorbidity Questionnaire (Sangha et al., 2003). Equipment and services data collected at Time 0 consisted of a chart review of the equipment and services

ordered for the patient post discharge and to be put in place upon the patient's return home.

At Time 1 and Time 2 patients completed the CTM-15 questionnaire by phone and were asked questions regarding equipment ordered and received, services (e.g.,, home care services such as nursing, personal care, physiotherapy) ordered and received, any scheduled health care provider visits (HCP), any unscheduled HCP visits, any Emergency Department visits, and any rehospitalizations. Following all data collection, length of stay and FIM data were obtained from the hospital's Quality Measurement and Clinical Decision Support team, as well as information regarding hospital readmission and emergency department visits in the 30 days following hospital discharge.

Collected as part of the National Rehabilitation Reporting System from participating adult inpatient rehabilitation facilities and programs across Canada (CIHI, 2020) functional capacity of patients attending a rehabilitation hospital is assessed with the FIM. Thirteen FIM items assess four aspects of physical function (self-care, sphincter control, transfers, locomotion) and five items assess two aspects of cognitive function (communication and social cognition) (Zeltzer, 2011). All 18 items are scored from 1 (total assistance in all areas) to 7 (total independence in all areas) for a total maximum score of 126.

6.2.4 Study Dependent and Independent Variables

The following two sections outline the dependent and independent variables used in this study.

6.2.4.1 Dependent variable – Care Transition Measure 15

The study dependent variable, patient care transition experience, was measured using the CTM-15. The CTM-15 is a 15 item self-report patient experience assessment questionnaire that assesses the quality of a care transition from the hospital from the perspective of the patient. The CTM-15 items are answered using a four-point Likert scale (Strongly agree [4], agree [3], disagree [2], strongly disagree [1]) with an additional option for "Don't know/don't remember/not applicable". For each patient, raw item scores were summed, averaged and transformed for a score on a scale from 0 to 100 (Coleman, 2005a). The transformed score reflects the quality of the care transition, with a lower score indicating a poorer quality transition, and a higher score indicating a better transition (Coleman, 2005b). This variable was treated as a continuous variable. A copy of the CTM-15 and the scoring guide are included as Appendix B and C respectively.

Based on a review of psychometric properties of the CTM-15 at Time 1, Time 2 and averaged scores across Time 1 and Time 2 (Chapter 5), the averaged CTM-15 score based on the full study sample (n = 50) demonstrated both internal consistency and test retest reliability. As a result, for this study the averaged CTM-15 scores were used to assess the transitional care experience of older adults transitioning from a rehabilitation setting to home.

6.2.4.2 Independent variables

Based on previous literature, the independent variables chosen for this study were age, sex, education, length of stay and function as measured by the FIM. On both units, function was measured both on admission and just prior to discharge. While studies conducted in both acute care and inpatient rehabilitation (Shih et al., 2015; Shih et al.,

2016) have shown that admission FIM motor scores were significantly associated with 30-day readmission, it was thought that FIM at discharge scores might be a better representation of a patient's ability to function independently or with support as they transitioned home. To see which FIM score would explain more of the variance in averaged CTM-15 scores, it was decided that models that included age, sex, education, length of stay and FIM score at admission would be generated and compared to models that included age, sex, education and length of stay but instead of FIM at admission, FIM at discharge. The independent variables age, FIM score at admission and discharge, and length of stay were treated as continuous variables and sex and education were treated as dichotomous categorical variables. The reference category for sex was female and the reference category for education was completed college and/or university degree. Details regarding the specifics of how these data elements were collected and then used in the reported analyses are provided in Appendix T.

6.2.5 Sample size calculation

A data file from a previous study (Chapter 5) was used to examine factors associated with CTM-15 scores among older adults transitioning from a rehabilitation hospital to home. Based on the need to have at least 10 observations for each predictor variable in a linear regression model (Cohen, 1992; Austin & Steyerber, 2015; Hanley, 2016), it was determined the relationships amongst the study independent variables (age, sex, education, length of stay and function) and the dependent variable (averaged CTM-15 scores) could be examined with the existing data file that included 50 participants.

6.3 Data analysis

All data were analyzed using IBM SPSS Statistics Version 25. Descriptive statistics were summarized with the appropriate parametric or nonparametric statistic and a summary table was generated. Distributions of continuous variables were examined both statistically and visually (Shapiro and Wilk, 1965). When non-normal distributions were encountered, both means and medians and their respective indicators of variation were reported. Floor and ceiling effects were deemed to be present if more than 15% of the CTM-15 scores were at the scale limits (McHorney & Tarlov, 1995).

Next, associations amongst the study independent variables were examined. For relationships between continuous variables, Spearman rho correlations were generated. The Fisher's exact test was used to assess relationships between categorical variables, and the Mann Whitney U test was used to assess relationships between categorical and continuous variables. A significance level of 0.05 was used to identify significant bivariate relationships.

Then, bivariable linear regression models were generated to assess simple relationships between averaged CTM-15 scores and age, sex, education length of stay, FIM on admission and FIM on discharge. Subsequently, a multivariable linear regression model of averaged CTM-15 scores that included age, sex, education, length of stay and FIM on admission was generated. A backward elimination approach was then used to generate a reduced model. Independent variables were sequentially removed from the full model. The least significant variable was removed first, and the model was rerun. This process continued until the p-values associated with each of the remaining independent variables was less than or equal to 0.20 (Dunkler et al., 2014). Potential confounding was

deemed to be present if there was at least a 10% change in the unstandardized beta regression coefficient between the simple and final reduced model (Portney & Watkins, 2015).

Next, a multivariable regression model that included age, sex, level of education, length of stay and FIM on discharge was generated to determine if a model of the transitional care experience that used functional assessment on admission explained more of the variance in averaged CTM-15 scores than models that used functional assessment on discharge. Again, a full model that included age, sex, education, length of stay but this time FIM at discharge was generated and then reduced using the backward elimination approach described above.

In the simple and reduced regression models, regression coefficients associated with age are reported in 10-year age increments. Regression coefficients associated with FIM on admission and FIM at discharge are reported in 10-point increments.

Finally, model diagnostics were performed. Specifically, the assumptions of linear regression that were tested included linearity, homoscedasticity, normality, singularity, multicollinearity and influential data (Tabachnick & Fidell, 2013; Institute for Digital Research and Education Statistical Consulting, 2019). Linearity was tested using scatterplots of standardized residual values and standardized predicted values. Homoscedasticity was tested using scatterplots of the dependent variable with the continuous independent variables. The normality of the distribution of the dependent and independent variables was assessed through the Shapiro-Wilk test (Shapiro & Wilk, 1965). Probability-probability (P-P) plots of standardized residuals of the dependent variable and independent continuous variables were generated and assessed.

Multicollinearity and singularity were assessed using a correlation matrix of continuous variables. Collinearity statistics in SPSS were also generated. Specifically, the Variance Inflation Factors (VIFs) were examined to assess multicollinearity. Values below 10 were considered acceptable (Institute for Digital Research and Education Statistical Consulting, 2019).

6.4 Results

6.4.1 Sample Characteristics

Although 64 patients were identified as eligible for this study, three people were subsequently admitted to another program. As a result, initial demographic data were available for 61 consented people. Eight patients were unavailable for follow up and three patients had only one set of CTM-15 scores, leaving 50 patients with complete data for analysis. All 50 patients responded to each question at both time points; no questions were left unanswered. The demographic and health-related characteristics of the 11 excluded patients is shown in Appendix P. Although they were not significantly different from the study sample by age, FIM on admission, length of stay, number of comorbidities, discharge location, level of education or by sex, excluded patients did have significantly lower FIM scores at discharge.

As seen in Table 6.1, more than three quarters of the study sample was female with a mean age of 80.4 years (standard deviation [SD]: 8.5). Age was the only continuous variable that was normally distributed. Twenty-two people (44%) had at least some post-secondary education. FIM at admission and discharge, length of stay and comorbidities all had skewed distributions.

Table 6.1

Study participant demographic and health-related characteristics at initial assessment (n=50)

Sample Characteristics	Frequency[a] (Percent)
Sex	
Female	38 (76)
Male	12 (24)
Education	
Some college/university or less	35 (70)
College/university degree	15 (30)
Discharge living arrangements	
Home alone	29 (58)
Home with spouse, family, retirement home	21 (42)
Age in years	
Median (IQR)	81 (13)
Mean (SD)	80.4 (8.5)
Minimum-maximum	63–97
Length of stay in days	
Median (IQR)	27 (10)
Mean (SD)	25.7 (9.2)
Minimum-maximum	8–54
FIM at admission	
Median (IQR)	84 (20)
Mean (SD)	81.8 (11.3)
Minimum-maximum	52-99
FIM at discharge	
Median (IQR)	111 (8)
Mean (SD)	108.7 (8)
Minimum-maximum	84–120

Note. [a] unless otherwise stated; SCQ = Self-administered Comorbidity Questionnaire; IQR = interquartile range; SD = standard deviation; FIM = Functional Independence Measure, range 18–126, worst to best.

6.4.2 Averaged CTM-15 score characteristics

The mean of the averaged CTM-15 score was 68.2 (SD: 10.9); however averaged CTM-15 scores were non normally distributed. Further, the median of the averaged CTM-15 score was 65.0 with an interquartile range of 7.2. Although three people had an

averaged CTM-15 score of 100, the maximum possible score, there were no floor effects or ceiling effects based on a 15% threshold (McHorney & Tarlov, 1995).

6.4.3 Relationships among the study independent variables

The relationships among the independent continuous variables are presented in Table 6.2. The table shows that among the continuous variables, only age and length of stay were not significantly correlated. As expected, as age increased function decreased significantly. As well, length of stay tended to be longer for those with poorer function.

Table 6.2

Spearman rho correlations among continuous study independent variables (95% CI)

Variable	Age	FIM at admission	FIM at discharge	Length of Stay
Age	--			
FIM at admission	-0.39** (-0.60, -0.13)	--		
FIM at discharge	-0.32 * (-0.55, -0.05)	0.69** (0.51, 0.81)	--	
Length of stay	0.13 (-0.15, 0.40)	-0.43** (-0.63, -0.17)	-0.45** (-0.65, -0.20)	--

Note. *: $p<0.05$; **: $p<0.01$; FIM = Functional Independence Measure

Using a Mann Whitney U test, relationships between sex and each of the continuous variables age, FIM on admission, FIM at discharge, and length of stay were found to be not statistically significant ($p>0.05$). Additionally, the relationships between education and the study continuous independent variables were not statistically significant ($p>0.05$). Using a Fisher's exact test, the relationship between sex and education was also found to be not significant ($p>0.05$).

6.4.4 Simple, Full and Reduced Regression Models

Simple regression results are given in Table 6.3. In simple linear models, age and FIM on admission were significantly associated with averaged CTM-15 scores ($p<0.05$). Age accounted for 9.4% of the total variance in averaged CTM-15 scores while FIM on admission accounted for 8.6% of the total variance in averaged CTM-15 scores. Further, the unstandardized regression coefficient associated with FIM on admission was larger than that associated with FIM on discharge (2.85 vs. 2.15); however, confidence limits overlapped.

Table 6.3

Simple models of averaged CTM-15 scores (n=50)

Independent variable	Unstandardized regression coefficient (95% CI)	R^2	Model F	Model Significance
Age	-3.93 (-7.47, -0.38)	0.094	4.96	0.031*
Sex	1.55 (-5.80, 8.89)	0.004	0.18	0.674
Education	-2.71 (-9.52, 4.10)	0.013	0.64	0.428
FIM at discharge	2.15 (-1.72, 6.02)	0.025	1.25	0.269
Length of stay	0.15 (-0.19, 0.49)	0.017	0.81	0.372
FIM on admission	2.85 (0.16, 5.53)	0.086	4.54	0.038*

Note. Unstandardized β reported, Age (10-year increment); Sex (0=female; 1=male); Education (0=any college or university,1= all others); FIM at discharge and admission in 10-unit increments; Length of stay (days), *: $p<0.05$.

Multivariable linear models that included FIM on admission were then generated. A reduced model that included age, LOS, and FIM on admission explained 18.8% of the total variance in averaged CTM-15 scores (Table 6.4). Controlling for other covariates in the reduced model, for every 10-year increase in age there was approximately a three-point decrease in the CTM-15 score. As well, for every 10-point increase in the FIM on admission score, the CTM-15 increased by 2.7 points. Finally, controlling for other

covariates in the model, for every single day increase in length of stay, the averaged CTM-15 score increased by about one third of a point.

Table 6.4

Backwards stepwise regression models of averaged CTM-15 scores that included FIM on admission (n=50)

Model	Variables	Unstandardized regression coefficient (95% CI)	T	T sign	R^2	Model F	Model Sign
Full	Age[a]	-3.17 (-6.95, 0.61)	-1.69	0.098	0.197	2.158	0.076
	Sex[b]	1.84 (-5.25, 8.93)	0.52	0.604			
	Education[c]	-1.24 (-7.80, 5.32)	-0.38	0.705			
	FIM admission[d]	2.59 (-0.37, 5.56)	1.76	0.085			
	Length of stay[e]	0.30 (-0.05, 0.64)	1.75	0.088			
Reduced	Age[a]	-3.07 (-6.76, 0.61)	-1.68	0.100	0.188	3.551	0.021*
	FIM admission[d]	2.73 (-0.16, 5.61)	1.90	0.063			
	Length of stay[e]	0.29 (-0.04, 0.63)	1.78	0.082			

Note. [a] = Age (10-year increments), [b] = Sex (0 = female; 1 = male); [c] = Education (0 = college or university degree, 1 = all others); [d] = FIM on admission (10-unit increments), [e] = length of stay (days), * $p<0.05$; sign: significance.

Regression diagnostics conducted on the reduced model revealed no gross violations in linearity, normality, homoscedasticity, multicollinearity, and influential data. Residuals were normally distributed and all VIF values were below 1.5 suggesting the redundancy of variables was within acceptable limits.

Next, multivariable models that included FIM at discharge were generated. As seen in Table 6.5, a reduced model that included age, LOS and FIM at discharge explained 15.7% of the variance in averaged CTM-15 scores. For the model using FIM at discharge, controlling for other covariates in the reduced model, for every 10-year increase in age there was approximately a four-point decrease in the CTM-15 score. As

well, for every 10-point increase in the FIM at discharge score, the CTM-15 score increased by 2.6 points. For every single day increase in length of stay, the CTM-15 score increased by about one third of a point, controlling for other covariates in the model.

Table 6.5

Backwards stepwise regression models of averaged CTM-15 scores that included FIM on discharge

Model	Variables	Unstandardized regression coefficient (95% CI)	T	T sign	R2	Model F	Model Sign
Full	Age[a]	-4.01 (-7.66, -0.37)	-2.22	0.032	0.168	1.77	0.138
	Sex[b]	1.71 (-5.56, 8.99)	0.48	0.637			
	Education[c]	-1.68 (-8.33, 4.98)	-0.51	0.614			
	FIM discharge[d]	2.45 (-1.62, 6.52)	1.21	0.232			
	Length of stay[e]	0.29 (-0.07, 0.64)	1.62	0.112			
Reduced	Age[a]	-3.98 (-7.53, -0.42)	-2.25	0.029	0.157	2.86	0.047*
	FIM discharge[d]	2.63 (-1.32, 6.59)	1.34	0.186			
	Length of stay[e]	0.29 (-0.06, 0.63)	1.67	0.102			

Note. [a] = Age (10-year increments); [b] = Sex (0 = female; 1 = male); [c] = Education (0 = college or university degree, 1 = all others); [d] = FIM at discharge (10-unit increments); [e] = length of stay (days); * $p<0.05$.

Again, regression diagnostics conducted on the reduced model revealed no gross violations in linearity, normality, homoscedasticity, multicollinearity, and influential data. As well, residuals were normally distributed and all VIF values were below 1.5.

6.4.5 Comparison of models using FIM on admission to models using FIM on discharge

As seen in Table 6.6, in the model that included FIM on admission, the influence of age, FIM and length of stay (-0.24, 0.28 and 0.25, respectively) are more similar than

in the model with FIM at discharge (-0.31, 0.20 and 0.24, respectively). In both models, the association between age and averaged CTM-15 after accounting for the other variables in the equation was negative.

Table 6.6

Standardized regression coefficients in models of averaged CTM-15 scores

Variable	Model with FIM at admission	Model with FIM at discharge
Age	-0.24	-0.31
FIM	0.28	0.20
Length of stay	0.25	0.24

Note. FIM = Functional Independence Measure.

6.4.6 Confounding

Regression coefficients from simple models were compared to those in the final two multivariable models. In models that used FIM on admission as an independent variable, the regression coefficient associated with age changed from -3.93 in simple models to -3.07 in the final reduced model, a net change of -21.8%. Similarly, the regression coefficient associated with FIM on admission changed by 4.2% and the regression coefficient associated with length of stay changed by -93.3%.

In models that used FIM on discharge, the regression coefficient associated with age changed very little from the simple to the final reduced model (-1.3%). However, there was a larger net change in the regression coefficient associated with FIM at discharge (-22.3%) and a net change in the regression coefficient associated with length of stay of -93.3%.

6.5 Discussion

The primary purpose of this study was to identify factors associated with the care transition experience of people transitioning from an inpatient rehabilitation setting to home as measured by the CTM-15. Multivariable linear regression models showed that age, function on admission to inpatient rehabilitation, function on discharge from rehabilitation, and length of stay were significantly associated with the care transition experience. To the best of our knowledge, this is the first study that has examined multivariable associations with CTM-15 scores. Further, the findings suggest that due to complex relationships amongst the CTM-15 and age, function, and length of stay, all three independent variables need to be included in complex models of patient care transition experience that use the CTM-15.

However, previous studies that used the CTM-15 only looked at simple, bivariable relationships making it challenging to compare this study's findings with what has been reported in the published literature. As well, CTM-15 means measured at only one time point have been compared using parametric statistical tests and this study used averaged CTM-15 scores and non-parametric tests due to the skewed distribution of the averaged CTM-15 distribution. For example, among adults hospitalized with acute coronary syndromes, Anatchkova et al. (2014) found that females had significantly lower CTM-15 scores than males (means: males: 74.9 vs. females: 72.1). In the current study, females also had lower CTM-15 scores (unstandardized regression coefficient: 1.55 (95% CI: -5.80, 8.89), but this difference was not statistically significant. Similar to Anatchkova et al. (2014) and contrary to McLeod et al. (2013) who found no significant relationship between age and CTM-15 scores, this study found a significant negative

association between age and CTM-15 scores. However, contrary to Anatchkova et al. findings (2014), this study found no significant association between levels of education and CTM-15 scores. Further, contrary to the findings of McLeod et al. (2013) but similar to those of Coleman et al. (2005), this study found a positive relationship between CTM-15 scores and length of stay. Future larger studies are needed to examine the relationships among sex, education and other possible covariates in models of averaged CTM-15 scores that include age, function, and length of stay.

The final reduced model using FIM at discharge only explained 16% of the total variance in averaged CTM-15 scores. And, the final model using FIM on admission only explained 19% of the total variance in averaged CTM-15 scores. These findings suggest there is a lot of unexplained variance in both final models. This finding is consistent with the multitude of transitional care factors that have been identified in qualitative studies. For example, Toscan, et al. (2012) found that confusion with communication about care, unclear roles and responsibilities, diluted personal ownership over care and role strain due to system constraints resulted in poor transitional care experiences. Harvey et al. (2017) concluded that the experience of transferring between care settings was unpredictable because of multiple disconnected providers and unspecified care paths. The need for education, better communication and information exchange, and self-help initiatives for patients in the community was recommended. Allen et al. (2018) found that the transitional care experience was impacted by the patient's desire to be independent, their need for supportive relationships with family caregivers, their desire for caring relationships with health care providers, their need for information, their need for discussing and negotiating the transitional care plan, and their desire for learning to self-

care. Mitchell et al. (2018) found that feeling cared for by medical providers, having health care system accountability, and feeling capable and prepared to implement their discharge care increased the patient transitional care experience. Future studies using a mixed methods approach and large sample size are needed to further explore the relationships of the numerous identified variables.

While previous studies have shown that FIM on admission was significantly associated with 30-day rehospitalization (Shih et al., 2015; Shih et al., 2016), a proxy measure of the patient care transition experience, we postulated that FIM at discharge might also be important to the self-assessment of the care transition experience. While both measures of function were significantly associated with the care transition experience in complex models, the relationships among function, age, and length of stay varied by model suggesting that FIM on admission may be measuring something different than FIM on discharge. Shih et al. (2015) suggest that FIM scores on admission to rehabilitation might be a surrogate marker of illness severity or a marker of additional risk factors for a worse recovery, such as infection or embolism. FIM at discharge may be less of a measure of complexity, multimorbidity and disease severity and more of a measure of a person's ability to function in a home environment. Future qualitative studies may be able to identify if these two measures of function are actually measuring the same or different concepts.

Unlike age, both FIM on admission and at discharge scores are modifiable factors. FIM scores can change with physical and occupational therapy (Chudyk et al., 2009). As such, quality improvement strategies both in acute care and in rehabilitation settings, could be used to improve both admission and discharge FIM scores. For example, more

rehabilitation during the acute care hospitalization could improve FIM on admission scores leading to a better care transition both from acute care to rehabilitation and from rehabilitation to home.

Some limitations that could impact the generalizability of the results exist in the current study. First, the sample size allowed for the use of only five independent variables. Although, the variables selected were the most common ones identified in the literature, a larger sample size would have allowed for a greater number of variables to be used in the regression modelling.

The demographic and health-related characteristics of the 11 excluded patients may have had an impact on the patient sample. Excluded patients had significantly lower FIM scores at discharge. This result could have decreased the estimates of mean and median CTM-15 scores and decreased variance estimates, since FIM scores are associated with the care transition experience.

A strength of this study is that no other studies in the literature have conducted a multivariable regression analysis of care transition factors. Future research that includes complex regression modelling would assist in replicating the current analyses in this study.

6.6 Conclusion

The results showed that in combination age, function as measured with the FIM, and length of stay were significantly associated with the care transition experience of patients transitioning from an inpatient rehabilitation hospital to home when using an averaged CTM-15. These terms should be modelled together in future studies due to the confounding effects noted in this study.

The overall variance explained by the factors selected for this study was less 20%. This suggests that other factors, perhaps those identified in the literature or still unknown, are key to one's self-assessed care transition experience. Future studies that also measure age, FIM and length of stay in addition to other factors may increase our understanding of the complex phenomena that make up the patient care transition experience.

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CHAPTER 7

STUDY 3

Care transitions from two rehabilitation units: an exploratory study

7.1 Introduction

Increasing numbers of older adults are living with comorbidity and often need to receive the services of multiple health care providers following an acute event such as a fall and hip fracture or a stroke (Arbaje et al., 2014). However, not all older adults are able to transition directly from acute care to home following an acute hospitalization. Sometimes additional health care in another setting may be needed to recover from functional loss associated with the index event. Thus, some older adults are transferred to an inpatient rehabilitation hospital following discharge from acute care. Rehabilitation plays an important role in optimizing physical function in older hospitalized adults (World Health Organization, 2011).

Two specialized clinical treatment units in a Southwestern Ontario rehabilitation hospital are the Geriatric Rehabilitation Unit (GRU) and the Musculoskeletal (MSK) units. Both units focus on older adults. It was thought that a comparison of these two units would yield an increased understanding of transitions among older adults with differing health problems.

The GRU is a 30-bed inpatient rehabilitation unit for older adults who are medically stable and in the recovery phase of a health issue, including exacerbation of chronic illness, and who require hospital-based rehabilitative medical and interdisciplinary care and intervention to maintain or improve their physical, psychosocial, and spiritual well-being (St. Joseph's Health Care London, Geriatric

Rehabilitation Unit, 2020). Patients are typically admitted for 2 to 6 weeks until their health condition is stabilized, or the treatment course is completed. The MSK unit is a 20-bed inpatient rehabilitation unit for older persons living with complex musculoskeletal conditions requiring inpatient interdisciplinary treatment. Admission diagnoses of people admitted to the MSK unit may include hip fracture, total joint replacement, trauma, generalized deconditioned state or neuromuscular disorders (St. Joseph's Health care London, Musculoskeletal Unit, 2020). Depending on patient progress, length of stay is anticipated as 10 to 30 days. On both units, patients have access to physicians, nurses, physiotherapists, occupational therapists, therapeutic recreation specialists, speech language pathologists, audiologists, registered dietitians, social workers, spiritual care chaplains and other health care providers.

The 15 item Care Transition Measure (CTM-15) has been used to evaluate the care transition experience of people moving from acute care to home (Coleman et al., 2005; Parry et al., 2008). However, only two studies have used the CTM-15 to evaluate the care transition of patients moving from a rehabilitation setting to home. Anatchkova et al. (2014) used the CTM-15 to evaluate the care transition experience of 1,545 adults transitioning from acute care-based cardiac rehabilitation to home. McLeod et al. (2014) used this tool to evaluate the experience of 15 older adults living with musculoskeletal problems transitioning from two inpatient rehabilitation units also to home. While both studies examined the tool's psychometric properties and factors associated with the care transition experience, there has been no study to date directly comparing the care transition experience of older adults discharged from two different inpatient rehabilitation specialized clinical treatment units to home.

7.1.1 Objectives

The purpose of this study was to explore and compare the care transition experience of patients discharged from two specialized clinical treatment units within a single rehabilitation hospital.

7.2 Methods

7.2.1 Study Design

A prospective observational study design was used for this study. Data were collected at three times. The initial patient interview (Time 0) was conducted prior to discharge. Patients were then phoned at 2 to 6 days after discharge (Time 1) and 28 to 32 days after discharge (Time 2). This study received the appropriate institutional approvals from Western University's Health Sciences Research Ethics Board and the Lawson Health Research Institute (Appendix A). All participants provided written informed consent.

7.2.2 Study participants

From September 2016 to March 2017, participants were recruited from two specialized clinical treatment units within a rehabilitation hospital. Inclusion criteria were: patients at least 60 years of age, able to read/understand English, able to provide written consent, able to make health care decisions independently without the need of a Substitute Decision Maker, and a planned home discharge (within the next seven days) from the inpatient unit. Patients who were not cognitively able to participate in follow up telephone discussions, as assessed by the unit's Resource Nurse, were excluded. Similar

to other studies (McLeod et al., 2013; Parry et al., 2008), people either returning to long-term care or who were being admitted to long-term care were excluded from the study.

7.2.3 Study data collection

At Time 0, demographic data were collected including, age (year of birth), sex, education, (less than high school, high school, some college/university, college/university), and discharge location (home alone, home with spouse/partner, home with family, retirement home). Comorbidity data were collected with the Self-administered Comorbidity Questionnaire (Sangha et al., 2003). Equipment needs and services required upon discharge as noted by the hospital health care staff were abstracted from the patient's chart.

At Time 1 and Time 2 data collected included the CTM-15 questionnaire, equipment ordered and received, services ordered (e.g.,, home care services such as nursing, physiotherapy and occupational therapy) and received, any scheduled health care provider (HCP) visits, any unscheduled HCP visits, any emergency department visits, and any rehospitalizations. The method of collecting data by telephone for follow up using the CTM-15 has previously been reported and is supported by the literature (Coleman et al., 2005; Parry et al., 2008, McLeod et al., 2013). Patient function was measured with the Functional Independence Measure (FIM) (Linacre et al., 1994). Rehabilitation hospital length of stay and FIM data were obtained from the hospital's Quality Measurement and Clinical Decision Support team, as well as information regarding any hospital readmission and emergency department visits within 30 days of rehabilitation hospital discharge.

7.2.4 Outcome Measure – The Care Transition Measure 15 (CTM-15)

The patient care transition experience was measured using the CTM-15. The CTM-15 is a 15 item self-report patient care transition experience questionnaire. The four response options for the CTM-15 are (Strongly agree [4], agree [3], disagree [2], strongly disagree [1]) with an additional option for "Don't know/don't remember/not applicable". Item scores are summed, a mean is calculated, and the mean is then transformed to a score on a scale from 0 to 100 (Coleman, 2005a). The overall score reflects the quality of the care transition, with a lower score indicating a poorer quality transition, and a higher score indicating a better transition (Coleman, 2005b). Appendix B contains a copy of the CTM-15. The scoring guide is included in Appendix C.

Based on findings reported in chapter 5, which included a review of CTM-15 scores at Time 1, Time 2 and averaged across Time 1 and Time 2, the averaged CTM-15 score demonstrated both internal consistency and test retest reliability. As a result, for this study the averaged CTM-15 scores, the mean of transformed CTM-15 scores at Time 1 and Time 2, were used to assess the transitional care experience of older adults transitioning from a rehabilitation setting to home.

7.2.5 Sample size calculation

For this exploratory study we were interested in quantifying any between unit differences in the CTM-15 score. From chapter 5 and 6 we knew that the data file included information on 25 people who had attended each of the two specialized clinical treatment units. We also knew the mean and variance estimate from the overall sample (mean averaged CTM-15 score: 68.2, standard deviation [SD]: 10.9). A sample size of 25

would allow us to detect a 9-point difference in averaged CTM-15 scores. With a sample size of 25, the 95% confidence interval around the mean CTM-15 scores for each unit would be 63.7 (lower limit), and 72.7 (upper limit).

7.3 Data analysis

All data were analyzed using IBM SPSS Statistics Version 25. Preliminary descriptive analyses of the data were performed to summarize participant characteristics using the appropriate parametric and non-parametric statistics.

7.3.1 CTM-15 characteristics

Statistical and visual assessment of the averaged CTM-15 scores and associated frequency plots stratified by unit were used to assess the distribution normality (Shapiro & Wilk, 1965).

7.3.2 Specialized clinical treatment unit analysis

First, between unit differences of the study independent variables were examined. The relationships between categorical variables were examined with Fisher's exact test and the relationships between continuous variables were examined using a Mann Whitney U test. Next, CTM-15 scores were examined by unit. LaVela and Gallan (2014) note that patient experience measures might be impacted by a person's subjective assessment of their current health status, regardless of their actual experience. We looked at possible health-related changes during the study period by evaluating a proxy measure for patient health status by unit. If patients who required new equipment or new services received all versus most, some or none of the recommended equipment and services, it is possible that they would consider themselves as having better health and so may recall a better care transition experience. If patients had unplanned HCP use, they would likely

feel that their health status had deteriorated and so recall a worse care transition experience. The Fisher's exact test was used to assess relationships between categorical variables using a significance level of 0.05 to identify significant bivariate relationships.

Then unit specific associations between CTM-15 scores and factors found to be associated (from Chapter 6) with rehabilitation care transitions were examined, specifically age, length of stay and FIM scores both at admission and discharge. Next, the characteristics of those who were in the lowest (worst) 25^{th} percentile of averaged CTM-15 scores, that is to say patients considered to be most at risk of having a worse care transition, were compared by unit. Distribution appropriate statistics were performed to identify statistically significant differences. Finally, unit-specific simple logistic regression models were built. Odds ratios associated with the independent variables age, length of stay, FIM on admission and FIM on discharge were generated in models where the dependent variable, the averaged CTM-15 score, was split at the lowest 25^{th} percentile. The reference categories were 0 = averaged CTM-15 NOT in the lowest 25^{th} percentile and 1 = averaged CTM-15 in the lowest 25^{th} percentile. Unit specific odds ratios associated with these simple logistic models were then compared to assess the possibility of a statistical interaction between unit and the independent variable. If the direction of the odds ratio differed, a complex model including the statistical interaction term was generated.

The assumptions of logistic regression reviewed included: a dependent variable measured on a dichotomous scale, the use of one or more independent variables, an independence of observations (no matched or repeated measures data), and a linear relationship between any continuous independent variables and the logit transformation

of the dependent variable (Laerd Statistics, 2018). Model fit and model diagnostics were then examined.

7.4 Results

7.4.1 Sample Characteristics

The generation of the study sample is summarized in Figure 7.2. Although 64 patients were enrolled, initial demographic data were available for 61 as three patients were subsequently transferred to another hospital program. Eight patients were unavailable for follow up and three patients had only one set of CTM-15 scores, leaving 50 patients with complete data for analysis. All 50 patients were able to provide a numeric score for each CTM-15 question at both time points. The final sample consisted of 50 patients with 25 patients from each specialized clinical treatment unit. The demographic and health-related characteristics of the 11 excluded patients is shown in Appendix P. Although excluded patients were not significantly different from the study sample by age, length of stay, FIM on admission, number of comorbidities, discharge location, level of education or by sex, they did have significantly lower FIM scores at discharge.

Figure 7.1

Patient study sample generation

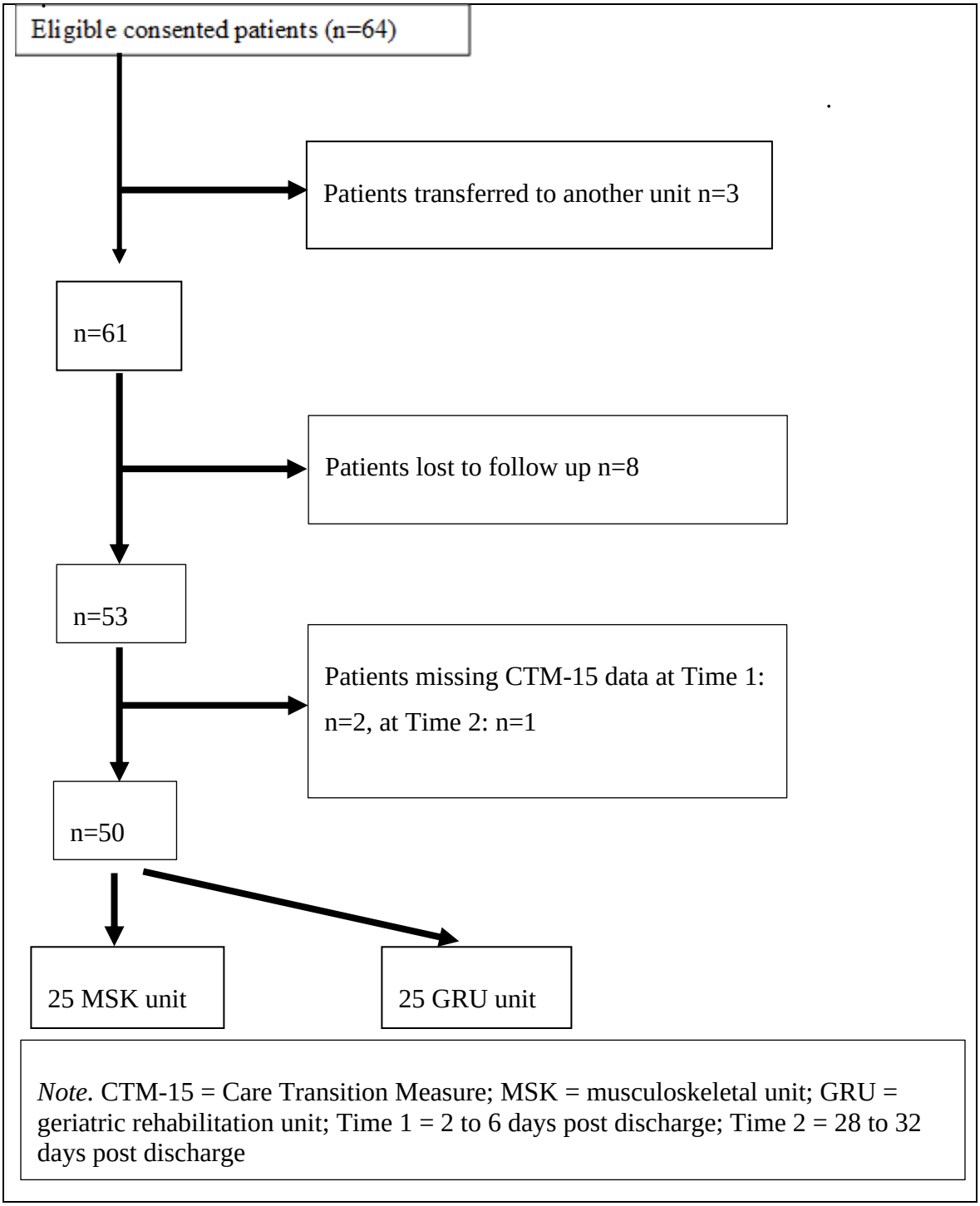


Table 7.1 *Study sample participant characteristics by unit*

Participant characteristic	MSK n=25	GRU n=25	p value
Sex			
Female	21(84%)	17 (68%)	0.18
Education			
Some college/university or less	12 (48%)	16 (64%)	0.25
Completed College/university degree	13 (52%)	9 (36%)	
Discharge living arrangements			
Home alone	17 (68%)	12 (48%)	0.15
Home with spouse, family, retirement home	8 (32%)	13 (52%)	
Transportation			
Drives self	4 (16%)	4 (16%)	0.94
Others drive[a]	21 (84%)	21 (84%)	
Age (years)			
Median (IQR)	77 (12)	82 (12)	0.02*
Mean (SD)	77.6 (8.5)	88.2 (8)	
Minimum - maximum	63 – 92	69 – 97	
Length of stay (days)			
Median (IQR)	27 (11)	28 (10)	1.00
Mean (SD)	26.2 (10.1)	25.2 (8.5)	
Minimum - maximum	10 – 54	8 – 48	
SCQ			
Median (IQR)	8 (7)	9 (9)	0.96
Mean (SD)	9.2 (5.3)	9.3 (5.6)	
Minimum - maximum	2 – 27	2 – 20	
FIM score on admission			
Median (IQR)	87 (10)	80 (15)	0.01*
Mean (SD)	85.4 (10.5)	78.2 (11.0)	
Minimum - maximum	58 – 99	52 – 94	
FIM score at discharge			
Median (IQR)	113 (6)	109 (13)	0.002*
Mean (SD)	112.4 (4.3)	105.1 (9.3)	
Minimum - maximum	101 – 120	84 – 115	
Absolute FIM gain			
Median (IQR)	25 (9)	28 (13)	0.75
Mean (SD)	27.0 (9.7)	26.9 (7.3)	
Minimum – maximum	7 – 53	12 – 39	

Note. MSK = musculoskeletal unit; GRU = geriatric rehabilitation unit; [a] = anything other than drives self including others drive including spouse, family, friends, neighbors, or paid transportation (e.g., cab), also unsure, don't know; SD = standard deviation; IQR = interquartile range; SCQ = Self-administered Comorbidity Questionnaire; * p value < 0.05.

Table 7.1 presents the study sample characteristics stratified by specialized clinical treatment unit. The table highlights that on average, the GRU patients were significantly older with worse (lower) FIM scores on admission and at discharge compared to MSK patients. Patients attending both units had similar increases in FIM scores during their rehabilitation stay. Patients on both units had an increase of over 25 points.

The number and proportion of patients who needed new equipment and received equipment, who needed new services and who had any unscheduled health care provider visits were compared by unit at Time 1 and Time 2. As seen in Table 7.2 While the proportion of people who had received needed equipment, services or attended an unplanned HCP visit increased at Time 2 for both units, only the increase in the proportion of people who received all new needed services increased significantly ($p<0.01$) for both units (Time 1 vs Time 2: MSK: 54.2% vs 87.5%; GRU: 44.0% vs. 76.0% respectively).

Table 7.2

Proportion of patients receiving needed equipment, services and who attended an unplanned health care provider visit at Time 1 and Time 2

	MSK			GRU		
	Frequency T1	Frequency T2	p-value[b]	Frequency T1	Frequency T2	p-value[b]
Equipment[a]						
All	12 (63.2%)	16 (84.2%)	0.12	13 (64.4%)	14 (73.7%)	1.00
Most/some	7 (36.8%)	3 (15.8%)		6 (35.6%)	5 (26.3%)	
Services[a]						
All	13 (54.2%)	21 (87.5%)	0.01	11 (44.0%)	19 (76.0%)	0.01
Most/some/none	11 (45.8%)	3 (12.5%)		14 (56.0%)	6 (24.0%)	
Unplanned health care professional use[c]						
No	24 (96.0%)	22 (88.0%)	0.62	23 (92.0%)	21 (84.0%)	0.62
Yes	1 (4.0%)	3 (12.0%)		2 (8.0%)	4 (16.0%)	

Note. [a] = only includes those who needed new equipment or new services and excludes if equipment or services = not applicable or had already; [b] = McNemar test; [c] = any emergency department visit, rehospitalisation, and/or unscheduled health care provider visit; T1 = Time 1, 2 to 6 days post discharge; T2 = Time 2, 28 to 32 days post discharge.

Then, the number and proportion of patients who needed new equipment and received equipment, who needed new services and who had any unscheduled HCP visits were compared by unit at Time 1 and Time 2. As seen in Table 7.3, there were no significant between unit differences at either time point. Of those who needed new equipment, only 63.2% of people discharged from the MSK unit and 64.4% of people discharged from the GRU had received all needed equipment at 2 to 6 days post discharge. At Time 2, 84.2% of MSK patients had received all needed equipment as well as 73.7% of GRU patients. Only one person discharged from the MSK unit and two people discharged from the GRU had an unscheduled HCP visit at Time 1.

Table 7.3

Proportion of patients receiving needed equipment, services and who attended an unplanned health care professional visit at Time 1 and Time 2

	Time 1			Time 2		
	MSK	GRU	p-value	MSK	GRU	p-value
Equipment[1]						
All	12 (63.2%)	13 64.4%)	1.00	16 84.2%)	14 73.7%)	0.70
Most/some	7 (36.8%)	6 (35.6%)		3 (15.8%)	5 (26.3%)	
Services[1]						
All	13 (54.2%)	11 (44.0%)	0.57	21 (87.5%)	19 (76.0%)	0.46
Most/some/none	11 (45.8%)	14 (56.0%)		3 (12.5%)	6 (24.0%)	
Unplanned health care provider use[2]						
No	24 (96.0%)	23 (92.0%)	1.00	22 (88.0%)	21 (84.0%)	1.00
Yes	1 (4.0%)	2 (8.0%)		3 (12.0%)	4 (16.0%)	

Note. [1] = only includes those who needed new equipment or new services and excludes if equipment or services = not applicable or had already; Time 1 = 2 to 6 days post discharge; Time 2 = 28 to 32 days post discharge; MSK = musculoskeletal unit; GRU = geriatric rehabilitation unit; [2] = any emergency department visit, rehospitalization, and/or unscheduled health care provider visit.

7.4.2 CTM-15 scores by unit

As the averaged CTM-15 scores were not normally distributed (Sharpiro Wilk test, p = 0.001), subsequent analyses used non-parametric statistics. Although both the mean and the median of the averaged CTM-15 scores were lower for GRU patients than among those receiving care on the MSK unit (Table 7.4), this difference was not statistically significant (p=0.14). As well, variability in averaged CTM-15 scores was greater among MSK unit patients than GRU patients.

Table 7.4

Averaged Care Transition Measure (CTM) 15 scores by treatment unit*

	MSK n=25	GRU n=25
Median (IQR)	65.6 (17.2)	64.4 (4.4)
Mean (SD)	71.1 (11.9)	65.2 (9.2)
95% CI	66.2 – 76.0	61.5 – 69.0
Minimum Maximum	58.9 – 100	45.6 – 100
p value	0.14†	

Note. * Averaged CTM-15 scores = the average of Time 1 and Time 2 CTM-15 scores; 95% CI = 95% confidence interval; SD = standard deviation, IQR = interquartile range; † Mann-Whitney U-test for nonparametric data performed.

7.4.3 Associations between study independent factors and averaged CTM-15 scores by unit

In simple, bivariable models, for patients discharged from either the MSK unit or GRU, as age increased the CTM-15 scores decreased (Figure 7.2). However, the association between age and averaged CTM-15 scores was not statistically significant in simple linear models. Further, the association between FIM scores at discharge and averaged CTM-15 scores was not statistically significant on either the MSK unit [unstandardized regression coefficient (T-test significance): -0.74 (p=0.90)] or the GRU [0.90 (p=0.66)].

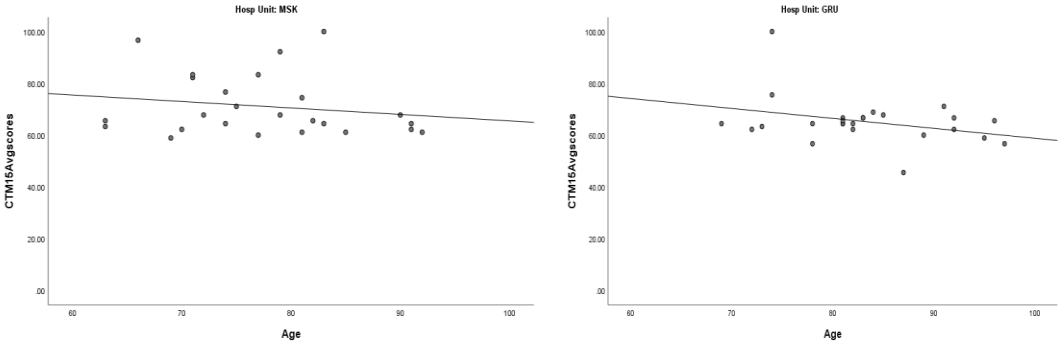
Among MSK patients, as length of stay increased the averaged CTM-15 score increased; however, this association was not statistically significant [unstandardized regression coefficient: 0.41 (p = -0.09)]. However, for GRU patients, as length of stay increased, averaged CTM-15 scores decreased [unstandardized regression coefficient: -0.24 (p = 0.28)].

Figure 7.2

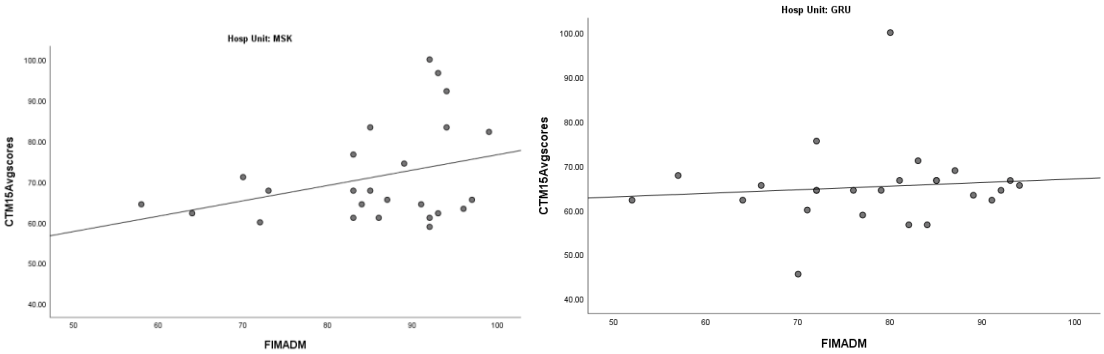
Associations between study continuous independent factors and averaged CTM-15 scores by unit

MSK **GRU**

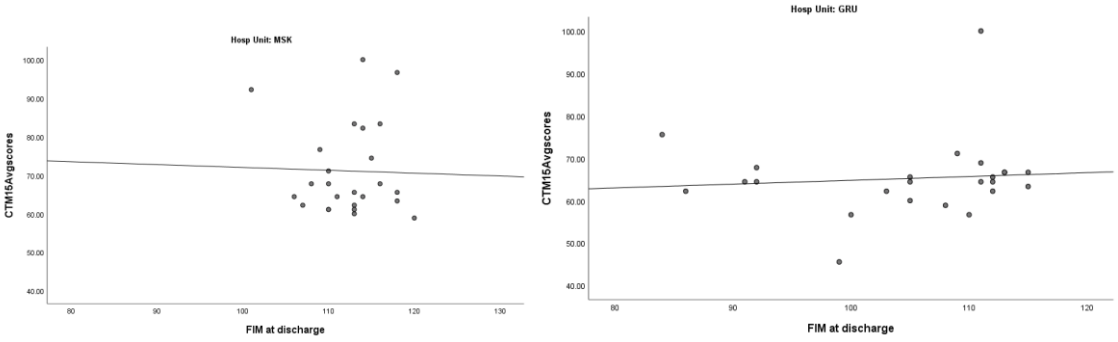
Age



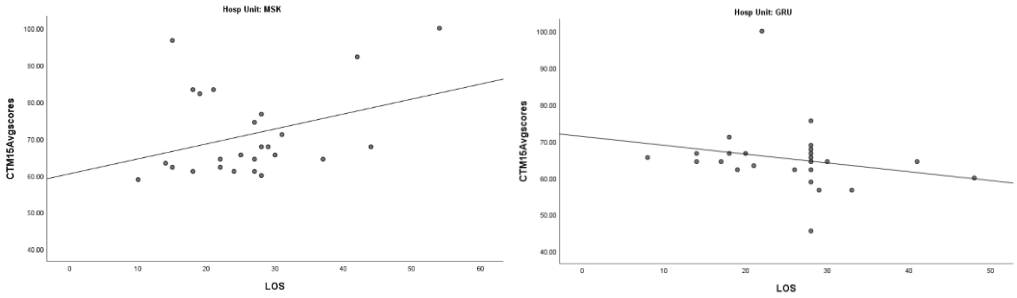
FIM on admission



FIM at discharge



Length of stay **MSK** **GRU**



Note. LOS=length of stay; CTM15Avgscores=CTM-15 scores Averaged; MSK=musculoskeletal unit; GRU=geriatric rehabilitation unit.

7.4.4 Associations among the study independent factors by unit

As seen in Table 7.5a, for patients discharged from the MSK unit, FIM on admission and FIM at discharge were the only variables that were significantly correlated. For GRU patients (Table 7.5b), FIM on admission and FIM at discharge were also significantly correlated, in addition to FIM on admission and length of stay, and FIM at discharge and length of stay. For MSK patients, when looking at the confidence intervals (CIs) in Table 7.5a, some of the CIs that span the null value (i.e., were not statistically significant) were asymmetric (i.e., the distance from zero to each value was not equal). While the correlations between age and FIM on admission, age and FIM at discharge, FIM on admission and length of stay, and FIM at discharge and length of stay, were not statistically significant, they trended toward the negative. For patients discharged from the GRU, the confidence bounds around correlations between age and FIM on admission, age and FIM at discharge were far more symmetrical.

Table 7.5 a and b: *Associations among the study continuous independent factors by unit*

7.5a *MSK Spearman Rho Correlations among continuous independent variables (95% CI)*

Variable	Age	FIM on admission	FIM at discharge	Length of stay
Age	-			
FIM on admission	-0.37 (-0.67, 0.03)	-		
FIM at discharge	-0.34 (-0.65, 0.06)	0.56** (0.21, 0.78)	-	-
Length of stay	0.30 (-0.11, 0.62)	-0.37 (-0.67, 0.03)	-0.38 (-0.67, 0.02)	-

Note. MSK= musculoskeletal unit; FIM = Functional Independence Measure; **significant at p<0.01.

7.5b *GRU Spearman Rho Correlations among continuous independent variables (95% CI)*

Variable	Age	FIM on admission	FIM at discharge	Length of stay
Age	-			
FIM on admission	-0.20 (-0.55, 0.21)	-		
FIM at discharge	-0.05 (-0.44, 0.35)	0.79*** (0.57, 0.90)	-	
Length of stay	0.06 (-0.34, 0.44)	-0.53** (-0.76, -0.17)	-0.61** (-0.81, -0.28)	-

Note. GRU= geriatric rehabilitation unit; FIM = Functional Independence Measure; ** significant at p<0.01; ***significant at p<0.001.

The simple regression models by unit are contained in Appendix U. None of the models explained more than 10% of the total variance on either unit.

For patients from both the MSK and GRU units, using a Mann Whitney U test, relationships between sex and the continuous variables age, length of stay, and FIM on admission and FIM at discharge were not statistically significant. Additionally, the

relationships between education and the study continuous independent variables were not statistically significant. Using a Fisher's exact test, the relationship between sex and education was also found to be not significant.

Frequency distributions of averaged CTM-15 scores were generated by unit and on both units the 25th percentile was a score of 62.2. Table 7.6 compares patient characteristics by unit among those whose averaged CTM-15 score was less than or equal to 62.2. Among patients considered to be most at risk of having a worse care transition, those on the GRU had a significantly longer length of stay and worse (lower) FIM at discharge.

Table 7.6

Study sample participant characteristics by unit, for those in the lowest 25th percentile of averaged CTM-15 scores

Participant characteristic	**MSK (n=7)**	**GRU (n=8)**	**p-value[1]**
Age (years)			
Median (IQR)	81.0 (21.0)	88.0 (15.0)	p = 0.18
Mean (SD)	80.7 (9.3)	86.5 (8.6)	
Minimum maximum	69-92	72-97	
Length of stay (days)			
Median (IQR)	22.0 (12.0)	28.0 (6.0)	
Mean (SD)	20.6 (6.6)	29.9 (8.3)	p = 0.02*
Minimum maximum	10-28	19-48	
FIM score on admission			
Median (IQR)	86.0 (20)	74.0 (18)	
Mean (SD)	83.1 (11.2)	73.9 (12.4)	p = 0.09
Minimum maximum	64-93	52-91	
FIM score at discharge			
Median (IQR)	113.0 (3.0)	104.0 (10.0)	
Mean (SD)	112.3 (4.1)	102.9 (8.2)	p = 0.01*
Minimum maximum	107-120	86-112	

Note. MSK=musculoskeletal unit participants with an averaged CTM-15 score ≤ 62.2, GRU=geriatric rehabilitation unit with an averaged CTM-15 score ≤ 62.2; CTM= averaged CTM-15 score; 1 = Mann Whitney U test, IQR = interquartile range; SD = standard deviation; FIM = Functional Independence Measure; * = significant at p<0.05.

Table 7.7 shows the odds ratios associated with age, length of stay, FIM on admission and FIM on discharge in simple logistic regression models of patients considered to be most at risk of having a worse care transition versus those at lower risk (i.e., lowest 25th percentile averaged CTM-15 score vs all other CTM-15 scores) by unit. In models of MSK patients, when compared to the odds of having an averaged CTM-15 score in the highest 75th percentile of the sample, the odds of having an averaged CTM-15 score in the lowest 25th percentile was an estimated 11% lower (odds ratio = 0.89, 95% Confidence Interval [CI] = 0.77, 1.02) for those with a longer length of stay. In models of GRU patients, when compared to the odds of having an averaged CTM-15 score in the highest 75th percentile of the sample, the odds of having an averaged CTM-15 score in the lowest 25th percentile was an estimated 12% higher (odds ratio = 1.12, 95% CI = 0.98, 1.28) for those with a longer length of stay. However, all of the confidence bounds around the odds ratios included zero and so were not statistically significant ($p>0.05$).

Table 7.7

Odds ratios (95% Confidence Intervals) associated with simple logistic regression models of patients considered to be most at risk of having a worse care transition versus those at lower risk by unit

Participant characteristic	MSK	GRU
Age (years)		
Odds ratio (95% CI)	1.07 (0.95, 1.20)	1.09 (0.97, 1.24)
p-value	0.25	0.15
Length of stay (days)		
Odds ratio (95% CI)	0.89 (0.77, 1.02)	1.12 (0.98, 1.28)
p-value	0.09	0.09
FIM score on admission		
Odds ratio (95% CI)	0.97 (0.89, 1.05)	0.95 (0.87, 1.03)
p-value	0.50	0.19
FIM score at discharge		
Odds ratio (95% CI)	0.99 (0.81, 1.22)	0.96 (0.88, 1.05)
p-value	0.93	0.41

Note. MSK=musculoskeletal unit, GRU=geriatric rehabilitation unit, CTM= care transition measure, AvCTM= averaged CTM-15 score; FIM = Functional Independence Measure. The p value of the Wald test is reported.

Because the direction of odds ratio associated with length of stay differed by unit, the possibility of a statistical interaction between unit and length of stay was examined. Table 7.8 shows the interaction between length of stay and unit in a logistic regression model of patients considered to be at most risk of having a worse care transition experience versus those at lower risk of having a worse care transition experience. The Omnibus tests of model coefficients was significant for the model with length of stay and the interaction term ($p < 0.05$), Chi-square = 7.94, $p = 0.047$.

Table 7.8

Interaction between LOS and Unit in logistic regression models of patients considered to be most at risk of having a worse care transition versus those at lower risk

Variables	B	S.E.	Wald test	p	Exp (B)	95% CI (lower, upper)
Unit	5.64	2.49	5.14	0.02	282.64	2.14, 37259.65
Length of stay (los)	-0.12	0.07	2.79	0.09	0.89	0.77, 1.02
Interaction_los_unit	0.23	0.09	5.68	0.02	1.26	1.04, 1.53
Constant	-3.75	1.86	4.06	0.04	0.02	

Note. Variable(s) entered: Hosp Unit, length of stay, Interaction_LOS_Unit; B = unstandardized regression weight; S.E. = standard error of β; p = significance; Exp(B) = odds ratio; 95% CI = 95% confidence interval.

Logistic regression diagnostics were performed. The Hosmer and Lemeshow goodness of fit test (1980) was not significant (Chi-square = 3.32, p = 0.85). The Box-Tidwell test (1962) for the assumption of linearity was not significant (p = 0.55).

7.5 Discussion

The purpose of the present study was to explore and compare differences in the care transition experience of patients discharged from two specialized clinical treatment units within a single rehabilitation hospital. To our knowledge, this is the first study that has directly compared the concurrent care transition experience of older adults attending two units specific to two different rehabilitation populations.

The demographic characteristics of our study sample were similar to those of other study samples of MSK and GRU patients. For example, this study's mean MSK unit patient age (77.6 years) was similar to that reported by McLeod et al. (2013) (77.2 years). Further, GRU FIM scores were similar to those reported by Muir-Hunter et al. (2015). In that study the FIM on admission among those living with no dementia was 77.9 (12.8) and FIM at discharge was 98.9 (17.2) and in the current study the FIM on admission was 78.2 (11.0) and FIM at discharge was 105.1 (9.3).

Only some patients are admitted to rehabilitation following an acute event. Inpatient rehabilitation services are usually only offered to those who have the potential to either return to their premorbid functional level or to increase their post-acute care functional level as a result of participation in an inpatient rehabilitation program (GTA Rehab network, 2009). Older adults living with some comorbidities may be at greater risk of functional decline and loss of mobility following an acute event (Kleinpell et al., 2008).

Study patients did have more comorbidity than older hospitalized adults who were discharged from hospital to home. Sangha et al. (2003) found that among 170 consecutive adult (age greater than 50 years) admissions to three general medical and

three general surgical care units, the mean Self-administered Comorbidity Questionnaire (SCQ) score was 5.61 (SD 4.1) and the median was 5.0. In this study, both MSK and GRU patients had a higher (worse) mean (MSK 9.2; GRU, 9.3) and median (MSK 8, GRU 9) SCQ score than that reported by Sangha et al. (2003).

Despite comorbidity and functional loss, both MSK and GRU patients benefitted from their hospital stay. On both units the median FIM change score exceeded 25 points and, on both units, FIM scores increased on average by approximately one point per day. This is comparable to the changes reported by Muir-Hunter et al. (2015) who found that FIM scores among GRU patients with no dementia increased by an average of 21.0 (SD = 14.0) points during their rehabilitation stay.

Patients sent to rehabilitation are triaged at admission and admitted to the rehabilitation unit that is best able to meet their needs. As expected, this study found that patients discharged from the MSK unit differed significantly from those discharged from the GRU. Compared to those on the MSK unit, patients on the GRU were significantly older with lower FIM scores at both admission and discharge.

Despite these demographic and functional differences, the care transition experience did not significantly differ by unit. As neither the medians nor the means of the averaged CTM-15 scores were significantly different between the units, we conclude that the preparation patients received for their care transition is generating comparable care transition experiences for patients attending both units.

However, the current exploratory study was only powered to detect a 9-point difference in averaged CTM-15 scores, and the literature suggests that a study with greater power (larger sample size) might have found a significant between unit difference

in care transition experience. While the mean of the averaged CTM-15 scores among patients on the MSK unit [71.1 (SD=11.9)] was similar to mean CTM-15 scores reported in other studies of patients undergoing rehabilitation [e.g.,, McLeod et al (2013): 72.3 (SD=16.6); Anatchkova et al. (2014): 73.9 (SD=16.2)], the mean CTM-15 score from the Anatchkova et al. (2014) study was higher than the mean score among GRU patients [65.2 (SD=9.2)].

Although no between unit differences in the mean or the median averaged CTM-15 score were found, the relationship between the study independent variable length of stay and the study dependent variable differed by unit. In simple linear regression models, a longer length of stay was associated with a better care transition experience (a higher averaged CTM-15 score) among MSK patients. However, among GRU patients, a longer length of stay was associated with a worse care transition experience.

The direction of the relationship between length of stay and averaged CTM-15 scores split at the 25th percentile also differed by unit. For MSK unit patients, when compared to the odds of having an averaged CTM-15 score NOT in the lowest 25th percentile of the sample, the odds of having an averaged CTM-15 score in the lowest 25th percentile were an estimated 11% lower with an increased length of stay**.** However, among GRU patients, when compared to the odds of having an averaged CTM-15 score NOT in the lowest 25th percentile of the sample, the odds of having an averaged CTM-15 score in the lowest 25th percentile was an estimated 12% higher with longer lengths of stay**.** The suggested interaction between unit and length of stay was confirmed in a logistic regression model that included both unit and length of stay.

Conflicting relationships between length of stay and CTM-15 scores have been reported in the literature. McLeod et al. (2014) found a negative relationship between CTM-15 scores and length of stay ($r = -0.53$, $p = 0.04$) among 15 older individuals with musculoskeletal issues attending a rehabilitation hospital. However, Coleman et al. (2005) found a significant positive correlation between length of stay and CTM-15 scores ($r = 0.14$, $p < 0.05$) when looking at the administrative records of 200 American adults discharged from acute care with a primary diagnosis of chronic obstructive pulmonary disease, congestive heart failure, stroke or hip fracture.

These differing relationships between length of stay and CTM-15 scores may be due to differing relationships among the independent factors associated with CTM-15 scores which, in turn, may be a function of the study sample. In the current study, the relationships between length of stay and both FIM on admission and FIM at discharge varied by unit. For the MSK unit, there was no significant association between length of stay and either FIM on admission or FIM at discharge. However, for GRU patients, there was a significant positive association between length of stay and both FIM on admission and FIM at discharge. Future larger and more powerful studies are required to fully understand the relationships among sample characteristics as well as the associations between factors thought to influence care in regression models of CTM-15 scores.

The study findings have clinical implications as well. With respect to equipment and services, only 72% of people discharged from the MSK unit and 76% of people discharged from the GRU had received all needed equipment at 2 to 6 days post hospital discharge. Further, only 56% of MSK patients and 44% of GRU patients had received all needed services immediately following hospital discharge. Patients who do not have

access to needed equipment are less likely to improve their ability to carry out activities of daily living and instrumental activities of daily living to support their independence in the home (Rehabilitative Care Alliance, 2017). Strategies that ensure patients receive all their required equipment through coordination with services in the community would ensure that needed equipment and services arrive on time.

The small study sample size may have limited the power to detect additional between unit differences. However, the goal of this exploratory study was to provide valid point estimates of averaged CTM-15 scores that could be used to inform future research. As well, this study was limited to English-speaking, cognitively intact older adults attending a single hospital thereby precluding generalization to non-English speaking, cognitively impaired older adults.

7.6 Conclusions

The results from this study suggest there is no significant difference in the care transition experience of older adults transitioning from two different inpatient rehabilitation units to home. However, the relationship between length of stay and unit differed significantly in logistic regression models of averaged CTM-15 scores split at the 25^{th} percentile.

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CHAPTER 8

OVERALL DISCUSSION

8.1 Introduction

In this dissertation, three studies were conducted to gain a further understanding of the care transition experience of older adults transitioning from two specialized clinical units in an inpatient rehabilitation hospital to home. Once the psychometric properties of the 15-item Care Transition Measure (CTM-15) (Coleman et al., 2005) were evaluated, the CTM-15 was used to identify factors associated with the care transition. Finally, the care transition experience of older adults discharged from two specialized clinical treatment units within a single rehabilitation hospital was compared.

8.2 Summary of study results and discussion

The first study showed that when CTM-15 scores from two time points were averaged, the measure demonstrated both internal consistency (Cronbach's alpha = 0.91 at Time 1) and test retest reliability ($ICC_{2,2}$ = 0.78). However, the evidence supporting construct validity was mixed. The strength of the correlation between a global question and the averaged CTM-15 score was fair (Chan, 2003) (Spearman rho = 0.53), thereby providing support for construct convergent validity. The correlations between CTM-15 scores and each of age and FIM at discharge were statistically significant but weaker (-0.32 and 0.35, respectively); however, the correlation between averaged CTM-15 and length of stay was 0.13 providing fair to poor support (Chan, 2003) for construct discriminant validity. The second study showed that in combination, increased age, lower function as measured with the FIM either on admission or at discharge, and increased length of stay were significantly associated with a poorer care transition experience

among older adults transitioning from an inpatient rehabilitation hospital to home. However, these three factors only accounted for less than 20% of the overall variance in averaged CTM-15 scores indicating that additional factors may be involved with the evaluation of care transition experience. Finally, the results from the third study showed that while there was no significant difference in the care transition experience of older adults transitioning from two different inpatient rehabilitation units to home, the relationship between length of stay and care transition experience differed significantly by unit.

The findings from the third study prompted a re-evaluation of the results from the first study. Knowing that the direction of the association between care transition experience and length of stay was a function of unit, suggests that the observed low correlation between length of stay and care transition experience, as noted in Chapter 6, may not provide evidence that does not support discriminant construct validity. The literature suggests that length of stay can be a function of many factors that may not have a direct association with the patient care transition experience (Gledhill et al., 2020). For example, Tan et al. (2010) found that family issues (e.g., patient living alone and no informal care givers) delayed discharge among stroke patients receiving rehabilitation. Further, Black and Pearson (2002) concluded that individual, medical, and organizational factors (e.g., waiting for needed equipment to be delivered/installed; system pressures such as the need for emergency room beds prompting early hospital discharge) can interact and affect length of stay. Thus, we are left with evidence of that supports fair convergent and discriminant validity. As well, findings from the third study suggest

further work is needed to understand how length of stay is associated with averaged care transition experience.

The remainder of this discussion is organized around answering the question "Can the CTM-15 be used as a discriminative tool among older adults transitioning from an inpatient rehabilitation setting to home?" Tests can be used for multiple purposes. Kirshner and Guyatt (1985) note that health care related tools can be used for three purposes: discriminating between people or groups on some underlying dimension when there is no gold standard, predicting either the prognosis or the results of another test, or for evaluating the extent of change over time in some characteristic among individuals or groups.

Kirshner and Guyatt (1985) propose a set of criteria for evaluating the usefulness of a discriminative tool. According to the Kirshner and Guyatt framework (1985) a discriminative tool should include items important to patients. When developing the CTM-15, Coleman et al. (2002) used purposeful sampling of the Kaiser Permanente, Colorado Region administrative database to identify older persons (i.e., 65 or more years of age) who had recently experienced one or more care transitions. Six focus groups were held with a total of 49 older adults who had been admitted to acute care at least once and received subsequent skilled nursing care in either a facility or in the home in the past six months. Selected items from the satisfaction measure developed by Hendriks et al. (2001) were reviewed by focus group participants who then indicated that the selected items had face validity.

Further, Kirshner and Guyatt (1985) suggest that a discriminative tool should have a short response set to promote uniform interpretation of the measure's response

options. The CTM-15 has a short response set (strongly agree, agree, disagree and agree). However, McLeod et al. (2013) noted that respondents may not be interpreting the response categories the same way. In interviews following the administration of the CTM-15, several participants commented on the subjective selection of "strongly agree" versus "agree". Cognitive interviewing following tool administration may provide further insights into how item responses are selected.

As well, in the current study, patients rarely selected the "strongly disagree" response option. Only two people selected "strongly disagree" for any single CTM-15 item at Time 1 (one person for one item, one person for three items) and no one selected "strongly disagree" at Time 2, thereby reducing the CTM-15's variability and potential ability to discriminate between those who had a good or a bad care transition. As well, Time 1 scores only ranged from 49 to 100 although theoretically CTM-15 scores could have ranged from 0 to 100.

In addition, Anatchkova et al. (2014) and McLeod et al. (2013) both noted acquiescence bias in their respective studies, an issue that is more common in tools that use an "agree/disagree" format (Lavrakas, 2008). Acquiescence bias occurs when patients have the tendency to agree to statements, regardless of content, resulting in a possible over estimation of the measure's score (Dunsch et al., 2018). To resolve the issue of highly left skewed CTM-15 scores, Anatchkova et al. (2014) have suggested that the current linear scoring of the CMT 15 be replaced with another analytic approach, perhaps one used for categorical data. Future studies could examine the impact of various scoring strategies on the psychometric properties of the CTM-15.

A discriminative tool should only include items that are specific to a person's care transition experience. Procedures designed to assess internal consistency can provide an indication of how well the selected items measure the construct. In this case, Cronbach's alpha was 0.91 at 2 to 6 days post discharge, thereby demonstrating acceptable internal consistency (Portney & Watkins, 2015; Streiner et al., 2015).

Kirshner and Guyatt (1985) also suggest that a discriminative tool demonstrate large and stable inter-subject variation. The single measures test retest reliability was lower than anticipated ($ICC_{2,1}$: 0.63) but improved when averaged CTM-15 scores were used ($ICC_{2,2}$: 0.78). Further, the standard error of measurement (SEM), based on CTM-15 scores at Time 1 and Time 2, was 7.3, comparable to that observed by McLeod et al. (2013) (7.8). Finally, the Bland Altman plot showed that 94% of the study data fell within the normal limits of agreement. When taken together, these findings suggest that the CTM-15 does demonstrate large and stable inter-subject variation.

In the analysis of the study data, three influential cases that were outside the 95% limits of agreement were found; however, there was no substantial reason to remove these cases and so they were retained in subsequent analyses. Such large changes in recalled transitional care experience may suggest the presence of factors that may impact the recollection of the underlying phenomenon, care transition experience. For example, Manary et al. (2013) postulate that patients may base the assessment of their care transition experience on their current health status, regardless of the care that they actually received during the transition. As well, Stull et al. (2009) suggest that as patients gain insight into their recovery and as they adjust to their current health status, their recollection of their earlier health status may change, leading to changes in their

assessment of their care transition experience. Also, recall can be impacted by emotional states. For example, individuals living with high anxiety levels may recall past experiences more negatively (Kessels, 2003).

There are several possible reasons for the lower than anticipated ICC. Test retest reliability quantifies the degree to which test scores remain constant when measuring a stable characteristic on different occasions (Portney & Watkins, 2015; Vilagut, 2014). In the current study, it is possible that some people were in fact still changing even though they had completed their care transition (i.e., they had left the hospital and returned home). As well, a shorter interval between Time 1 and Time 2 may have yielded both a higher $ICC_{2,1}$ and $ICC_{2,2}$. The retest period for the test retest study (Chapter 5) was approximately three weeks. Patients were reassessed at 28 to 32 days post discharge based on the time period used by McLeod et al. (2014) who re-administered the CTM-15 6 to 10 days after the first assessment which was conducted at 3 to 4 weeks post discharge, that is to say at 27 to 38 days post discharge. However, Streiner et al. (1993) suggest a retest of no earlier than two weeks for measurement instruments that are shorter in nature, similar to the CTM-15, to avoid any recall bias. Future test retest studies might consider shortening the retest time point to approximately two weeks.

As well, the timing of the first administration of the CTM-15 has varied in the literature. Although Coleman and colleagues (2002 and 2005) measured care transition experience at 6 to 12 weeks post hospital discharge, McLeod et al. (2013) first contacted older adults discharged from inpatient rehabilitation at 3 to 4 weeks following discharge. Further, Anatchkova et al. (2014) collected CTM-15 data at the one-month follow up visit while Shadmi et al. (2009) collected CTM-15 data on patients who had been

discharged from hospital in the previous 2 to 12 weeks and LaManna, Bushy, Norris and Chase (2015) at 7 days post discharge. Deutsch et al. (2019) collected CTM-15 data at 2 to 7 days before discharge and 21 to 35 days after discharge. This dissertation is the first study to administer the CTM-15 at 2 to 6 days post discharge. This time period was selected because the CTM-15 focuses on how prepared patients feel at the point of leaving the hospital (McLeod et al., 2013). With this in mind, it was felt that with a shorter time frame there would be fewer factors influencing recall.

The assessment of validity involves evaluating the strength of the relationship between the instrument's content and the construct it intended to measure. Kirshner and Guyatt (1985) indicate that a discriminative tool should demonstrate cross-sectional construct validity. The current study findings echo those of McLeod et al. (2013) who also found that the CTM-15 was significantly correlated with a global assessment of patient experience at 3 to 4 weeks post discharge. However, while the correlations found in the current study could be described as fair (Chan, 2003) (i.e., ranging from 0.53 to 0.32) and in the anticipated direction, thus providing fair support for construct validity, further work needs to be done.

For example, with no common definition of patient experience (Wolf et al., 2014), the identification of all domains important to care transitions is challenging. In fact, Coleman et al. (2005) state: "*It is possible that the CTM does not incorporate every dimension of this construct or that one or more of its components are confounded by other factors that are yet to be identified.*" Additionally, Oikonomou et al. (2019) suggest that a measure developed for an American audience may not reflect the experience of those receiving care in another country where the health care system is quite different. As

a result, the transitional care experience measure developed by Oikonomou et al. (2019) has eight dimensions while the CTM-15 has four (Coleman et al., 2005). Future research into the identification of domains fundamental to the care transition experience of older adults transitioning from rehabilitation to home is warranted.

As well, factors used to establish discriminant construct validity have not been consistently replicated. For example, both Coleman et al. (2005) and Anatchkova et al. (2014) found that the CTM-15 was able to discriminate between patients discharged from the hospital who did and did not have a subsequent emergency department visit or rehospitalization. However, this finding was not replicated in this study or in a study by Bakshi et al. (2012). In both of these studies, there was no significant difference in CTM scores between patients with and without ED visits or rehospitalization.

Thus, based on Kirshner and Guyatt's framework (1985), we conclude that while there is some evidence supporting the use of the CTM-15 as a discriminative tool, further evidence is warranted.

8.3 Outstanding Issues

Given the recommendation to administer the CTM-15 at two time points, there are some considerations about who should administer the CTM-15. First, it is unknown if response selection is a function of who administers the tool. For example, it is unknown if patients would select the same response option if the tool was administered by a health care provider known to the patient or by an unknown office assistant. As well, if this tool needs to be administered twice, an integrated approach that pools resources from multiple health care systems (e.g., from acute care, rehabilitation services and home care) is needed. While integrated models of care exist (MacAdam, 2008), older adults living with

multiple chronic conditions are frequently dealing with a health care delivery system primarily designed to attend to acute care needs over a limited time period (Chen et al., 2000). Further research into the association between an integrated care approach and transitional care experience is needed.

As well, the clinical utility of the CTM-15 remains unknown. For example, focus groups with those administering the CTM-15 could examine the tool's ease of use as well as the usefulness of the information gathered. Further assessment of the tools benefits (e.g., does it provide information additional to clinical judgement; what is the sensitivity and specificity of the measure) and drawbacks (e.g., how much time does the tool take to administer; who will enter the data into a data base and transform the item scores into a score from 0 to 100) is warranted.

8.4 Limitations

A study sample of 50 people was used for the three studies included in this dissertation. With this study sample, both Study 1 and Study 2 were sufficiently powered to answer the proposed research questions using the described methods. Although only powered to detect a 9-point difference in averaged CTM-15 scores, the findings from Study 3 can be used for future sample size calculations.

Mandates of health care organizations are constantly changing resulting in ongoing programmatic evolution. Funding sources are also in a constant state of change. Thus, the study results are only a snapshot in time of the care transition experience of older adults returning home after receiving care in an inpatient rehabilitation hospital.

The sample population recruited from a single rehabilitation hospital is not representative of all older adults attending a rehabilitation hospital. The study sample

included only English-speaking older adults admitted to two specific rehabilitation units. As well, those being discharged to long-term care were excluded. In addition, CTM-15 data were collected directly from patients; data were not collected from substitute decision makers, caregivers, or family members on behalf of cognitively impaired older adults.

There may be an impact on generalizability of excluding patients living with dementia. Although this exclusion was unmeasured for this study, one would expect a worse care transition resulting in potentially lower CTM-15 scores for those with dementia. Future study could include patients living with dementia and their caregivers.

The application of standardized processes may have differed by clinician and could have been influenced by both the process used to identify hospital admission and the assessment by the resource nurse in the application of inclusion/exclusion criteria for this study. For example, standardized processes by the intake nurse are applied to patients who are admitted to both the MSK and GRU. For those admitted to this study, the Resource Nurses might have used both clinical expertise as well as objective criteria in selecting study appropriate patients. Therefore, there could be some selection bias with the study sample, limiting generalizability to the MSK and GRU located in the study hospital.

Finally, there may be selection bias in study participants in terms of level of education because the education level of participants was higher than other studies identified in the literature. Inferred from this, the bias likely also includes socioeconomic status.

8.5 Strengths

While our study sample may not be representative of all rehabilitation populations (i.e. stroke, cardiac, spinal cord), our sample was representative of other MSK and GRU inpatient rehabilitation patients. Dissertation results will provide clinicians working on similar units with additional insights into factors associated with older adult care transition experience.

This study is also one of the first to use multivariable modelling to assist in identifying factors associated with the patient care transition experience among older adults returning home after inpatient rehabilitation. Study findings will add to the limited body of knowledge on care transitions of older adults moving from an inpatient rehabilitation hospital to home.

This is one of only a few studies to use the CTM-15 in an inpatient rehabilitation setting rather than an acute care setting. In the 2018/2019 fiscal year, an estimated 39,438 Canadians were admitted to an inpatient rehabilitation bed (Canadian Institute for Health Information [CIHI], 2019). Of this total number of admissions, 75.6% were 65 or more years of age (CIHI, 2019). As the number of seniors increases (CIHI, 2019) and so the demand for rehabilitation beds, obtaining a better understanding of factors associated with older adult care transitions from inpatient rehabilitation is of value to both the patient and the health care system.

8.6 Implication of Findings

Clinical implications can be drawn from each of the studies reported in this dissertation. Recollection of transitional care experience can vary from one time point to the next for older adults transitioning from inpatient rehabilitation to home. The findings

from Study 1 suggest that two assessments are needed to obtain a reliable assessment of care transition experience. As well, a number of factors go into patient-assessed care transition experience. As seen in Study 2, when taken together age, physical function as measured by the FIM and length of stay are associated with a person's assessment of their care transition experience. However, these three factors accounted for less than 20 percent of the total variability in averaged CTM-15 scores, suggesting the need for a greater understanding of what goes into someone's assessment of a good care transition and what clinicians need to consider when determining who is likely to need additional resources during their care transition. The findings from the third study suggest additional work is needed to understand how length of stay, an issue associated with other factors such as living situation, is associated with the patient-assessed care transition experience.

8.7 Conclusion

Subject to two administrations, this study determined that the CTM-15 is a reliable and valid discriminative measure when used with older adults transitioning from an inpatient rehabilitation setting to home. As well, in future studies exploring the care transition experience of older adult transitioning from inpatient rehabilitation to home, age, function, and length of stay need to be accounted for in the study design and/or the analysis. Finally, although there was no significant difference in the median averaged CTM-15 scores suggesting that the preparation study patients received for their care transition is generating comparable care transition experiences, future studies exploring the reasons underpinning the possible interaction between length of stay and unit in models of care transition experience are warranted.

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APPENDICES

Appendix A.1

Western Research

Research Ethics

Western University Health Science Research Ethics Board
HSREB Delegated Initial Approval Notice

Principal Investigator: Dr. Iris Gutmanis
Department & Institution: Schulich School of Medicine and Dentistry\Epidemiology & Biostatistics, Western University

Review Type: Delegated
HSREB File Number: 108165
Study Title: Factors associated with care transitions of Older Adults discharged from the inpatient Geriatric Rehabilitation Unit or the Musculoskeletal Unit at the Parkwood Institute

HSREB Initial Approval Date: August 17, 2016
HSREB Expiry Date: August 17, 2017

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Data Collection Form/Case Report Form	Appendix C: Data collected from patient chart	2016/06/06
Data Collection Form/Case Report Form	Appendix G information on needed equipment and services edit July	2016/07/14
Data Collection Form/Case Report Form	Appendix E: Patient script at 2-6 days post discharge	2016/06/06
Data Collection Form/Case Report Form	Appendix F: Patient script at 28-32 days post discharge	2016/06/06
Data Collection Form/Case Report Form	Appendix H: health care visits: Gateway reports	2016/06/06
Data Collection Form/Case Report Form	Appendix D: data collected from patient prior to discharge	2016/06/06
Other	Appendix A: recruitment script	2016/06/06
Letter of Information & Consent	Appendix B LOI Consent Edit July	2016/07/14
Western University Protocol	Received 12Aug16	

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above named study, as of the HSREB Initial Approval Date noted above.

HSREB approval for this study remains valid until the HSREB Expiry Date noted above, conditional to timely submission and acceptance of HSREB Continuing Ethics Review.

The Western University HSREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use Guideline for Good Clinical Practice Practices (ICH E6 R1), the Ontario Personal Health Information Protection Act (PHIPA, 2004), Part 4 of the Natural Health Product Regulations, Health Canada Medical Device Regulations and Part C, Division 5, of the Food and Drug Regulations of Health Canada.

Members of the HSREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 0(

Ethics Officer, on behalf of Dr. Marcelo Kremenchutzky, HSREB Vice Chair

Ethics Offic… Karen Gopaul

Western University, Research, Support Services Bldg., Rm. 5150
London, ON, Canada N6G 1G9 t. 519.661.3036 f. 519.850.2466 www.uwo.ca/research/ethics

Appendix A.2

LAWSON FINAL APPROVAL NOTICE

LAWSON APPROVAL NUMBER: R-16-330

PROJECT TITLE: Factors associated with care transitions of Older Adults discharged from the inpatient Geriatric Rehabilitation Unit or the Musculoskeletal Unit at the Parkwood Institute

PRINCIPAL INVESTIGATOR: Dr. Iris Gutmanis

LAWSON APPROVAL DATE: 17/08/2016

ReDA ID: 1596

Overall Study Status: Active

Please be advised that the above project was reviewed by Lawson Administration and the project was approved.

Please provide your Lawson Approval Number (R#) to the appropriate contact(s) in supporting departments (eg. Lab Services, Diagnostic Imaging, etc.) to inform them that your study is starting. The Lawson Approval Number must be provided each time services are requested.

Dr. David Hill
V.P. Research
Lawson Health Research Institute

Appendix A.3

Western Research

Date: 20 July 2020

To: Dr Iris Gutmanis

Project ID: 108165

Study Title: Factors associated with care transitions of Older Adults discharged from the inpatient Geriatric Rehabilitation Unit or the Musculoskeletal Unit at the Parkwood Institute

Application Type: Continuing Ethics Review (CER) Form

Review Type: Delegated

REB Meeting Date: 04/Aug/2020

Date Approval Issued: 20/Jul/2020

REB Approval Expiry Date: 17/Aug/2021

Dear Dr Iris Gutmanis,

The Western University Research Ethics Board has reviewed the application. This study, including all currently approved documents, has been re-approved until the expiry date noted above.

REB members involved in the research project do not participate in the review, discussion or decision.

Western University REB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The REB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

The Office of Human Research Ethics

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix B: The Care Transition Measure 15

The first few statements are about the time you were in the hospital (here at Parkwood)…..

Q1 Before I left the hospital, the staff and I agreed about clear health goals for me and how these would be reached.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q2. The hospital staff took my preferences and those of my family or caregiver into account in deciding ***what*** my health care needs would be when I left the hospital.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q3. The hospital staff took my preferences and those of my family or caregiver into account in deciding ***where*** my health care needs would be met I left the hospital.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next set of statements is about when you were preparing to leave the hospital……

Q4. When I left the hospital, I had all the information I needed to be able to take care of myself.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q5. When I left the hospital, I clearly understood how to manage my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q6. When I left the hospital, I clearly understood the warning signs and symptoms I should watch for to monitor my health condition.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q7. When I left the hospital, I had a readable and easily understood written plan that described how all of my health care needs were going to be met.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q8. When I left the hospital, I had a good understanding of my health condition and what makes it better or worse.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q9. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q10. When I left the hospital, I was confident that I knew what to do to manage my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q11. When I left the hospital, I was confident I could actually do the things I needed to do to take care of my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next statement is about your follow-up doctor's appointments……

Q12. When I left the hospital, I had a readable and easily understood written list of the appointments or tests I needed to complete within the next several weeks.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next set of statements is about your medications……..

Q13. When I left the hospital, I clearly understood the ***purpose*** for taking each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q14. When I left the hospital, I clearly understood ***how*** to take each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q15. When I left the hospital, I clearly understood the possible ***side effects*** of each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

END OF CTM - 15

Appendix C: The Care Transition Measure-15 Scoring Guide

Overall Quality of Care Transition Score: This score reflects the overall quality of the care transition, with lower scores indicating a poorer quality transition, and higher scores indicating a better transition.

Scoring Protocol

Step 1: Code responses as Strongly Disagree =1; Disagree =2; Agree =3; Strongly Agree =4.

Step 2: Assign code (e.g., 9) to missing responses, and a different code (e.g., 99) to Don't Know/Don't Remember/Not Applicable. These will not be counted as answered questions for Step 3a, as the 9 and 99 codes are not included in the 4-point Likert scale and therefore will not contribute to the CTM score. You can, however, get a count of 99's in order to calculate a percentage of these responses relative to questions answered (step 3a.)

Step 3: Compute a mean score for each respondent based only on the questions answered. To do this:

- Step 3a: For each respondent count the number of questions answered. (In SPSS, Step 3a is accomplished with the Count command in the Transform menu and Step 3b by a Compute command).
- Step 3b: For each respondent obtain a summated score by adding Step 1 values across answered questions.
- Step 3c: Obtain **mean** for each respondent by dividing Step 3b result by Step 3a result. The name of this value is **mean**.

Step 4: Perform a linear transformation of the result of Step 3c to obtain a user-friendly 0-100 score. Use the following formula:

- 0-100 CTM® Score for each respondent = [(Step 3c result-1)/3]*100 .
- In SPSS Syntax this computation is:

```
COMPUTE CTM15_0_100 = (((ctm15)-(1))/(3))*100 .

EXECUTE.
```

Appendix D: Search Strategy

Search Strategy – Psychometric section

The following search terms were used: care transition(s), care transition measure, CTM-15, and older adult, complex chronic care, chronic disease, inpatient, inpatient rehabilitation, hospital, as well as reliability and validity were used to search Pubmed, MEDLINE, Cinahl, Scopus and the Cochrane Library. Papers published by the Canadian Institute for Health Information (CIHI), the Ontario Rehabilitation Care Alliance (ORCA), and the World Health Organization (WHO) were also reviewed.

Search Strategy – Factors section

The following search terms were used: care transition(s), factors that affect care transition, patient care transition experience, older adult, complex chronic care, chronic disease, in-patient, in-patient rehabilitation, and hospital. PubMed, MEDLINE, CINAHL, Scopus and the Cochrane Library were searched. Grey literature including papers published by the Canadian Institute of Health Information, the Ontario Rehabilitation Care Alliance, Health Quality Ontario, and the World Health Organization were also reviewed using the following search terms: care transition(s), factors that affect care transition, patient care transition experience, older adult, complex chronic care, chronic disease, in-patient, in-patient rehabilitation, and hospital. These articles were searched using the Google search engine as well as government websites (Canadian and International). The reference lists of all articles were also searched for additional articles that would meet the search criteria.

Appendix E: Staff Study Recruitment Letter

Factors associated with care transitions of older adults discharged from the inpatient Geriatric Rehabilitation Unit (GRU) or the Musculoskeletal (MSK) Unit at the Parkwood Institute

Brief Study Description

This study description is designed to aid staff members in inviting patients to potentially enrol in this research study. As a health care professional at the Parkwood Institute and as a member of the potential patient(s)' circle of care, please find below important information about this study and its recruitment strategy.
With sincere thanks for your assistance,

Dr. Iris Gutmanis, Principal Investigator

Project title: *Factors associated with the care transition of older adults discharged from the inpatient Geriatric Rehabilitation Unit (GRU) and Musculoskeletal Unit (MSK) unit at the Parkwood Institute*

Patient eligibility criteria:
To be eligible to enrol in this study, the potential participant must:

- Be able to read/understand English and be able to provide written consent
- Be at least 60 years of age
- Be able to make health care decisions independently without the need of a Substitute Decision Maker
- Soon to be discharged from the Inpatient Geriatric Rehabilitation Unit or Musculoskeletal Unit at the Parkwood Institute

Patient recruitment strategy:

- Health care professionals who are a member of a patient's circle of care are being asked to approach the patients who meet the study eligibility criteria to verbally provide them with the brief study description below and, subsequently, to solicit an indication of whether or not the patient is interested in enrolling. In soliciting interest to participate, the health care professional is asked to convey that enrolment is voluntary, and that there is no obligation to participate.

- If the patient indicates that s/he is interested in participating in the study, the health care professional making the invite can ask the patient for permission to share his/her name with the research team as well as their room number so that they can arrange a follow-up visit to provide further details about the study. During this follow-up visit, the researcher will provide the patient with a Letter of Information. Upon review of the Letter of Information, the patient can choose to decline participating, or can provide informed written consent to enroll in the study.

Suggested wording for conveying the study purpose and soliciting interest:
Hello. On behalf of one of the research teams here at the Parkwood Institute, I'd like to invite you to consider enrolling in a research project studying care transitions. This project focuses on gaining a better understanding of factors involved with how a patient transitions from an inpatient rehabilitation hospital to a home environment. The purpose of this study is to gain insights into how your experience with the transition home affects your need for equipment and services and your need for health care professional visits after you return home. The findings from this study will help in developing further strategic planning processes at the hospital, as well as contribute to best care practices for specialized geriatric patients. Enrolment is completely voluntary – you're not obliged at all to participate. But if you're interested in learning more about this research, I could give your name and room number to the research team so that one of the investigators could come meet you and provide you with a Letter of Information so that you can make an informed decision about whether or not to participate. Is participating in this study something that interests you?

- *If NO: No problem. Thanks for your time.*
- *If YES: May I have your permission then to give your name to the research team so that may contact you with more details about the study?*

Appendix F: <u>Letter of Information</u>

Factors associated with care transitions of older adults discharged from the inpatient Geriatric Rehabilitation Unit or the Musculoskeletal Unit at the Parkwood Institute

Study Investigators: Dr. Iris Gutmanis, Ph.D.

Specialized Geriatric Services
St. Joseph's Health Care London
Parkwood Institute, Main Building
550 Wellington Road
London, ON, N5C 0A7

Dr. Dalton Wolfe, Ph.D.

St. Joseph's Health Care London
Parkwood Institute, Main Building
550 Wellington Road
London, ON, N5C 0A7

Dr. Bert Chesworth, Ph.D.
Faculty of Health Sciences,
Health and Rehabilitation Sciences
Western University

Ms. Patricia Versteegh, MSc, PhD (c)
Doctoral student
Health and Rehabilitation Science
Measurement and Methods
Western University

Funding Agency N/A

Introduction

As someone who has received care on the Geriatric Rehabilitation Unit (GRU)/Musculoskeletal MMSK) Unit at Parkwood Institute, Main Building, you are being invited to take part in a study that will examine the impact of factors associated with your transition home from an in-patient rehabilitation hospital.

The purpose of this letter is to provide you with the information you require to make an informed decision about participating in the research. It is important for you to know why the study is being conducted and what it will involve. Please take your time to read this letter carefully. Feel free to ask questions if anything is unclear or if there are words or phrases you do not understand.

You may keep a copy of this letter of information and the consent form. Feel free to discuss the study with your family, friends and health care providers before you decide.

Background and Purpose of Study
Returning home from an in-patient rehabilitation stay can be difficult for some older adults who have been hospitalized for a long period of time. This research aims to explore some of the specific factors that affect the transition home. Also, the use of equipment & services, and the occurrence of unscheduled and health care professional visits remains unclear.

The purpose of this study is to determine the most influential factors that have an effect on patient care transition after rehabilitation and ultimately hospital utilization following discharge from the Geriatric Rehabilitation Unit or the Musculoskeletal Unit. Therefore, we hope to establish what factors are associated with care transition challenges, use of equipment & services and return visits to the hospital. As well, the study results will be used to make program improvements that may reduce hospital use and increase quality of care transition.

Who can participate in this study?
To take part in this study you must:
1) be able to read and speak English;
2) be at least 60 years of age;
3) be in the process of being discharged from the GRU/MSK Unit at the Parkwood Institute; and
4) have access to a telephone line

What will I have to do if I choose to take part?
Over the 30 days, we will be asking you to:
1) participate in an in-person interview *prior to discharge*;
2) participate in a telephone interview between *2-6 days after discharge*;
3) participate in a telephone interview between *28-32 days after discharge*; and

Throughout the 30 days we will be asking for just under one hour of your time.

1) In-person interview
About 24 to 72 hours before your discharge from the Geriatric Rehabilitation Unit or the Musculoskeletal Unit, a member of the research team will come to your hospital room and ask you a few questions. The information you share with us will be recorded on paper. The research member will ask you about your current chronic medical conditions, through a questionnaire, as well as some general information about you (i.e. education level, living

arrangements). We expect that this interview will take approximately 15 minutes. As well, the research team will schedule a time for a phone call for approximately 2-6 days after your discharge.

2) *First telephone follow-up after discharge survey*
Approximately 2-6 days after discharge you will be contacted by phone at your pre-scheduled and preferred time and will be asked to reflect on your care transition experience while on the GRU or MSK and your hospital-to-home transition and unscheduled health care professional visits. The phone call will take approximately 15 minutes. We will only try to contact you once per day and we will stop trying to reach you after we have made five attempts.

3) *Second telephone follow-up after discharge survey*
At between 28 and 32 days of being discharged from the GRU or MSK, you will be phoned to complete a survey again. The survey should take approximately 20 minutes to complete. The survey asks you to reflect on your care transition and whether or not you've required unscheduled health care professional visits.

Will this study benefit me in any way?
You may or may not benefit directly from participation in this study. However, your participation may help others by improving our understanding of the factors that contribute to mobility issues following in-hospital rehabilitation. With this information in-hand, the researchers will work with GRU staff to identify program improvements

Are there any potential risks/discomforts?
We do not anticipate any risks or discomfort. There is no obligation to participate in this study and declining will not influence your care. All interactions between you and the research staff are designed to make you feel comfortable. If at any time you feel uncomfortable or anxious you will be offered the opportunity to skip questions and/or withdraw from the study without consequence. To withdraw from the study at any time, please contact Dr. Iris Gutmanis (Principal Investigator) at (519) 646-6100, extension 42766. All information collected during your time in the study will be securely destroyed once you withdraw.

Will I be paid to participate in this study?
You will not be paid to participate in this study and there will be no cost to you to participate in the study. As noted above, the surveys will be sent with pre-paid postage.

What happens to the information I provide?
All data collected will remain confidential and accessible only to the study investigators listed on the first page. Any information you provide will be kept confidential to the extent permitted by applicable laws. Please note that even though the risk of identifying you from the study data is very small, it can never be completely eliminated.

Your name will not appear in any verbal or written reports of the study findings. All paper documentation will be stored with the other study documents in a locked cabinet in a locked office at the Parkwood Institute. And any electronic data will be stored on a secure hospital server that is password protected on computers that are behind the hospital firewall. After five
years, all documentation collected throughout this study will be shredded and/or deleted in accordance with hospital policies.

Conflict of interest

There are no conflicts of interest to declare related to this study.

Contacts for further information

If you require any further information regarding this research project or your participation in the study you may contact:

Dr. Iris Gutmanis (Principal Investigator)
Dr. Dalton Wolfe (Study Co-investigator)

Or

If you have any questions about your rights as a research participant or the conduct of this study, you may contact Dr. David Hill, Scientific Director, Lawson Health Research Institute.

Please note that qualified representatives of the Lawson Quality Assurance Education Program may look at your medical/clinical study records at the site where these records are held, for quality assurance (to check that the information collected for the study is correct and follows proper laws and guidelines).

Consent Form

Project title: *Factors associated with the care transition of older adults discharged from the inpatient Geriatric Rehabilitation Unit (GRU) or the Musculoskeletal Unit (MSK) unit at the Parkwood Institute*

I have read the letter of information, have had the nature of the study explained to me and I agree to participate. All of my questions have been answered to my satisfaction. I will be given a copy of the letter of information and consent form once it is signed.

_____ I agree to be interviewed prior to discharge from the Geriatric Rehabilitation Unit or
Musculoskeletal unit as part of this study. Please initial if you agree.

_____ I agree to be contacted after discharge by phone for the follow-up portion of this study as described within this document. Please initial if you agree.

Participants Name: (please print):
_____

Participants Signature:
_____

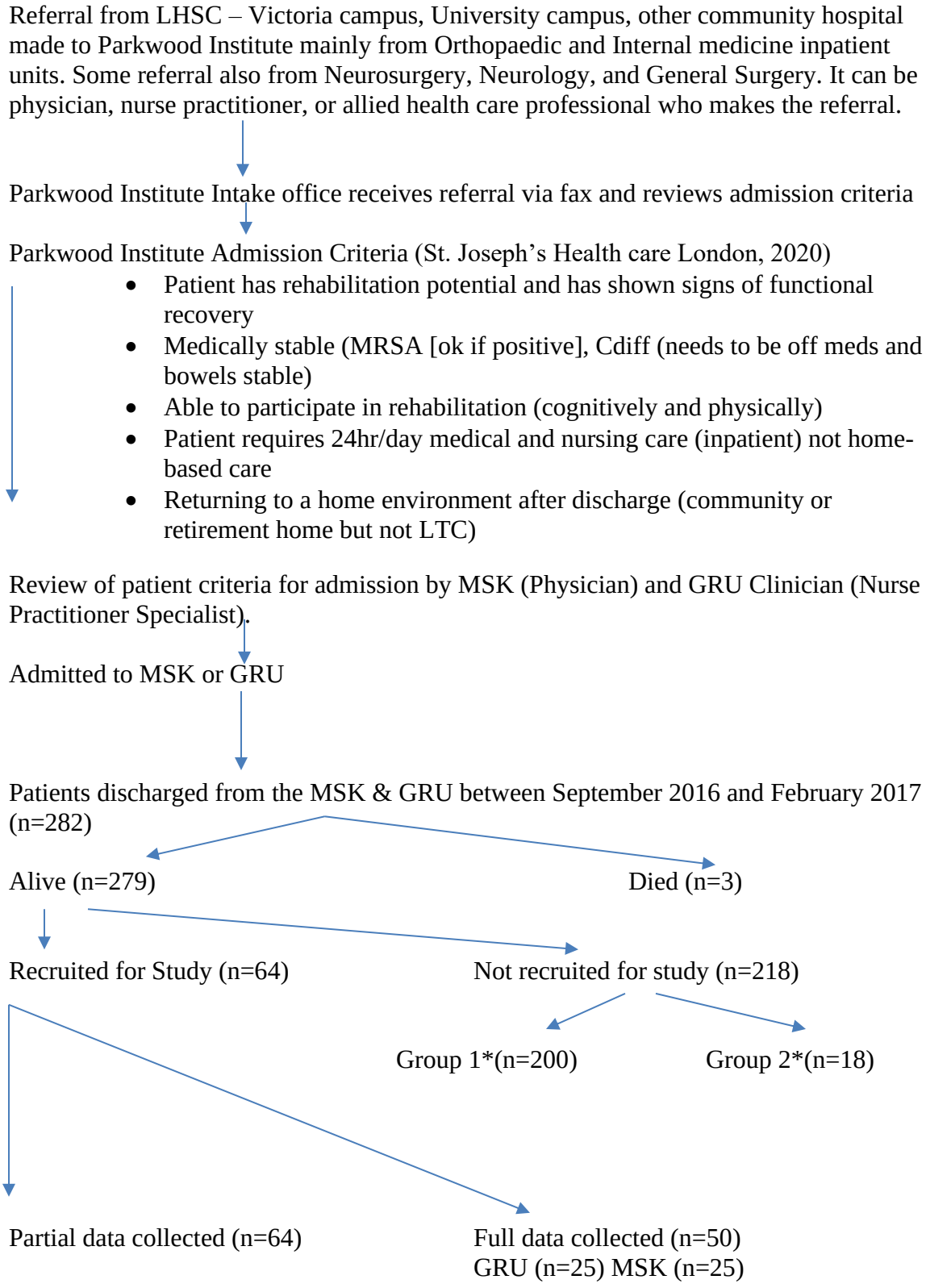
Date:
_____

Person obtaining consent (please print):
_____

Signature:
_____

Date:
_____

Appendix G: Figure G4.1 CONSORT Diagram



*Group 1 includes:
Patients with cognitive issues (mainly patients from the GRU), those who declined to participate, and other issues
*Group 2 includes:
Patients recruited for an intensive needs program from both the MSK and GRU

Abbreviations

C. diff	Clostridioides difficile
GRU	Geriatric rehabilitation unit
LHSC	London Health Sciences Center
LTC	Long term care
MRSA	Methicillin-resistant Staphylococcus aureus
MSK	Musculoskeletal unit

References

St. Joseph's Health care London (2020). Musculoskeletal Rehabilitation Program. https://www.sjhc.london.on.ca/musculoskeletal.

St. Joseph's Health care London (2020). Geriatric Rehabilitation Unit. https://www.sjhc.london.on.ca/areas-of-care/specialized-geriatric-services/specialized-geriatric-services-inpatient/services

Appendix H: In-person Interview Following Consent

Factors associated with care transitions of older adults discharged from the inpatient Geriatric Rehabilitation Unit and Musculoskeletal Unit at the Parkwood Institute

Use these guidelines to interview the patient before discharge

Introduce yourself to the patient.
Ask the patient if this is a good time for a 10 minutes conversation.
If yes, continue with interview
If No*, reschedule interview
* record new date and time _____
Give the patient the opportunity to ask questions about the study.
Ask the patient if there discharge date is still what you have recorded here:
_____
Now complete the **Self-Administered Comorbidity Questionnaire** with the patient (see below).
Education level

Less than high school _____
High school _____
Some college/university _____
College/university degree _____

Do you have access to transportation to attend appointments?
Yes ___
No ____

A follow-up phone call will be made to the client (approximately 2-6 days after discharge).
Try to schedule with the patient a good time for you to call and record date and time here:_____

SCQ Problem	Do you have the problem?		Do you receive treatment for it?		Does it limit your activities?	
	N (0)	Y (1)	N (0)	Y (1)	N (0)	Y (1)
Heart disease	n	y	n	y	n	y
High blood pressure	n	y	n	y	n	y
Diabetes	n	y	n	y	n	y
Ulcer or Stomach disease	n	y	n	y	n	y
Kidney disease	n	y	n	y	n	y
Liver disease	n	y	n	y	n	y
Anemia or other blood disease	n	y	n	y	n	y
Cancer	n	y	n	y	n	y
Depression or other mental illness	n	y	n	y	n	y
Osteoarthritis, degenerative arthritis	n	y	n	y	n	y
Back pain	n	y	n	y	n	y
Rheumatoid arthritis	n	y	n	y	n	y
Other:						
Vision problems	n	y	n	y	n	y
Hearing problems	n	y	n	y	n	y
Falls/balance problems	n	y	n	y	n	y

Score:

Appendix I: Information on equipment & services

Patient Name _____ PIN _____

		Has own at home	Ordered thru ADP	CCAC rental	Other rental	Other source	Declined
Mobility	□ Walker						
	□ Rollator	□	□	□	□	□	□
	□ ____ Wheeled walker	□	□	□	□	□	□
	□ Standard walker	□		□	□	□	□
	□ Wheelchair						
	□ Transport	□		□	□	□	□
	□ Custom	□	□	□	□	□	□
	□ Cane	□			□	□	□
Bathroom	□ Toilet						
	□ Raised toilet seat □ with / □ without arms	□		□	□	□	□
	□ Versa □ mode □ frame	□		□	□	□	□
	□ Commode □ at bedside	□		□	□	□	□
	□ Urinal	□				□	□
	□ Grab bars						
	□ Toilet □ Tub	□				□	□
	□ Clamp on	□		□	□	□	□
	□ Tub / Shower						
	□ Tub / Shower chair	□		□	□	□	□
	□ Bath transfer bench	□		□	□	□	□
	□ Bath board	□		□	□	□	□
Bedroom	□ Bedrails	□		□	□	□	□
Dressing	□ Reacher	□				□	□
	□ Sock-aid	□				□	□
	□ Shoe horn	□				□	□

Eating	□ Large handled utensils	□				□	□
	□ Weighted utensils	□				□	□
Other	□ _____	□	□	□	□	□	□
	□ _____	□	□	□	□	□	□
	□ _____	□	□	□	□	□	□

Signature: _____Date: _____

Appendix J: Data collected from Patient Chart

Data Collection Form

Factors associated with care transitions of older adults discharged from the inpatient Geriatric Rehabilitation Unit and Musculoskeletal Unit at the Parkwood Institute

All data elements will come from hospital records/charts.

Patient year of birth _____

Patient sex M or F

Date of admission: _____
dd/mm/year

Expected discharge date _____
dd/mm/year

Admission FIM _____

Discharge FIM _____

Date of discharge _____
dd/mm/year

Length of stay _____ days

Discharge Destination: home alone or home with spouse/partner

Patient FSA _____

Patient diagnoses on discharge (Most Responsible Diagnosis on discharge summary)

_____

Patient services noted in chart

_____

Appendix K: Care Transition Measure (CTM-15) and Health Care Services Telephone Questionnaire 2 to 6 days after discharge

Record date and time of call.

Date: _____ Time of call: _____

Attempt: 1st 2nd 3rd 4th 5th

Ask each question as it is written and in the order it appears. Circle the response that best corresponds to answer provided.

Q1. Dial the number. If you do not get any answer, try later. Do not leave a message on answering machines/services.

1. Someone answers (GO TO Q2)
2. No answer
3. Answering machine/service
4. Busy signal
5. Number change (RECORD new number ____-____-_____
6. Line problem
7. Number not in service
8. Business number
9. Other non-residential number
10. Fax or computer line
11. Other, SPECIFY _____

Q2. May I please speak to (FULL NAME) _____?

1. Person answers/comes to the phone (GO TO Q7)
2. Told requested person is not home/not available (GO TO Q5)
3. Wrong number (GO TO Q3)
4. Business number (GO TO Q3 – OUT OF STUDY)
5. Hung up (OUT OF STUDY)
6. Other, SPECIFY_____

Q3. Is this _____ - _____ - _____

1. Yes (check telephone number/name; GO TO Q4 and OUT OF STUDY)

2. No (GO TO Q4 and redial)

Q4. I am sorry to have bothered you. Have a nice day/night. Good-bye. (END CALL)

Q5. Is there a particular time that I could reach (FULL NAME) _____?

1. Yes DATE:_____ TIME _____ (GO TO Q6)
2. Would not specify date or time (GO TO Q6)
3. Hang up (OUT OF STUDY)

Q6. Thank you for your time, I will try later. Have a nice day/night. Good-bye. (END CALL)

Q7. Hello, (FULL NAME) _____. This is _____(give first and last name) from Dr. Iris Gutmanis' office at the Parkwood Institute. While you were undergoing rehabilitation, you agreed to participate in a study. Do you have a few minutes today to answer some questions?

1. Yes (GO TO Q11)
2. No (GO TO Q8)
3. Hang up (OUT OF STUDY)

Q8. Is there a better time to call you?

1. Yes DATE:_____TIME _____ (GO TO Q9)
2. Would not specify date or time (GO TO Q10)
3. Hang up (OUT OF STUDY)

Q9. I will call you later then. Have a nice day/night. Good-bye.

Q10. I am sorry to have bothered you today/tonight. Good-bye.

Q11. I'd like to start with some questions about your experience while on the Geriatric Rehabilitation Unit (GRU)/Musculoskeletal (MSK) Unit at the Parkwood Institute. You can answer most of the questions with STRONGLY AGREE, AGREE, DISAGREE, STRONGLY DISAGREE, or DON'T KNOW/DON'T REMEMBER/NOT APPLICABLE. As well, feel free to add comments.

CARE TRANSITION MEASURE 15 (CTM-15)

The first few statements are about the time you were in the hospital (here at Parkwood)…..

Before I left the hospital, the staff and I agreed about clear health goals for me and how these would be reached.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q12. The hospital staff took my preferences and those of my family or caregiver into account in deciding ***what*** my health care needs would be when I left the hospital.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q13. The hospital staff took my preferences and those of my family or caregiver into account in deciding ***where*** my health care needs would be met I left the hospital.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next set of statements is about when you were preparing to leave the hospital……

Q14. When I left the hospital, I had all the information I needed to be able to take care of myself.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q15. When I left the hospital, I clearly understood how to manage my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q16. When I left the hospital, I clearly understood the warning signs and symptoms I should watch for to monitor my health condition.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q17. When I left the hospital, I had a readable and easily understood written plan that described how all of my health care needs were going to be met.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q18. When I left the hospital, I had a good understanding of my health condition and what makes it better or worse.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q19. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q20. When I left the hospital, I was confident that I knew what to do to manage my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q21. When I left the hospital, I was confident I could actually do the things I needed to do to take care of my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next statement is about your follow-up doctor's appointments……

Q22. When I left the hospital, I had a readable and easily understood written list of the appointments or tests I needed to complete within the next several weeks.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/**

Not applicable

Comments_____
_____
_____

The next set of statements is about your medications……..

Q23. When I left the hospital, I clearly understood the ***purpose*** for taking each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q24. When I left the hospital, I clearly understood ***how*** to take each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q25. When I left the hospital, I clearly understood the possible ***side effects*** of each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

END OF CTM - 15

Equipment and Services questionnaire

The next set of questions are about the equipment and services you received after you returned home…….

Q26. When I read your inpatient chart, I noticed some equipment was recommended/ ordered including:

_____
_____
(read list, based on data collected from Appendix G).

Did you receive all of the recommended equipment?

1. All
2. Some
3. Most
4. None

Comments_____
_____
_____

Q27. When I reviewed your inpatient medical chart, I noticed that some services were recommended including: (i.e., Occupational Therapy home assessment, Physiotherapy (home vs day hospital), Personal Support Worker (for personal care), wound care, meals, and housekeeping)

_____
_____
_____

Did you receive the services I just listed?

1. All
2. Some
3. Most
4. None

Comments_____
_____
_____

The next set of questions are about visits to health care professionals since discharge.

First I'm going to ask you about unscheduled appointments. Unscheduled means that you did not have a planned appointment, but rather something happened/something changed and you felt you needed to see your family doctor right way.

Q28. Have you had any unscheduled visits to your family doctor or medical clinic?

1. Yes ⟹ How many unscheduled visits have there been? _____
   Family Doctor _____
   Medical Clinic _____
2. No

Comments_____
_____
_____

Q29. Since you were discharged from hospital, have you had to go to the Emergency Room/Urgent Care Clinic?

1. Yes ⟹ How many times have you been to the
   Emergency Room? _____ / don't remember
   Urgent Care? _____/don't remember
2. No

Q30. Since you were discharged from hospital, have you been admitted to a hospital?

1. Yes ⟹ How many times have you been admitted to the Hospital? _____ /don't remember
2. No

Q31. You also had a/some scheduled appointment(s). One was with your _____. Were you able to go to this appointment?

1. Yes

2. No ⇒ Why not?
_____

You also had a scheduled visit with your _____. Were you able to go to this scheduled appointment?

1. Yes
2. No ⇒ Why not?
_____

You were scheduled for an appointment with your _____. Were you able to go to this scheduled health care professional visit?

1. Yes
2. No ⇒ Why not?
_____

Comments_____
_____
_____

Q32. Any other comments you would like to share with us?

_____
_____
_____
_____
_____

Those are all the questions I have for you today. If you have any concerns about this interview, please call Dr. Iris Gutmanis.

You will be receiving another phone call from us in about 30 days' time. When would be a good time for us to call you the week of _____

_____ _____
dd/mm Time

Thank you for your time today.

Record any impressions / challenges with call
_____
_____
_____
_____

Record time call ended. _____

Appendix L: Care Transition Measure (CTM-15) and Health Care Services Telephone Questionnaire
28-32 days after discharge

Record date and time of call.

Date: _____ Time of call: _____

Attempt: 1st 2nd 3rd 4th 5th

Ask each question as it is written and in the order it appears. Circle the response that best corresponds to answer provided.

Q1. Dial the number. If you do not get any answer, try later. Do not leave a message on answering machines/services.

1. Someone answers (GO TO Q2)
2. No answer
3. Answering machine/service
4. Busy signal
5. Number change (RECORD new number ____-____-_____
6. Line problem
7. Number not in service
8. Business number
9. Other non-residential number
10. Fax or computer line
11. Other, SPECIFY _____

Q2. May I please speak to (FULL NAME) _____?

1. Person answers/comes to the phone (GO TO Q7)
2. Told requested person is not home/not available (GO TO Q5)
3. Wrong number (GO TO Q3)
4. Business number (GO TO Q3 – OUT OF STUDY)
5. Hung up (OUT OF STUDY)
6. Other, SPECIFY_____

Q3. Is this _____ - _____ - _____

1. Yes (check telephone number/name; GO TO Q4 and OUT OF STUDY)
2. No (GO TO Q4 and redial)

Q4. I am sorry to have bothered you. Have a nice day/night. Good-bye.

(END CALL)

Q5. Is there a particular time that I could reach (FULL NAME) _____?
1. Yes DATE:_____ TIME _____ (GO TO Q6)
2. Would not specify date or time (GO TO Q6)
3. Hang up (OUT OF STUDY)

Q6. Thank you for your time, I will try later. Have a nice day/night. Good-bye. (END CALL)

Q7. Hello, (FULL NAME) _____. This is _____(give first and last name) from Dr. Iris Gutmanis' office at the Parkwood Institute. While you were undergoing rehabilitation, you agreed to participate in a study. Do you have a few minutes today to answer some questions?
1. Yes (GO TO Q11)
2. No (GO TO Q8)
3. Hang up (OUT OF STUDY)

Q8. Is there a better time to call you?

1. Yes DATE:_____TIME _____ (GO TO Q9)
2. Would not specify date or time (GO TO Q10)
3. Hang up (OUT OF STUDY)

Q9. I will call you later then. Have a nice day/night. Good-bye.

Q10. I am sorry to have bothered you today/tonight. Good-bye.

Q11. I'd like to start with some questions about your experience while on the Geriatric Rehabilitation Unit (GRU)/Musculoskeletal (MSK) Unit at the Parkwood Institute. You can answer most of the questions with STRONGLY AGREE, AGREE, DISAGREE, STRONGLY DISAGREE, or DON'T KNOW/DON'T REMEMBER/NOT APPLICABLE. As well, feel free to add comments.

CARE TRANSITION MEASURE (CTM-15)

The first few statements are about the time you were in the hospital (here at Parkwood)…..

Before I left the hospital, the staff and I agreed about clear health goals for me and how these would be reached.

Strongly Disagree Agree Strongly Don't know/

Disagree	**Agree**	**Don't remember/ Not applicable**

Comments_____
_____
_____

Q12. The hospital staff took my preferences and those of my family or caregiver into account in deciding ***what*** my health care needs would be when I left the hospital.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q13. The hospital staff took my preferences and those of my family or caregiver into account in deciding ***where*** my health care needs would be met I left the hospital.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next set of statements is about when you were preparing to leave the hospital……

Q14. When I left the hospital, I had all the information I needed to be able to take care of myself.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q15. When I left the hospital, I clearly understood how to manage my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q16. When I left the hospital, I clearly understood the warning signs and symptoms I should watch for to monitor my health condition.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q17. When I left the hospital, I had a readable and easily understood written plan that described how all of my health care needs were going to be met.

Strongly	**Disagree**	**Agree**	**Strongly**	**Don't know/**

Disagree **Agree** **Don't remember/ Not applicable**

Comments_____
_____
_____

Q18. When I left the hospital, I had a good understanding of my health condition and what makes it better or worse.

Strongly Disagree **Disagree** **Agree** **Strongly Agree** **Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q19. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.

Strongly Disagree **Disagree** **Agree** **Strongly Agree** **Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q20. When I left the hospital, I was confident that I knew what to do to manage my health.

Strongly Disagree **Disagree** **Agree** **Strongly Agree** **Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q21. When I left the hospital, I was confident I could actually do the things I needed to do to take care of my health.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next statement is about your follow-up doctor's appointments……

Q22. When I left the hospital, I had a readable and easily understood written list of the appointments or tests I needed to complete within the next several weeks.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

The next set of statements is about your medications……..

Q23. When I left the hospital, I clearly understood the ***purpose*** for taking each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q24. When I left the hospital, I clearly understood ***how*** to take each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

Q25. When I left the hospital, I clearly understood the possible ***side effects*** of each of my medications.

Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**	**Don't know/ Don't remember/ Not applicable**

Comments_____
_____
_____

END OF CTM - 15

Equipment and Services questionnaire

The next set of questions are about the equipment and services you received after you returned home…….

Q26. As we discussed when I called you on _____, some equipment was recommended/ ordered including:

_____
_____

(read list, based on data collected from Appendix G).

Did you receive all of the recommended equipment?

1. All
2. Some
3. Most

4. None

Comments_____
_____
_____

Q27. Some services were also recommended including: (i.e., OT. PT, PSW, Meals, housekeeping, wound care)

_____
_____
_____

Did you receive the services I just listed?

1. All
2. Some
3. Most
4. None

Comments_____
_____
_____

The next set of questions are about visits to health care professionals since discharge.

First I'm going to ask you about unscheduled appointments. Unscheduled means that you did not have a planned appointment, but rather something happened/something changed and you felt you needed to see your family doctor right way.

Q28. Have you had any unscheduled visits to your family doctor or medical clinic since our last call?

1. Yes ⟹ How many unscheduled visits have there been? _____

   Family Doctor _____
   Medical Clinic _____

2. No

Comments_____
_____
_____

Q29. Since you were discharged from hospital, have you had to go to the Emergency Room/Urgent Care Clinic?

1. Yes ⟹ How many times have you been to the Emergency Room? _____ / don't remember
   Urgent Care Clinic? _____/don't remember
2. No

Q30. Since you were discharged from hospital, have you been admitted to a hospital?

1. Yes ⟹ How many times have you been admitted to the Hospital? _____ /don't remember
2. No

Q 31. You also had a/some scheduled appointment(s). It was with your _____. Were you able to go to this appointment?

3. Yes
4. No ⟹ Why not? _____

You also had a scheduled visit with your _____. Were you able to go to this scheduled appointment?

1. Yes
2. No ⟹ Why not? _____

You were scheduled for an appointment with your _____. Were you able to go to this scheduled health care professional visit?

1. Yes
2. No ⟹ Why not? _____

Comments_____
_____
_____

Q32. Overall, on a scale of 1-10, how would you rate your transition from GRU/MSK to home?

1	2	3	4	5	6	7	8	9	10
Poor									Excellent

Q33. Any other comments you would like to share with us?

_____
_____
_____
_____

Those are all the questions I have for you today. If you have any concerns about this interview, please call Dr. Iris Gutmanis.

Thank you so much for participating this study. Best of luck with your continued recovery.

Record any impressions / challenges with call

_____
_____
_____
_____

Record time call ended. _____

Appendix M: Post Discharge Health Care Provider, Hospital and ED visits

Data Collection Form

Factors associated with care transitions of older adults discharged from the inpatient Geriatric Rehabilitation Unit and Musculoskeletal Unit at the Parkwood Institute

1. **Scheduled health care professional visits at 2-6 days**

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments

_____
_____
_____

2. **Unscheduled health care professional visits at 2-6 days**

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments
_____
_____
_____

3. Scheduled health care professional visits at 28-32 days

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments
_____
_____
_____

4. Unscheduled health care professional visits at 28-32 days

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments

_____
_____
_____

5. **Emergency Room visits at 2-6 days**

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments

_____
_____
_____

6. **Emergency Room visits at 28-32 days**

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments

_____
_____
_____

7. Hospital admissions at 2-6 days

Visit 1 _____ with _____
dd/mm/year

Visit 2 _____ with _____
dd/mm/year

Visit 3 _____ with _____
dd/mm/year

Visit 4 _____ with _____
dd/mm/year

Visit 5 _____ with _____
dd/mm/year

Comments

_____
_____
_____

8. Hospital admissions at 28-32 days

Visit 1 _____ with _____

Visit 2 _____ with _____

Visit 3 _____ with _____

Visit 4 _____ with _____

Visit 5 _____ with _____

dd/mm/year

Comments

_____

_____

_____

Appendix N: Variable Summary Table

Table N5.1

Variable Summary Table

Variable	**Levels/scale limits**	**Type of variable**	**Frequency distribution/ Shapiro Wilk test**	**When measured**
Sex	2 levels male female	Categorical	N/A	Prior to discharge
Education	4 levels Less than high school High school diploma Some college/university College/university degree	Categorical	N/A	Prior to discharge
Living arrangements	4 levels Living alone Living with spouse Living with family/friends Retirement home	Categorical	N/A	Prior to discharge
Age (years)	60 – 120	Continuous	Normal	Prior to discharge
FIM at discharge	0 – 120	Continuous	Non normal distribution	At admission and discharge
Length of stay (days)	1 – 100	Continuous	Non normal distribution	At discharge
# of comorbidities	0 – 10	Continuous	Non normal distribution	At discharge
CTM-15	0 – 100	Continuous	Non normal distribution at both time points	Time 1 (2-6 days after discharge) Time 2 (28-32 days after discharge)

Appendix O: ANOVA table and ICC calculations (Chapter 5 Results section)

Table O5.1 ANOVA table CTM-15 time 1 and time 2

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		11633.240	49	237.413		
Within People	Between Items	23.040	1	23.040	.430	.515
	Residual	2624.960	49	53.571		
	Total	2648.000	50	52.960		
Total		14281.240	99	144.255		

Grand Mean = 68.26, n=50, k=2,

The formula for $ICC_{2,1}$ is:

$$\frac{BMS - EMS}{BMS + (k - 1)\,EMS + k(JMS - EMS)/n}$$

where BMS is the between patients mean square, EMS is the within patient residual mean square, JMS is the within patient between times mean square, *n* is the number of patients, and *k* is the number of testing occasions (Shrout & Fleiss, 1979).

$$ICC_{2,1} = \frac{237.413 - 53.571}{237.413+(2-1)\,53.571 + 2\,(23.040-53.571)/50}$$

$$= \frac{183.842}{290.984 + (-1.221)} \quad = \frac{183.842}{289.763} \quad = 0.6345$$

Shrout, P.E. & Fleiss, J.L. (1979). Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin, 86*(2); 420-428.

Appendix P: Demographic characteristics of excluded patients (n=11) and full sample (n=50), (Chapter 5)

Table P5.1

Demographic characteristics of excluded patients (n=11) and full sample (n=50)

Sample characteristic	**Total n=50 Frequency (percent)**	**Total n=11 Frequency (percent)**
Unit		
MSK	25 (50)	6 (55%)
GRU	25 (50%	5 (45%)
Sex		
Female	38 (76%)	8 (73%)
Male	12 (24%)	3 (27%)
Education		
Some college/university or less	35 (70%)	5 (45%)
College/university degree	15 (30%)	6 (55%)
Discharge living arrangements		
Home alone	29 (58%)	3 (27%)
Home with spouse, family, retirement home	21 (42%)	8 (73%)
Age in years, median (IQR)	81 (13)	86 (12)
Mean (SD)	80 (8.5)	81.8 (9.3)
Min – max	63-97	63 – 91
Length of stay, days median (IQR))	27 (10)	28 (11)
Mean (SD)	25.7 (9.2)	27.6 (15)
Min – max	8 – 54	14 – 69
Comorbidities[1], median (IQR)	8.5 (8)	12 (13)
Mean (SD)	9.3 (5.4)	11.2 (6.7)
Min – max	2 – 17	0 – 19
FIM at discharge, median (IQR)	111 (8)	104 (20)
Mean (SD)	108.7 (8)	99.4 (17.4)
Min – max	84 – 120	65 – 117

Note. MSK = musculoskeletal unit; GRU = geriatric rehabilitation unit; 1 = comorbidities obtained through the full Self-administered Comorbidity Questionnaire.

Appendix Q: Participant Characteristics by Sample

Table Q5.1 *Characteristics by samples*

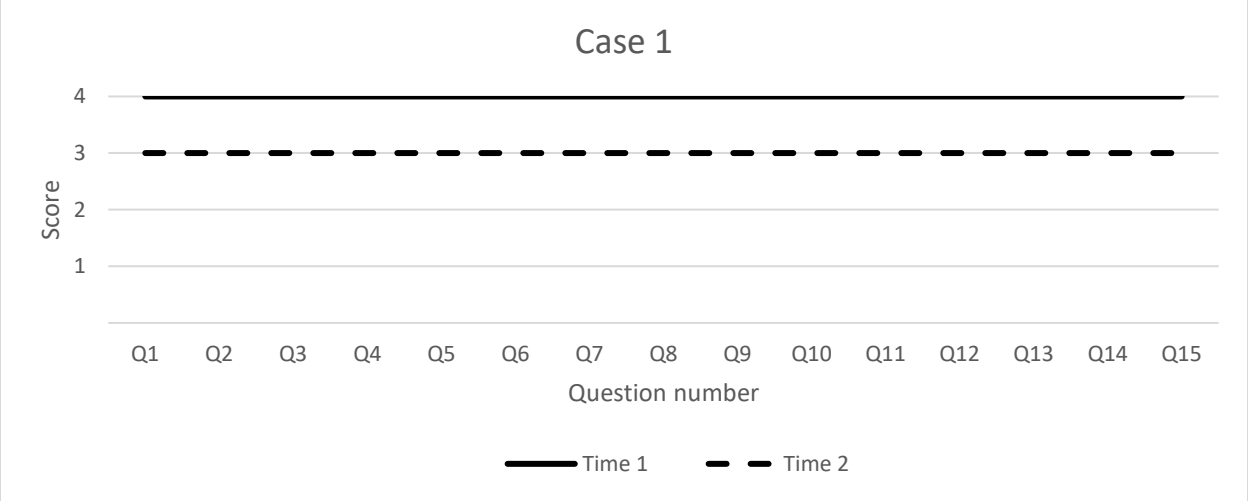
Patient Characteristic	n=50	MSK n=25	GRU n=25	n=61
Sex: Female	38 (76)	21(84)	17 (68)	46 (75)
Male	12 (24)	4(16)	8(32)	15 (25)
Education				
Less than HS	13 (26)	5 (20)	8 (32)	15 (25)
HS diploma	15 (30)	7 (28)	8 (32)	18 (30)
Some college university	7 (14)	4 (16)	3 (12)	7 (11)
College/university	15 (30)	9 (36)	6 (24)	21 (34)
Discharge living arrangements				
Home alone	29 (58)	17 (68)	12 (48)	32 (52)
Home spouse	10 (20)	3 (12)	7 (28)	13 (21)
Home with family	9 (18)	5 (20)	4 (16)	12 (20)
Retirement home	2 (4)	0 (0)	2 (8)	4 (7)
Transportation				
Drive self	8 (16)	4 (16)	4 (16)	8 (13)
Others drive	42 (84)	21 (84)	21 (84)	53 (87)
Age in years				
Median (IQR),	81 (13)	77 (12)	82 (12)	81 (14)
Min-max age range	63-97 years	63 – 92	69 – 97	63 – 97
Mean (SD)	80 (8.5)	77.5 (8.5)	88.2 (7.7)	80.6 (8.6)
95% CI	78 – 82	74 – 81	80 – 86.4	78.4 – 83
Length of stay,				
days, Median	27 (10)	27 (11)	25 (8.5)	27 (11)
(IQR)	8 – 54 days	10 – 54	8 – 48	8 – 69
Min – max range	25.7 (9.25)	26 (10)	28 (10)	26 (10)
Mean (SD)	23 – 28.3	22 – 30	22 – 29	23.4 – 28.7
95% CI				
SCQ				
Median (IQR)	8.5 (8)	8 (7)	9 (9)	9 (9)
Min – max	2 – 27	2 – 27	2 – 20	0 – 27
Mean (SD)	9.26 (5.4)	9.2 (5.3)	9.3 (5.6)	9.7 (5.8)
95% CI	7.7 – 10.8	7 – 11.4	7 – 11.6	8.2 – 11.2
FIM at discharge				
Median (IQR)	111 (8)	113 (6)	109 (13)	111 (9)
Min – max FIM	84 – 120	101 – 120	84 – 115	65 – 120
Mean (SD)	108.7 (8)	112.4 (4.3)	105 (9.3)	107 (10.8)
95% CI	106.4 - 111	110.6 – 114	101 – 109	104 – 110

MSK = musculoskeletal unit, GRU = geriatric rehabilitation unit, IQR = interquartile range, SD = standard deviation, CI – confidence interval, HS = high school, FIM = Functional Independence Measure, SCQ = self-administered comorbidity questionnaire, others drive = spouse, family, friends, neighbor, paid transportation, don't know or unsure.

Appendix R: Influential observations - 3 cases (Chapter 5)

The Bland Altman plot as well as the scatter plot identified three potential influential observations. A review of all the demographic and health-related factors associated with these three cases revealed no obvious reason for these large change scores. To understand the impact of these three cases, additional analyses were done. As seen in Figure 5.7, for case 1, the respondent chose "strongly agree" for all 15 items at Time 1 and "agree" for all 15 items at Time 2 (mean item scores: Time 1: 4.0; Time 2: 3.0). This resulted in a Time 1 score of 100 and a Time 2 score of 66.67, for an overall drop of 33.33 points in the total transformed CTM-15 score.

Figure 5.1: *Item by item scores for Case 1 for Time 1 and Time 2*

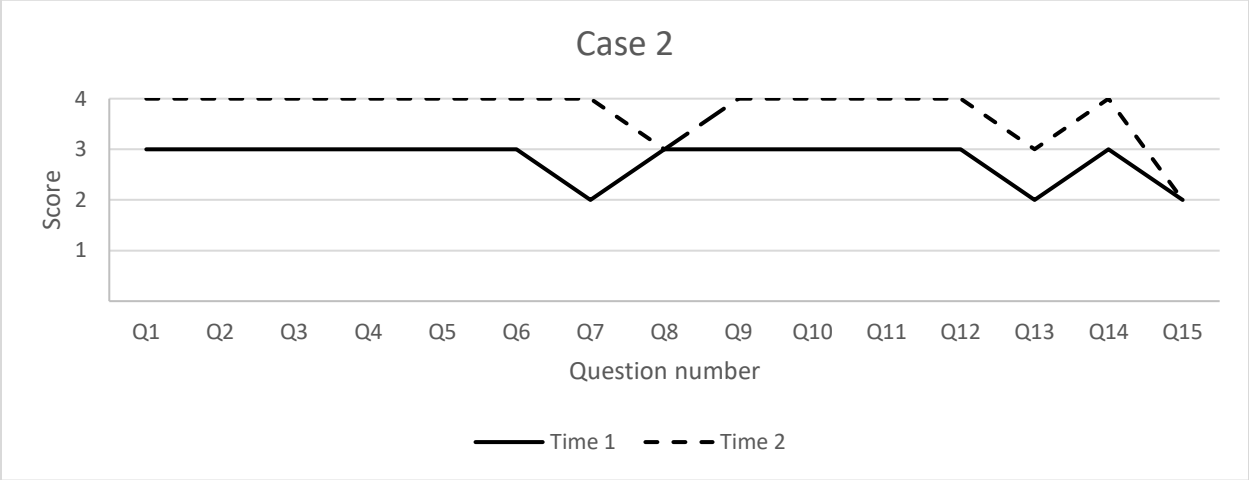


Note: Scores: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree

As seen in Figure 5.8, in case 2, the responses to 11 questions went from 3 (agree) to 4 (strongly agree), while for one question the response changed from disagree to strongly disagree and for another question the response changed from disagree to agree. This resulted in a Time 1 score of 60.00 (mean item score: 2.80) and a Time 2 score of

91.11 (mean item score: 3.73), for an overall increase of 31.11 points in the overall transformed CTM-15 score.

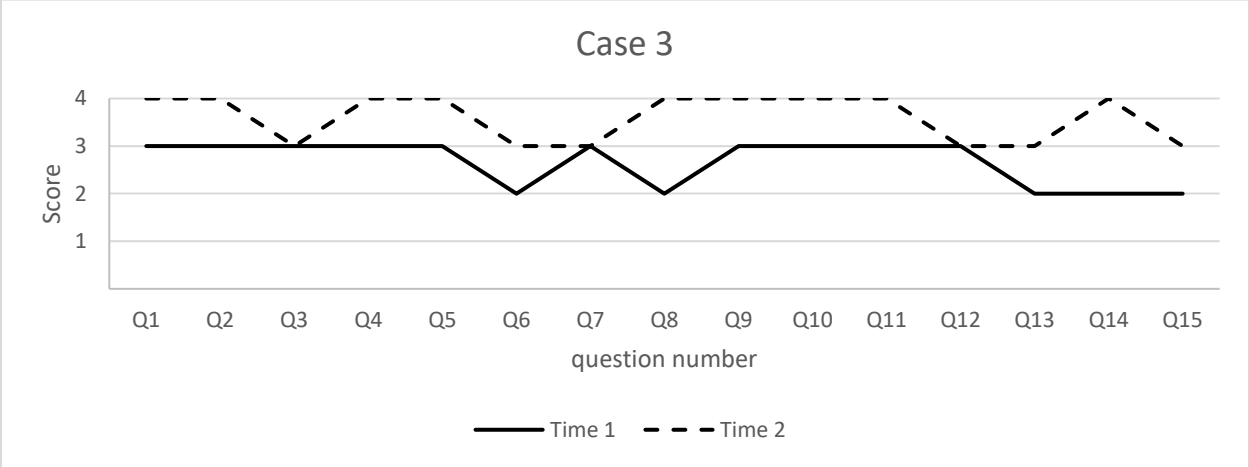
Figure 5.2: *Item by item scores for Case 2 for Time 1 and Time 2*



Note: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree

As seen in Figure 5.8, for case 3, the scores for seven questions went from 3 (agree) to 4 (strongly agree), while for three questions the scores went from disagree to agree and the scores for two questions went from disagree to strongly agree. This resulted in a Time 1 score of 55.56 (mean item score: 2.67) and a Time 2 score of 86.67 (mean item score: 3.60), for an overall increase of 31.11 points in the overall transformed CTM-15 score.

Figure 5.3: *Item by item scores for Case 3 for Time 1 and Time*



Note: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree

Appendix S: Calculation of Variance Estimates, Intraclass Correlation Coefficients and Standard Errors of Measurement

From the repeat measures ANOVA table, we use the Mean Square (MS) to calculate the variances of subject, repetition or time and error.

Full study sample: 50 people

Tests of Between-Subjects Effects

Dependent Variable: CTM15 score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11750.898[a]	50	235.018	4.382	.000
Intercept	464825.332	1	464825.332	8666.417	.000
Subject	11722.414	49	239.233	4.460	.000
Time	28.484	1	28.484	.531	.470
Error	2628.127	49	53.635		
Total	479204.357	100			

a. R Squared = .817 (Adjusted R Squared = .631)

MS (error) = variance due to error = 53.635

MS (time/repetition) = (number of people [50]) * variance due to time + variance due to error

28.484 = (50) (variance due to time) + 53.635
(50) (variance due to time) = 28.484 – 53.635
variance due to time = -25.151 / 50
= -0.5030

MS (inter-subject) = (number of repetitions [2]) * inter-subject variance + error variance

239.233 = (2) (inter-subject variance) + 53.635
2 (inter-subject variance) = 239.233 – 53.635
Inter-subject variance = 185.598/2
= 92.799

Variance due to error: 53.635
Variance due to time/repetition: -0.503
Inter-subject variance: 92.799

ICC, absolute agreement, single rater:
= inter-subject variance / (inter-subject variance + variance due to time/repetition + variance due to error)
= 92.799 / (92.799 + (-0.503) + 53.635)

= 92.799 / 145.931
=0.6359
Standard Error of Measurement = Sq root (mean square associated with error)
= Sq root (53.635)
= 7.324

3 influential observations removed: 47 people

Tests of Between-Subjects Effects

Dependent Variable: CTM15 score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11115.632[a]	47	236.503	9.654	.000
Intercept	430017.243	1	430017.243	17552.371	.000
Subject	11109.256	46	241.506	9.858	.000
Time	6.375	1	6.375	.260	.612
Error	1126.958	46	24.499		
Total	442259.833	94			

a. R Squared = .908 (Adjusted R Squared = .814)

MS (error) = variance due to error = 24.499

MS (time/repetition) = (number of people [50]) * variance due to time + variance due to error

6.375 = (47) (variance due to time) + 24.499
(50) (variance due to time) = 6.375 – 24.499
variance due to time = -18.124/ 47
= -0.3856

MS (inter-subject) = (number of repetitions [2]) * inter-subject variance + error variance

241.506 = (2) (inter-subject variance) + 24.499
2 (inter-subject variance) =241.506 – 24.499
Inter-subject variance = 217.007/2
= 108.5035

Variance due to error: 24.499
Variance due to time/repetition: -0.3856
Inter-subject variance: 108.5035

ICC, absolute agreement, single rater:
= inter-subject variance / (inter-subject variance + variance due to time/repetition + variance due to error)

= 108.5035/ (108.5035 + (-0.3856) + 24.499)
= 108.5035 / 132.6169
=0.8182

Standard Error of Measurement = Sq root (Mean square associated with error)
= Sq root (24.499)
= 4.950

Table S5.4

Mean squares and variance estimates associated with error, time and subject both with and without the influential cases

	n=50	**n=47^**
Inter-subject mean square (p-value)	239.23 (<0.001)	241.51 (<0.001)
Mean square repetition (p-value)	28.48 (0.47)	6.38 (0.61)
Variance due to error*	53.64	24.50
Variance due to repetition	-0.50	-0.39
Inter-subject variation	92.80	108.50
F statistic associated with subject (p-value)	4.46 (<0.001)	9.86 (<0.001)
F statistic associated with time (p-value)	0.531 (0.470)	0.260 (0.612)
ICC	0.64	0.82
Standard Error of Measurement	7.32	4.95

Note. ^: based on Bland-Altman plot, three influential observations removed; *: mean square error from repeat measures ANOVA table.

Reference

Kim, H. Y. (2013). Statistical notes for clinical researchers: Evaluation of measurement error 1: using intraclass correlation coefficients. *Restor Dent Endod*; 38(2):98-102. doi: 10.5395/rde.2013.38.2.98. PMID: 23741714; PMCID: PMC3670985.

Appendix T

Independent variables used to assess factors associated with the 15 item Care Transitions Measure

Variable	Continuous or categorical	Data Source	Unit of analysis	Details
Age	Continuous, normally distributed	Baseline interview: Time 0	10-year increments	Date of birth subtracted from date of admission
Sex	Categorical • Female: 0 • Male: 1	Baseline interview: Time 0		
Education	Categorical • Completed college and/or university degree: 0 • Some college/university, completed high school or lower: 1	Baseline interview: Time 0		
Length of stay	Continuous; skewed distribution	From QMCDS	Per day	Date of admission subtracted from date of discharge
FIM® on admission	Continuous; skewed distribution	From QMCDS	10-/point increments	Data are collected within the first few days of hospital admission by the unit's HCPs; min-max scores: 18-126
FIM® on discharge	Continuous; skewed distribution	From QMCDS	10-point increments	Data are collected within a few days of discharge by the unit's HCPs; min-max scores: 18-126

Note. QMCDS = hospital's quality measurement and clinical decision support unit; FIM = Functional Independence Measure; HCPs = health care provider.

Appendix U: Simple regression models by unit (Chapter 7)

Table 7.1 a and b present simple regression models by unit. For the MSK unit, FIM admission and length of stay were significantly associated with averaged CTM-15 scores. For the GRU, age was the only significant variable using a $p < 0.20$ threshold.

Table U7.5a

MSK (n=25) simple regression models

Variable	Regression coefficient (95% CI)	R2	Model F	Model Significance
Age	-2.50 (-8.48, 3.48)	0.032	0.75	0.40
Sex	7.94 (-5.39, 21.26)	0.062	1.52	0.23
Education	-5.70 (-15.49, 4.09)	0.059	1.45	0.24
FIM on admission	0.38 (-0.08, 0.84)	0.111	1.70	0.10
FIM at discharge	-0.74 (-12.62, 11.14)	0.001	0.02	0.90
Length of stay	0.41 (-0.07, 0.89)	0.117	3.05	0.09

Note. MSK=musculoskeletal unit, CI=confidence interval, FIM=Functional Independence Measure.

Table U7.5b

GRU (n=25) simple regression models

Variable	Regression coefficient (95% CI)	R2	Model F	Model Significance
Age	-3.84 (-8.67, 0.98)	0.106	2.71	0.11
Sex	-0.16 (-8.45, 8.14)	0.000	0.01	0.97
Education	2.41 (-5.59, 10.41)	0.017	0.39	0.54
FIM on admission	0.08 (-0.27, 0.44)	0.010	0.22	0.64
FIM at discharge	0.90 (-3.31, 5.11)	0.008	0.19	0.66
Length of stay	-0.24 (-0.69, 0.21)	0.050	1.22	0.28

Note. GRU= geriatric rehabilitation unit, CI=confidence interval, FIM=Functional Independence Measure.

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