The Relationship between Chronic Disease Self-Efficacy and Nutritional Status, Functional Ability and Quality of Life in Older Adults at Risk of Hospital Readmission

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KEYWORDS

Chronic disease, Functional status, Health-related quality of life, Malnutrition, Nutrition status, Older adults, Risk of hospital readmission, Self-efficacy, Social support, Testing theory, Structural equation modelling.

ABSTRACT

Background and significance:

Older adults with chronic diseases are at increasing risk of hospital admission and readmission. Approximately 75% of adults have at least one chronic condition, and the odds of developing a chronic condition increases with age. Chronic diseases consume about 70% of the total Australian health expenditure, and about 59% of hospital events for chronic conditions are potentially preventable. These figures have brought to light the importance of the management of chronic disease among the growing older population. Many studies have endeavoured to develop effective chronic disease management programs by applying social cognitive theory. However, limited studies have focused on chronic disease self-management in older adults at high risk of hospital readmission. Moreover, although the majority of studies have covered wide and valuable outcome measures, there is scant evidence on examining the fundamental health outcomes such as nutritional status, functional status and health-related quality of life.

Aim:

The aim of this research was to test social cognitive theory in relation to self-efficacy in managing chronic disease and three health outcomes, namely nutritional status, functional status, and health-related quality of life, in older adults at high risk of hospital readmission.

Methods:

A cross-sectional study design was employed for this research. Three studies were undertaken. Study One examined the nutritional status and validation of a nutritional screening tool; Study Two explored the relationships between participants' characteristics, self-efficacy beliefs, and health outcomes based on the study's hypothesized model; Study Three tested a theoretical model based on social cognitive theory, which examines potential mechanisms of the mediation effects of social support and self-efficacy beliefs. One hundred and fifty-seven patients aged 65 years and older with a medical admission and at least one risk factor for readmission were recruited. Data were collected from medical records on demographics, medical

history, and from self-report questionnaires. The nutrition data were collected by two registered nurses. For Study One, a contingency table and the kappa statistic was used to determine the validity of the Malnutrition Screening Tool. In Study Two, standard multiple regression, hierarchical multiple regression and logistic regression were undertaken to determine the significant influential predictors for the three health outcome measures. For Study Three, a structural equation modelling approach was taken to test the hypothesized self-efficacy model.

Results:

The findings of Study One suggested that a high prevalence of malnutrition continues to be a concern in older adults as the prevalence of malnutrition was 20.6% according to the Subjective Global Assessment. Additionally, the findings confirmed that the Malnutrition Screening Tool is a valid nutritional screening tool for hospitalized older adults at risk of readmission when compared to the Subjective Global Assessment with high sensitivity (94%), and specificity (89%) and substantial agreement between these two methods ($k = .74$, $p < .001$; 95% CI .62-.86).

Analysis data for Study Two found that depressive symptoms and perceived social support were the two strongest influential factors for self-efficacy in managing chronic disease in a hierarchical multiple regression. Results of multivariable regression models suggested advancing age, depressive symptoms and less tangible support were three important predictors for malnutrition. In terms of functional status, a standard regression model found that social support was the strongest predictor for the Instrumental Activities of Daily Living, followed by self-efficacy in managing chronic disease. The results of standard multiple regression revealed that the number of hospital readmission risk factors adversely affected the physical component score, while depressive symptoms and self-efficacy beliefs were two significant predictors for the mental component score.

In Study Three, the results of the structural equation modelling found that self-efficacy partially mediated the effect of health characteristics and depression on health-related quality of life. The health characteristics had strong direct effects on functional status and body mass index. The results also indicated that social support partially mediated the relationship between health characteristics and functional status. With regard to the joint effects of social support and self-efficacy, social support fully mediated the effect of health characteristics on self-efficacy, and self-efficacy partially mediated the effect of social support on functional status and health-related quality of life. The results also demonstrated that the models fitted the data well with relative high variance explained by the models, implying the hypothesized constructs under discussion were highly relevant, and hence the application for social cognitive theory in this context was supported.

Conclusion:

This thesis highlights the applicability of social cognitive theory on chronic disease self-management in older adults at risk of hospital readmission. Further studies are recommended to validate and continue to extend the development of social cognitive theory on chronic disease self-management in older adults to improve their nutritional and functional status, and health-related quality of life.

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LIST OF ABBREVIATIONS

ADL	Index of Activities of Daily Living
ACE	Acute Care for Elders Unit
AGFI	Adjusted Good-of-Fit Index
APN	Advanced Practice Nurse
BMI	Body Mass Index
CAMA	Corrected Arm Muscle Area
CC	Calf Circumference
CDSES	Chronic Disease Self-Efficacy Scale
CFI	Comparative Fit Index
CI	Confidence Interval
COPD	Chronic Obstructive Pulmonary Disease
FN	False Negative
FP	False Positive
GDS	Geriatric Depression Scale
GFI	Goodness-Fit Index
IADL	Instrumental Activities of Daily Living
LOS	Length of Stay
MUAC	Mid-Upper Arm Circumference
MCS	Mental Component Score
MOS SSS	Medical Outcomes Study Social Support Survey
MST	Malnutrition Screen Tool
NC	Normal Chi-Square
PARR	Patients At Risk of Rehospitalisation

PCS	Physical Component Score
PDA	Peripheral Arterial Disease
Pra	Probability of Repeated Admission
RMSEA	Root-Mean-Square Error of Approximation
SCT	Social Cognitive Theory
SD	Standard Deviation
SEM	Structural Equation Modelling
SF-12	Short Form-12 Health Survey.
SGA	Subjective Global Assessment
SPMSQ	Short Portable Mental Status Questionnaire
SRMR	Standardized Root-Mean-Square Residual
TN	True Negative
TP	True Positive
TSF	Triceps Skin Fold
VIF	Variance Inflation Factor
WHO	World Health Organization
WIQ	Walking Impairment Questionnaire

STATEMENT OF ORIGINAL AUTHORSHIP

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

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Chapter 1: Introduction

Introduction

With the growth of the ageing population, healthcare delivery has shifted its focus from acute care to the prevention and management of chronic diseases, and enhanced quality of life in this population (World Health Organization, 2002). While aging well and aging productively are the aims to respond to the changing demographic population of Australian older adults (Department of Innovation Industry Science and Research, 2011), improving older adults' health through effective and efficient management of chronic diseases is also a response to achieving these national aims. Older adults (over 65 years) account for 37% of hospitalizations (Karmel, Lloyd, & Hales, 2007), and comprise 41% of the total burden of disease and injury in Australia (Australian Institute of Health and Welfare, 2007). These figures also stress the importance of developing effective and efficient interventions to tackle the issue of chronic disease management among older adults to prevent hospital readmission and premature mortality and morbidity.

Although a great number of studies have applied social cognitive theory, particularly the concept of self-efficacy, in chronic disease self-management, such as arthritis and diabetes in recent years (Lorig, Ritter, Laurent, & Plant, 2008; Lorig, Ritter, & Plant, 2005; Lorig, Ritter, Villa, & Piette, 2008; Shortridge-Baggett, 2001), there is a scant body of knowledge on the association between self-efficacy in managing chronic disease and nutritional status, functional status, and health-related quality of life. The current study, therefore, tests the theory based on the major constructs of social cognitive theory to investigate the relationship between self-efficacy and health outcomes, which include nutritional status, functional ability and health-related quality of life in older adults at high risk of hospital readmission.

This chapter describes the background and significance of the study; defines the study objectives, the research questions and hypotheses; provides definitions of terms used; and, finally, outlines the remaining chapters of the thesis.

1.1 Background and Significance of the Study

The world's population is ageing fast. According to a United Nation's report in 2006, globally, the number of people older than 60 years will rise to 22% by 2050 (United Nations, 2006). In the same way, the ageing of Australia's population, already evident in the current age structure (13% of population over 60 years), is expected to increase to 27%-31% by 2051 (Australian Bureau of Statistics, 2004). Older people are at an increased risk of chronic disease, disability, and financial and social dispossession, which can lead to their becoming major consumers of the health care system (Jayadevappa, Chatre, Weiner, & Raziano, 2006; Parker, 2005).

Chronic disease currently accounts for approximately 70% of the total burden of illness and injury experienced by the Australian population, and the proportion is expected to reach around 80% by 2020 (Australian Institute of Health and Welfare, 2006; National Public Health Partnership, 2001). In Australia, older adults commonly have at least two to three health conditions such as arthritis, hypertension and heart diseases (Australian Institute of Health and Welfare, 2008a). This also indicates that older adults have higher hospital admission and readmission rates compared to the general population. Risk factors for hospitalisation include increased age, number of illnesses, impaired physical function, cognitive impairment, falls, prolonged bed rest, psychiatric illness, poor self-rated health, and use of home health services (Dobrzanska & Newell, 2006; Lanièce et al., 2008)

Furthermore, readmission costs were reported to be higher by 24% to 55% than the first admission cost (Baker & Wellman, 2005; Marcantonio et al., 1999). Both readmission to hospital and the experience of multiple hospital admissions are reported as important contributors to the overall use of hospital beds and result in increasing health expenditure as well as iatrogenic hospital complications (Inouye et al., 2008; Parker, 2005). Thus, the prevention of hospital readmission is particularly crucial for both older adults and health care systems.

The majority of health conditions in older adults are chronic diseases which require life-long management. Poor management of chronic illness conditions results in negative health outcomes such as increased risk of co-morbidity, hospital readmission, and decline in functional ability, and overall wellbeing (Dobrzanska, 2004; Elzen, Slaets, Snijders, & Steverink, 2007; Kempen, Ormel, Brilman, & Relyveld, 1997). As a result, researchers have been focusing on preventing and managing chronic diseases. In terms of disease management, social cognitive theory, especially the concept of self-efficacy which is the central construct in social cognitive theory, has been studied as a vital influential mediator in managing chronic disease (Bandura, 1986; Lorig et al., 1996). Bandura (1986) stated that coping with chronic disease requires not only knowledge and skills but also a belief in one's ability to manage those skills in real situations and a belief that self management will produce desired outcomes.

Numerous studies are grounded in social cognitive theory in designing the interventions for enhancing self-efficacy in managing chronic illness. For example, there is evidence that improved self-efficacy beliefs can mediate the influence of a physical activity intervention on improvement in physical performance in pre-frail older adults (Rejeski, King et al., 2008), and quality of life in older adults (McAuley et al., 2006). However few studies contain tests of the theory (Calfas, Sallis, Oldenburg, & Ffrench, 1997). Although, studies have consistently demonstrated that social cognitive theory is effective in motivating behavioural change and achieving positive outcomes, little information is known on chronic disease self-management in older adults at high risk of hospital readmission. As theory-based research provides support in guiding research to a systematic way of understanding events or situations, and predicting findings (Rimer & Glanz, 2005), there is a need to apply social cognitive theory in relation to chronic disease self-management in older adults at risk of hospital readmission.

The term "test theory" refers to "a theory in which a theoretical framework was specified, and more than half the theoretical constructs were measured and explicitly tested, or two or more theories were compared to one another in a study" (Glanz, Rimer, & Viswanath, 2008, p. 33). Glanz et al. (2008) reported that only 3.6 percent of theories were tested when they reviewed types of theory that were used from 2000 to 2005. Similarly, limited studies have been carried out on model testing in relation to self-efficacy and chronic disease self-management in older adults. There is lack of a body of knowledge in the phenomenon of relations among variables in regard to self-efficacy and generalised chronic disease self-management in older adults at high risk of readmission. Further, there are limited studies measuring health outcomes in regard to nutritional status, functional ability and health-related quality of life.

In relation to health outcome measures, as nutritional status and functional ability are mutually dependent on each other, failure to manage chronic illness conditions also affects these two important health indicators and, as a result, older adults' quality of life will be compromised. Particular attention should be drawn to nutritional status, as malnutrition has been recognized as a global problem with increasing prevalence among older adults (Visvanathan, 2003). Malnutrition has resulted in undesirable health consequences, such as increasing immune function impairment, falls, pressure ulcers, slow wound healing, increased hospital length of stay (LOS), complications, hospital costs, readmission, mortality rate, and decreased physical functioning (Covinsky et al., 1999; Isenring, Cross, Daniels, Kellett, & Koczwara, 2006; Middleton, Nazarenko, Nivison-Smith, & Smerdely, 2001; Raja et al., 2004; Tierney, 1996).

International and local studies have shown the prevalence of malnutrition ranges from 13-78% depending on the assessment tool and setting (Kubrak & Jensen, 2007). Malnutrition among older people has also been identified as unrecognized and under-treated across acute health care settings, nursing homes and in the community (Green & Watson, 2005; Martin, Kayser-Jones, Stotts, Porter, & Froelicher, 2007; Pablo, Izaga, & Alday, 2003). Therefore, the prevalence of malnutrition amongst this population needs to be examined, especially for frail older adults at high risk of readmission in the acute and community settings.

Additionally, in order to detect the risk of malnutrition, a sensitive and validated nutrition screening tool is essential (Ferguson, Capra, Bauer, & Banks, 1999). Unfortunately, recommended methods of nutritional screening are often too complicated and time-consuming for routine application in frail, very old, hospitalized patients. However, the Malnutrition Screening Tool (MST) is a very simple, quick and easy-to-use tool, and has been widely used in Australian hospital settings. Yet, it has not been validated specifically for older hospitalized adults and community-dwelling older adults. Having a validated screening tool which can be used across settings, including older adults will benefit not only patients but also healthcare providers.

The current study formed a sub-study of “Preventing hospital readmissions and loss of functional ability in high risk older adults: A randomized controlled trial” of the ARC discovery grant (Parent study). A brief outline of the aims of the parent study follows. Firstly, the study aimed to conduct a randomized controlled trial to compare and evaluate health promotion interventions targeting older patients aged over 65 years who are at risk of hospital readmission after discharge. This is known as “tertiary” prevention which describes appropriate clinical management of diseases and it aims to reduce the risk of disabilities (World Health Organization, 2002); Secondly, the study aimed to compare and evaluate innovative health promoting exercise and telephone follow up interventions following discharge, in comparison to usual care on primary outcomes at 1 month, 3 months and 6 months. Thirdly, the study aimed to compare and evaluate the interventions as a means of reducing readmission rates; time to first readmission; unscheduled emergency department and general practitioner visits after discharge and improving health and functional status; psychosocial wellbeing; patient satisfaction and cost effectiveness.

Based on past research and in light of the parent study, it is suggested that there is a need to test theory based on social cognitive theory in relations to chronic disease self-management and health outcomes in older adults at high risk of hospital readmission. Moreover, the prevalence of malnutrition in high risk hospital readmission older adults needs to be explored as malnutrition has considerable implications for both health and quality of life, and association with mortality rates (Middleton, Nazarenko, Nivison-Smith, & Smerdely, 2001; Watson, Leslie, & Hankey, 2006). In order to achieve the prevention of malnutrition, validating the practical and sensitive screening tool, the Malnutrition Screening Tool (MST), is required so that older adults and healthcare providers can benefit.

1.2 Purposes

The overall purpose of this research was to test social cognitive theory in relation to self-efficacy in managing chronic disease and three health outcomes, namely nutritional status, functional status, and health-related quality of life, in older adults at high risk of hospital readmission. More specifically, three research aims were proposed:

1. to determine the nutritional status and prevalence of malnutrition among older adults who are at risk of hospital readmission, and validate the Malnutrition Screening Tool (MST) in this population;
2. to explore the relationships between participants' characteristics, self-efficacy in managing chronic disease and health outcomes based on the study's hypothesized model (Figure 3.4);
3. to test a theoretical model based on social cognitive theory, which examines potential mechanisms of the mediation effects of social support and self-efficacy beliefs.

1.2.1 Study objectives and research questions.

1.2.1 1 Study One.

Objectives

1. Examine the prevalence of malnutrition among older adults at high risk of hospital readmission at acute hospital setting.
2. Verify whether Malnutrition Screening Tool (MST) is a valid tool compared with the Subjective Global Assessment (SGA).

Research questions

1-1: What is the prevalence of malnutrition risk in older adults at high risk of hospital readmission in acute hospital settings?

1-2: Is the simple Malnutrition Screening Tool (MST) a valid nutrition screening tool compared to the comprehensive nutritional assessment method, the Subjective Global Assessment (SGA), in high risk older adults at admission?

1.2.1.2 Study Two.

Objectives

Determine the influential factors associated with self-efficacy in managing chronic disease, social support and three health outcomes (nutritional status, functional ability, and health-related quality of life).

Research questions

In order to examine the relationships between hypothesized independent variables and dependent variables thoroughly and comprehensively, two sets of questions were proposed to account for two steps of statistical approaches, bivariate analyses and multivariate analyses. The first set of research questions focused on the bivariate level which was research question 2-1 to 2-7, and the second set of questions were addressed on a multivariate level which was from research question 2-8 to 2-11.

2-1: Is there an association between perceived self-efficacy in managing chronic disease and participants' characteristics?

2-2: Is there an association between perceived self-efficacy in managing chronic disease and social support?

2-3: Is there an association between perceived self-efficacy in managing chronic disease and health outcomes (nutritional status, functional ability, and quality of life)?

2-4: Is there an association between perceived social support and health outcomes (nutritional status, functional ability, and quality of life)?

2-5: Is there an association between nutritional status, functional ability, and quality of life in older adults at high risk of hospital re-admission?

2-6: Is there an association between demographic characteristics and nutritional status, functional ability, and quality of life?

2-7: Is there an association between demographic characteristics and perceived social support?

2-8: How well do the demographic characteristics and socioeconomics status predict perceived self-efficacy in managing chronic disease? How well do the depressive symptoms and perceived social support predict perceived self-efficacy in managing chronic disease after controlling for significant socio-demographic variables in older adults at high risk of hospital readmission?

2-9: Based on the study's hypothesized model, what are the significant predictors of nutritional status?

2-9-1: what are the significant predictors for malnutrition risk in older adults at high risk of hospital readmission?

2-9-2: what are the significant predictors for malnutrition in older adults at high risk of hospital re-admission?

2-9-3: What are the significant predictors for Body Mass Index (BMI) in older adults at high risk of hospital re-admission?

2-10: Based on the study's hypothesised model, what are the significant predictors for functional status in older adults at high risk of hospital re-admission?

2-11: Based on the study's hypothesised model, what are the significant predictors for quality of life in older adults at high risk of hospital re-admission?

1.2.1.3 Study Three.

Objectives

Use a Structured Equation Modelling (SEM) approach to test a hypothesized model based on social cognitive theory in relation to chronic disease self management and health outcomes among older adults at high risk of hospital readmission.

Research questions and hypotheses

3-1: Does the level of chronic disease self-efficacy mediate the relationship between the health characteristics and health outcomes?

> H_1: Self-efficacy will have a mediation effect between health characteristics and health outcomes in older adults at high risk of hospital readmission.

3-2: Does the perceived social support mediate the relationship between the characteristics and health outcomes?

> H_1: Perceived social support will have a mediation effect between the health characteristics and health outcomes.

3-3: Does social support mediate the relationship between health characteristics and chronic disease self-efficacy? Also, does chronic disease self-efficacy mediate the relationship between social support and health outcomes in older adults at high risk of hospital readmission?

H_1: Social support and self-efficacy in managing chronic disease will have mediation effects on the relationships above.

1.3 Definition of Terms

In order to provide clear concepts for the current study, the terms of primary interest are defined, both conceptually and operationally. They are as follows.

Older adults

Conceptual definition: Most developed countries accept the chronological age of 65 years as a definition of 'elderly' or older person (World Health Organization) .

Operational definition: People aged 65 years and over were eligible for this study.

High risk of hospital readmission

Conceptual definition: Five domains of risk factors are considered to predict hospital readmission in older adults. They are: demographics or social support, disease or disease severity, physical examination and laboratory tests, and health related quality of life or physical functioning (Damush, Smith, Perkins, Dexter, & Smith, 2004, p 68-69).

Operational definition: In this study, patients are considered high risk when at least one of the following high risks for poor post-discharge outcome were identified: (1) aged over 75 years; (2) living alone; (3) lack of social support system; (4) moderate-severe functional impairment; (5) multiple hospital admissions in previous 6 months; (6) hospitalization in the past 30 days; (7) fair or poor self-rating of health; (8) history of depression.

Hospital readmission

Conceptual definition: Readmission is defined as the “next subsequent admission of a patient, emergency or unplanned, to any hospital within the same district within a defined reference period” (Chambers & Clarke, 1990, p. 1134).

Operational definition: The defined reference period was 4 weeks in this study.

Chronic disease and chronic illness

Conceptual definition: Chronic disease and chronic illness are often used interchangeably in health care, however, it is important to distinguish between disease and illness (Lubkin & Larsen, 2006). Chronic disease is variously defined. A classic definition is: "chronic diseases are long in duration, often with a long latency period and a protracted clinical course; of multifactorial aetiology; with no definite cure" (Australian Medical Association, 2001; Rothenberg & Koplan, 1990, p. 267).

Chronic illness: According to Curtin and Lubkin's (1995, p. 6-7) definition, chronic illness is the irreversible presence, accumulation, or latency of disease states or impairments that involve the total human environment for supportive care and self-care, maintenance of function, and prevention of further disability.

Operational definition: People were eligible for recruitment for this study if they were admitted to hospital with a medical diagnosis e.g., heart disease, respiratory disease (non-surgical).

Self-efficacy

Conceptual definition: Self efficacy is "people's judgment of their capabilities to organize and execute the course of action which requires designated types of performances" (Bandura, 1986, p. 391).

Operational definition: Chronic disease self-efficacy scales which were developed by Lorig et al. (1996) were used to measure participants' self-efficacy levels in managing chronic conditions.

Social support

Conceptual definition: Social support describes "the comfort, assistance, and/or information one receives through formal or informal contacts with individuals or groups" (Wallston, Alagna, DeVellis, & DeVellis, 1983, p. 369).

Operational definition: the Medical Outcome Study Social Support Survey was the mediator measure.

Malnutrition

Conceptual definition: Malnutrition is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein, and other nutrients causes measurable adverse effects on tissue/body form (body shape, size and composition) function, and clinical measures (Lochs et al., 2006).

Operational definition: Outcome variables related to nutritional status were measured by the Malnutrition Screening Tool (MST), Subjective Global Assessment (SGA), Body Mass Index (BMI), and Corrected Arm Muscle Area (CAMA).

Functional status

Conceptual definition: The functional status is defined by Leidy (1994) as a person's ability to undertake activities designed to meet basic needs, fulfil life roles, and maintain health and wellbeing.

Operational definition: Functional status was measured in terms of Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADL), and modified Walking Impairment Questionnaire in this study.

Quality of life

Conceptual definition: Quality of life is primarily a subjective sense of wellbeing encompassing physical, psychological, social and spiritual dimensions (Haas, 1999, p. 738).

Operational definition: The Short Form-12 was used to measure the health-related quality of life as one of the outcome variables in this study.

Depression

Conceptual definition: World Health Organization has defined depression as a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration (World Health Organization).

Operational definition: The Geriatric Depression Scale (GDS) was used to measured depression as one of the independent variables in this study.

Conclusion

In conclusion, older adults are commonly living with at least two chronic diseases, and tend to have higher hospital admission and readmission rates than the general population. Some studies have shown the effectiveness of managing chronic disease based on the central concept of social cognitive theory, self-efficacy beliefs. However, there is limited knowledge about testing theory based on social cognitive theory in relation to chronic disease self-management in older adults, especially for older adults at risk of hospital readmission. Thus, the relationship between self-efficacy in managing chronic disease and three key important health outcomes, nutritional status, functional status, and health-related quality of life in high risk of hospital readmission older adults remains unknown.

Therefore, this study sets out to determine the pathways that explain how self-efficacy in managing chronic disease actually influences high risk older adults' nutritional status, functional ability and quality of life, and examines whether level of self-efficacy depends on this population's unique characteristics. In addition, the prevalence of malnutrition and validation of a simple and sensitive malnutrition screening tool was undertaken. As a result, this study enriches "tertiary" prevention in health promotion with regard to identifying influential variables according to social cognitive theory, and the relationship between these variables can be established.

This chapter has outlined the background of the study, described the purpose and objectives, presented research questions and hypotheses, and stated the definitions of terms. The rest of the thesis is as follows. A critical review of the literature on the knowledge of chronic disease, risk factors for hospital readmission, and intervention programs in older adults is provided in Chapter 2. The theoretical framework underpinning this study is discussed in Chapter 3. The proposed study methodology is addressed in Chapter 4. Results from Study One and Two are presented in Chapter 5, followed by the results from Study Three which is presented in Chapter 6. Chapter 7 focuses on discussing the significant findings from the three studies. Chapter 8 provides an overview and a synthesis of significant findings from the three studies, and addresses how these significant findings contribute to current knowledge and theory development. The strengths and limitations of these studies, and the implications for clinical practice and recommendations for future research are also presented in this final chapter.

Chapter 2: Literature Review

Introduction

Older adults with multiple chronic conditions are at higher risk of hospital readmission than the general population. Approximately 75% of adults have at least one chronic condition in Australia (Schoen, Osborn, How, Doty, & Peugh, 2009), and the odds of developing a chronic condition increases with age (Australian Institute of Health and Welfare, 2006; Hoffmann, Rice, & Sung, 1996). According to the Australian Institute of Health and Welfare in 2007, more than 80% of all premature deaths among people aged less than 75 years were caused by chronic disease (Australian Institute of Health and Welfare, 2010b). Chronic diseases also consumed about 70% of the total Australian health expenditure (Australian Institute of Health and Welfare, 2006), and about 59% of hospitalisation events for chronic conditions were potentially preventable (Australian Institute of Health and Welfare, 2008b). These figures have brought to light the importance of the management of chronic disease among the growing older population. It is therefore imperative to develop effective ways to manage chronic conditions to prevent functional decline, hospital admission and readmissions, which in turn may reduce the health care costs and mortality rates in older adults (Newman, Steed, & Mulligan, 2004).

In the past decade, a great number of studies have endeavoured to develop effective chronic disease management programs for people with chronic illness by using social cognitive theory (Barlow, Wright, Turner, & Bancroft, 2005; Gallegos-Carrillo et al., 2009; Lorig et al., 2001). However, limited studies have focused on the chronic disease self-management in older adults who are at risk of hospital readmission. In addition, social cognitive theory is frequently applied for chronic disease self-management programs, yet there are few studies which have tested the theory underpinning the study (Glanz et al., 2008). It is also noted that the majority of studies have focused on assessing clinical assessment, behaviour and psychological wellbeing as outcome measures (Clark, 2003; Haas et al., 2005; Smeulders, Van Haastregt, van Hoef, van Eijk, & Kempen, 2006). There is a lack of evidence on examining the fundamental health outcomes such as nutritional status, functional status, and health-related quality of life in relation to chronic disease management.

This chapter firstly gives an overview of the trends of health status in older adults and chronic diseases in older adults. The current knowledge for managing chronic diseases in older adults is then reviewed, including the theories underpinning the studies and the outcome measures. Next, the risk factors for hospital readmission are identified, and the current prevention of readmission programs are presented. The chapter concludes by highlighting the areas and gaps for further research.

2.1 Trends of the Health Status in Older Adults

Along with the triumph of decreased mortality rates and resulting increased life expectancy, the older adults of today are healthier and report themselves to be in better health than those two decades ago (Crimmins, 2004). Similarly, there are increasing numbers of older Australians who report their health as good (32%) or good to excellent (36%) (Australian Bureau of Statistics, 2006). Average life expectancy is expected to extend another ten years globally by 2050 (The Journal of the American Medical Association, 2003). For Australians, at age 65 years, males could expect to live another 18.5 years to 83.5 years, and females another 21.6 years to 86.6 years (Australian Institute of Health and Welfare, 2010a). A study by Manton (2008) revealed that the prevalence of chronic disability had declined about 2.2% per annum from 1999 to 2004 in the U.S.A. Despite these positive results, the nature of the aging process means an increased risk of illness and disability which continues to challenge our society and health care system.

Increasing age is associated with long-term health conditions, higher rates of disability and poor health status (Australian Bureau of Statistics, 2006). In Australia, in 2005 about 23% of older adults had a severe or profound disability, and the rates of disability increased to 58% for people aged 85 years or older (Australian Bureau of Statistics, 2006). Moreover, the older adults with a profound disability reported having a higher average number of health conditions than those without a disability, which were 4.85 and 2.84 respectively (Australian Institute of Health and Welfare, 2010a). This report indicates that the older adults with a higher number of health conditions increased their risk of severe disability (Australian Institute of Health and Welfare, 2010a).

In 2005 about 100% of people age 65 years and over reported at least one long-term health condition (Australian Bureau of Statistics, 2006). The most common older adults' health conditions were diseases of the eye (90%), particularly long-sightedness, followed by musculoskeletal conditions (66%), and diseases of the circulation system (57%) (Australian Bureau of Statistics, 2006). Gender differences were particularly found in osteoporosis, with 22% of females reported with this condition compared to 4% of males (Australian Bureau of Statistics, 2006). However, circulatory disease, such as heart disease and hypertension, was the most common condition among older adults who lived in aged care facilities, regardless of age and gender (Australian Institute of Health and Welfare, 2010a). Musculoskeletal conditions, such as arthritis, were the next most common condition, followed by endocrine diseases such as diabetes and thyroid problems for both males and females residents (Australian Institute of Health and Welfare, 2010a).

In terms of mortality, cardiovascular disease was the top leading cause of death worldwide (World Health Organization, 2008). In high-income countries, such as America and European countries, more than two-thirds of all people live longer than 70 years and die of chronic diseases. These chronic diseases include: cardiovascular disease, chronic obstructive lung disease, cancers, diabetes or dementia (World Health Organization, 2008). Similarly, chronic diseases were also the major causes of death among older Australians. Five out of the top ten causes were chronic diseases, including coronary heart disease, cerebrovascular disease, chronic obstructive pulmonary disease, diabetes, and heart failure (Australian Institute of Health and Welfare, 2010a).

Coronary heart disease and cerebrovascular diseases were the leading two causes of death among both older males and females (Australian Institute of Health and Welfare, 2010a). Other causes such as dementia and cancers also played significant roles in causing death among older Australians (Australian Institute of Health and Welfare, 2010a). For instance, lung cancer was the third most common cause of death for older males and the fourth for older females (Australian Institute of Health and Welfare, 2010a). Colorectal cancer was also in the top ten leading causes of death for both genders, and prostate cancer and breast cancer were two prominent gender-specific causes of death (Australian Institute of Health and Welfare, 2010a).

In summary, the trends in older adults' health reveal that the average life expectancy is increasing, and more than one third of older adults rated their health as good to excellent in Australia (Australian Institute of Health and Welfare, 2010a). The trends also suggest that disability and long-term health conditions are commonly associated with increasing age, especially chronic diseases. This pattern has important consequences for the number of Australians reaching older ages, as chronic diseases continue to demonstrate their impact on people's health, quality of life and cause of death in Australian older adults. For these reasons, the details of chronic diseases in older adults are outlined in the next section.

2.2 Chronic Diseases in Older Adults

A considerable number of older adults are living with one or more chronic diseases (Albert & Freedman, 2010). Chronic diseases are known as non-communicable conditions, yet the definition is variously defined. A classic definition is: "chronic diseases are long in duration, often with a long latency period and a protracted clinical course; of multi-factorial etiology; with no definite cure" (Rothenberg & Koplan, 1990, p. 267). It has been reported that they affect more people than infectious diseases (Singh, 2008). In the World Health Organization report 2002, major chronic diseases currently account for almost 60% of all deaths and 43% of the global burden of disease, and their impact is expected to reach 73% of all deaths and 60% of the global burden of disease by 2020 (World Health Organization, 2007). Four of the most prominent chronic diseases are cardiovascular diseases (CVD), cancer, chronic obstructive pulmonary disease and type 2 diabetes (World Health Organization, 2007).

In Australia, older adults aged 65 to 74 years comprised 7% of the total population and experienced 16% of the total burden of disease and injury (Australian Institute of Health and Welfare, 2007; Begg et al., 2007). Similarly, older adults aged 75 years and over comprised 6% of the total population, and experienced 25% of the total burden in Australia (Australian Institute of Health and Welfare, 2007; Begg et al., 2007). Among this population, about 45% of older adults suffer from physical or multiple and diverse disability, and 41% had profound or severe limitations (Australian Institute of Health and Welfare, 2007). Arthritis accounted for 50% of the profound or severe core activity limitations among older people followed by hearing disorders (43%), hypertension (38%), heart diseases (30%) and stroke (23%) (Australian Institute of Health and Welfare, 2007).

Similar to other developed countries the leading burdens of disease are cardiovascular disease and stroke in Australia for people aged 65 and over (Australian Institute of Health and Welfare, 2007). The top ten leading burdens of disease in Australia, 2003 are shown in Table 2.1. It is notable that the leading causes of burden of diseases such as Type 2 diabetes, stroke, Chronic Obstructive Pulmonary disease (COPD), and cancer were similar in males and females (Australian Institute of Health and Welfare, 2007). The incidence of stroke, dementia, COPD and falls were positively correlated with increasing age (aged $\geq$ 75) (Australian Institute of Health and Welfare, 2007). The WHO (2002) also reported that cognitive and physical disabilities dramatically increase in very old age. These top ten conditions accounted for 56% and 61% of the total burden in 65-74 and $\geq$75 years old. Australians respectively (Australian Institute of Health and Welfare, 2007). The literature review thus far has demonstrated that chronic diseases are the leading cause of morbidity, disability, and mortality in Australian older adults. In the next section, the studies of managing chronic diseases in older adults are discussed.

Table 2.1

The Leading Burden of Disease in Older Australians

Aged	Rank	Males	Percent of total	Females	Percent of total
65-74	1	Ischaemic heart disease	15.5	Ischaemic heart disease	11.4
	2	Lung cancer	7.9	Type 2 diabetes	6.2
	3	Type 2 diabetes	5.8	Breast cancer	5.7
	4	Prostate cancer	4.9	Dementia	5.5
	5	Adult-onset hearing loss	4.9	Lung cancer	5.4
	6	COPD	4.8	Stroke	5.2
	7	Stroke	4.5	COPD	4.8
	8	Colorectal cancer	4.3	Colorectal cancer	4.1
	9	Dementia	3.2	Osteoarthritis	3.3
	10	Parkinson's disease	1.6	Adult-onset hearing loss	3.2
≥75	1	Ischaemic heart disease	19.3	Ischaemic heart disease	18.7
	2	Stroke	7.5	Dementia	12.4
	3	Dementia	7.3	Stroke	10.5
	4	Prostate cancer	5.4	Type 2 diabetes	4.1
	5	COPD	5.2	COPD	3.5
	6	Lung cancer	4.7	Colorectal cancer	2.6
	7	Type 2 diabetes	3.9	Lower respiratory tract infection	2.4
	8	Colorectal cancer	2.9	Lung cancer	2.4
	9	Adult-onset hearing loss	2.4	Breast cancer	2.4
	10	Lower respiratory tract infection	2.2	Falls	2.1

Source: Australian Institute of Health and Welfare (2007 , p. 64-65). Note. Chronic Obstructive Pulmonary disease (COPD).

2.2.1 Managing chronic disease in older adults.

Chronic illness in older adults not only challenges the health care system but also affects all aspects of an individual's life. The main impacts include the physical effects of the disease itself, such as altered morbidity, fatigue and chronic pain, cognitive limitation and psychosocial effects e.g. being unable to perform desired roles, social isolation, feeling helpless and decreased happiness (Lubkin & Larsen, 2006; Sawatzky, Liu-Ambrose, Miller, & Marra, 2007). Chronic disease by definition means there is no cure for patients, and as a result the goal is to keep the condition under the best possible control, preventing deterioration and the negative effects of the disease on physical and psychosocial functioning (Clark, 2003). In order to achieve this goal, changes in lifestyle and health-related behaviour such as self-management behaviour are necessary for older people with a chronic illness. Barlow et al. (2002, p. 178) defined self-management as "the individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and life style changes inherent in living with a chronic condition".

Chronic illness sufferers normally share similar problems regarding activities of daily living, interactions with the health care system, communication with family and friends, and dealing with negative emotions such as fear, anxiety and depression (Lorig et al., 1996). Older adults with a chronic condition are commonly required to deal with twelve self-management tasks (Lorig et al., 1996). These tasks included (1) recognizing and responding to symptoms, including monitoring symptoms and controlling triggers to symptoms; (2) using medications; (3) managing acute episodes and emergencies; (4) maintaining good nutrition and an appropriate diet; (5) maintaining adequate exercise and physical activity; (6) not smoking; (7) using relaxation and stress-reducing techniques; (8) interacting appropriately with health care providers; (9) seeking information and using community resources; (10) adapting to work and other role functions; (11) communicating with significant others; and (12) managing negative emotions and psychological responses to illness (Clark et al., 1991; Lorig et al., 1996).

However, initiating a change in lifestyle, health-related behaviour, and learning a new skill and knowledge in order to manage a chronic disease process in people with chronic diseases has been found to be a difficult task (Rapley & Fruin, 1999).

Recognition of such difficulties has led to studies that target the design of more effective self-management interventions based on theories that apply to the individual level of health behaviour changes. At the individual level, contemporary theories of health behaviour can be broadly categorized as “Cognitive-Behavioural” (Rimer & Glanz, 2005).

An increasing body of research shows that cognitive-behavioural approaches which refer to psychological determinants of behaviours have dominated health behaviour research. These theories emphasize three key concepts: 1) behaviour is mediated by cognitions which means that what people know and think affects how they act, 2) knowledge is necessary for most behaviour changes, however it is not sufficient to produce behaviour change, 3) perceptions, motivations, skills and the social environment are key influences on behaviour (Rimer & Glanz, 2005). Examples of cognitive-behaviour theories are the health belief model (Becker, 1974), the stage of change model/transtheoretical (Prochaska, DiClemente, & Norcross, 1992), theory of planned behaviour (Ajzen, 1991), and social cognitive theory (Bandura, 1986).

Among these theories, social cognitive theory (SCT) has been widely applied in health promotion interventions. Unlike other theories that overlook social-economic status and cultural factors, SCT provides a comprehensive theoretical basis in terms of recognizing the fundamental importance of individual beliefs, values and self confidence in determining health behaviour (Nutbeam & Harris, 2004). Additionally, it explicitly identifies the importance of social norms and environmental influences on health behaviour, and the continuous interaction between these factors (Nutbeam & Harris, 2004). There is a growing body of evidence that SCT exerts an influence on older adults’ health-related behaviour. A review of the literature in chronic disease and SCT in older adults will now be presented in detail.

2.2.2.1 *Self-efficacy and chronic disease in older adults.*

A large number of health promotion interventions, from primary to tertiary prevention, have applied SCT as a theoretical underpinning to the intervention. The concept of self-efficacy is the centre of SCT, which was defined by Bandura (1986, p. 391) as “people’s judgment of their capabilities to organize and execute the course of action which requires designated types of performances”. Thus, the term social cognitive theory seems to be used interchangeably with self-efficacy theory in the literature. Research has consistently demonstrated its importance as both a determinant and consequence of health management behaviour. For example, self-efficacy beliefs have been reported to influence exercise behaviour in older adults (Resnick, Palmer, Jenkins, & Spellbring, 2000). Self-efficacy beliefs have also been found to predict long-term physical activity and act as a mediator in physical activity for improvements in quality of life in healthy older adults (McAuley et al., 2008; McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003; McAuley et al., 2006).

Numerous studies have applied social cognitive theory to the management of chronic diseases. These studies can be classified in two types, one focuses on disease-specific or task-specific behaviour and one on generalized chronic disease self-management (multiple tasks) studies (Lorig et al., 2005; Rapley & Fruin, 1999). In regard to disease-specific self-management, various studies were found to account for each different chronic disease or condition. For example, a study which examined self-efficacy and self-management behaviours in patients with chronic kidney disease revealed that higher perceived self-efficacy was associated with self-management such as increased communication, partnership, self-care, and medication-adherence behaviour (Curtin et al., 2008). Similar results were reported by Davis and colleagues (2006), who examined two types of disease-specific self-efficacy in patients with chronic obstructive pulmonary disease (COPD), and found that self-efficacy for walking was positively related to walking performance, and self-efficacy for managing shortness of breath was positively related to symptom severity .

Self-efficacy has also been studied extensively related to type two diabetes (Allen, Fain, Braun, & Chipkin, 2008; Goldfield et al., 2008; King & Galuppo, 2011; Wu et al., 2007) and cardiac disease management (Everett, Salamonson, & Davidson, 2009; Millen & Bray, 2009). For example, Allen and colleagues (2008) conducted a randomized clinical trial study in type two diabetes patients (N = 52, age = 57 ± 12.5 years) to test the effects of a counselling intervention using continuous glucose monitoring system (CGMS) feedback on physical activity self-efficacy, physical activity levels, and physiological variables. They found that participants receiving the intervention had higher self-efficacy scores than the control group for adherence to activity, indicating more confidence in maintaining a physical activity program, and reducing risk factors for diabetes-related complications.

Similarly, Clark and Dodge (1999) applied a theoretical basis of self-efficacy to examine the connections between self-efficacy beliefs and disease management behaviour of older women with heart disease. They found that self-efficacy was a predictor of behaviour on exercise and diet. Many other disease-specific self-management studies exist, however it is beyond the scope of this thesis to review all existing disease-specific self-management studies related to self-efficacy. From the review thus far, a clear pattern appears that increased self-efficacy is associated with positive change in health care behaviours and health outcomes.

As presented above, most studies have drawn on Bandura's work in applying self-efficacy as a disease-specific or behaviour-specific construct (Bandura, 1982; Bandura, Adams, & Beyer, 1977). However, many chronically ill older adults have a combination of more than one chronic disease, also known as co-morbidities (Crimmins, 2004; Elzen et al., 2007). This leads to a question of whether a disease-specific self-management program is sufficient for older adults with multiple chronic illnesses. Rapley and Fruin (1999) claimed that when self-efficacy theory is applied to the self-management of complex chronic disease health-care regimens, it must account for initial and ongoing phases of a multitask self-management regimen. Complex regimens involve multiple tasks, each with its own efficacy belief and expectation (Rapley & Fruin, 1999).

Lorig and colleagues conducted both disease-specific self-management programs and generalized self-management programs based on the concept of self-efficacy beliefs (Lorig, Chastain, Ung, Shoor, & Holman, 1989; Lorig, Seleznick et al., 1989; Lorig et al., 1999). They developed a disease-specific self-management program, an arthritis self-management program, aimed at improving self-efficacy so that a recommended self-care regimen could be pursued. The results suggested that health status change was more strongly associated with improved scores on measures of regimen-specific self-efficacy than on self-reported behaviour (Lorig, Chastain et al., 1989; Lorig, Seleznick et al., 1989; O'Leary, Shoor, Lorig, & Holman, 1988).

Lorig and colleagues further developed a generalized self-management program called “the Chronic Disease Self-Management Program” (CDSMP). The CDSMP is a well known program in terms of chronic disease self-management, which targets heterogeneous groups of chronic disease patients, including those with co-morbidities (Lorig et al., 2001; Lorig et al., 1999). A period of four and half years, 6-months randomized CDSMP study was conducted in nine hundred and fifty two adults (mean age 64.2 years, range 40-90 years) with heart disease, lung disease, and stroke or arthritis were recruited in community settings (Lorig et al., 2001; Lorig et al., 1999). The CDSMP was a community-based patient self-management education course.

The focus of CDSMP was to improve the person’s self-efficacy beliefs in their ability to carry out their self-management tasks in different aspects of chronic disease, as well as decreased health care utilization. The main outcome measure included health status, health care utilization and health behaviour at 6 months (Lorig et al., 1999). However, health behaviour measurement was replaced by perceived self-efficacy measurement in a two year follow-up report (Lorig et al., 2001). The findings concluded that the CDSMP was effective in increasing health-care behaviour, maintaining or improving health status, and decreasing rates of hospitalization at 6 months (Lorig et al., 1999). Apart from improvements in self-efficacy, the results were consistently supported in the two year follow-up report.

The CDSMP has been conducted in many countries such as Australia (Swerissen et al., 2006), the United States (Lorig et al., 2001; Lorig, Ritter, Laurent, & Plant, 2006), the United Kingdom (Kennedy et al., 2007), Netherlands (Elzen et al., 2007), Japan (Yukawa et al., 2010), and China (Fu et al., 2003). The CDSMP was also implemented in low socioeconomic status (Rose et al., 2008), and culturally diverse populations (Swerissen et al., 2006). Research has consistently demonstrated positive effects in terms of self-management behaviour and health status through the CDSMP program (Lorig et al., 2001; Swerissen et al., 2006; Yukawa et al., 2010).

However, this positive effect was not supported by Elzen et al. (2007) who adopted and evaluated CDSMP in patients (mean age 68.5 years, range 59-87 years) who were attending the internal medicine outpatient clinic in the Netherlands. Their study did not provide any evidence for the effectiveness of the CDSMP on self-efficacy, self-management behaviour or the health status of older patients (Elzen et al., 2007). Elzen et al. (2007) claimed these results were due to the enthusiasm of the participants in participating in the program. If that is the case, it may indicate that the participants were highly motivated, and the results should be reflected in their self-efficacy score. However, the results did not yield any evidence for that assumption.

The majority of CDSMP studies seem to measure the four categories of 20 outcome variables in their studies (Fu et al., 2003; Lorig et al., 1999; Swerissen et al., 2006; Yukawa et al., 2010). They are: (1) self-management behaviour change score (exercise, practice of cognitive symptom management, and communication with doctors); (2) self-efficacy to manage symptoms; (3) health status (self-rated health, health distress, shortness of breath, pain, disability, depression, energy and fatigue, and social and role activity limitations); and (4) health service utilization (visits physicians, visits to emergency department, number of hospital stays, and nights spend in hospital).

These twenty outcome variables are considered as comprehensive outcome measures; however, numbers of studies have alternated their outcome measures to suit the study populations (Elzen et al., 2007; Haas et al., 2005; Smeulders et al., 2010; Smeulders et al., 2006). For instance, Smeulders (2006) adapted the CDSMP specifically for patients with congestive heart failure, and the primary outcomes of the effect evaluation were self-efficacy expectancies, perceived control, and cognitive symptom management. The secondary outcome measures were smoking and drinking behaviour, Body mass index (BMI), physical activity level, self-care behaviour, health-related quality of life, perceived autonomy, symptoms of anxiety and depression, and health care utilisation (Smeulders et al., 2006). Although these studies measured health outcomes across a broad range of physical, mental and psycho-social areas, very little investigation has examined other variables beyond the above mentioned variables such as thoroughly examining the nutrition and functional status.

Nutrition and functional status are known as two fundamental health determiners for older adults, however, there are inadequate studies that have explored the relationships between chronic disease self-management and these nutrition and functional states. For example, limited studies have incorporated the Corrected Arm Muscle Area (CAMA) or Instrumental Activities of Daily Living (IADL) as health outcome measures. CAMA is an indicator of nutritional status for body protein and fat stores, while IADL is an indicator of functional status, and they both are associated with morbidity and mortality in older adults (Millán-Calenti et al., 2010; Miller et al., 2002; Neumann, Miller, Daniels, & Crotty, 2005; Scott, Macera, Cornman, & Sharpe, 1997).

In terms of the study population for the CDSMP, a recent narrative literature review study of the CDSMP found that about 75% of studies focused on middle aged adults (45-65 years) (Jonker, Comijs, Knipscheer, & Deeg, 2009). In addition, it is also noted that in Jonker et al's. study, most studies targeted community dwelling older adults (Elzen et al., 2007; Haas et al., 2005; Lorig et al., 1999), yet little is known about the impact of the CDSMP in vulnerable older adults who are at risk of hospital readmission. More specifically, self-efficacy in managing chronic disease and health outcomes in older adults at high risk of hospital readmission has not yet been explored.

A couple of issues have been noted through reviewing the CDSMP studies. Firstly, there is no standard measurement of outcome variables such as health status. For example, Lorig et al. (1996) measured participants' health status by combining a few different scales: self-rated health scale, health assessment questionnaire (HAQ), physical disability scale, energy/fatigue scale, the health distress scale, the social/role activity limitation scale. While, Elzen et al. (2007) used the Short Form-36 physical and mental health summary scale. Secondly, the CDSMP study populations mainly focused on community-dwelling adults, and hence the feasibility of the CDSMP for vulnerable older adults, such as who is at risk of hospital readmission, remains unknown.

Thirdly, although a majority of studies are grounded in the self-efficacy model in designing the interventions, very few studies contain tests of the model. Finally, little is known about whether perceived self-efficacy in chronic disease self-management plays an influential role in mediating between high risk of hospital readmission in older adults and outcome variables such as nutritional status, functional ability and quality of life in the self-efficacy model. The following review contains different variables that have been tested in relation to self-efficacy theory and older adults in the literature.

2.2.2.2 Self-efficacy and model testing.

Theory based research provides support in guiding research to a systematic way of understanding events or situations, and predicts findings (Rimer & Glanz, 2005). Briefly, theory is "a set of concepts, definitions, and propositions that explain or predict these events or situations by illustrating the relationships between variables" (Rimer & Glanz, 2005, p. 4). In order to understand the relationship between each component within a theory, two elements need to be clarified, mediators and moderators. Baron and Kenny (1986, p. 1176) conceptualized mediators as variables that carry active mechanisms to intervene between independent variable and outcome variables. In contrast, they conceptualized moderators as variables that affect the direction and/or strength of the relation between an independent or predictor variable and an outcome variable (Baron & Kenny, 1986, p. 1174).

Limited studies have undertaken theoretical model testing or included it as part of study in relation to self-management in health behaviour change (Newman et al., 2004). As Newman et al. (2004) pointed out the theoretical approach on chronic disease self-management interventions were more often mentioned in studies of diabetes and arthritis. They further suggested that the use of theory in self-management needs to be explicit; in other words, theory-driven studies should be clear and consistent about which theoretical approaches and concept have been used so as to identify more effective components (Newman et al., 2004). The following section reviews the studies that apply the self-efficacy construct in relation to health behaviour in older adults, including physical activities, nutrition related behaviour, and chronic disease self-management behaviour.

2.2.2.3 Self-efficacy and physical activity/exercise behaviour.

The benefits of regular exercise for older adults are well documented and as a result a great number of studies have endeavoured to explore behaviour change in relation to exercise. Resnick et al. (2000) undertook a study to test a theoretically and empirically based model describing the factors that influence the exercise behaviour of older adults. They found that age and gender indirectly influence exercise behaviour via self-efficacy and outcome expectations. They also revealed that self-efficacy played an influential role in older adults' adherence to regular exercise. Resnick (2001) further did a study to test a model of overall activity in older adults living independently in a continuing-care retirement community. The variables included in the model were age, education, gender, mood state, physical health status, and outcome expectation. The findings from this study support previous studies, in terms of self-efficacy and outcome expectations to directly influence older adults' exercise and overall activity. Mental health and physical health were the variables that directly influenced self-efficacy expectation. Age was the only demographic variable to directly influence outcome expectations (Resnick, 2001).

McAuley and colleagues have done extensive studies in physical activity associated with quality of life based on self-efficacy theory in older adults (McAuley, Courneya, Rudolph, & Lox, 1994; McAuley et al., 2008; McAuley et al., 2006; McAuley & Morris, 2007). In a recent study, McAuley and colleagues examined the roles played by self-efficacy and physical and mental health status in the physical activity and quality of life relationships in older women (McAuley et al., 2008; McAuley et al., 2006). Their findings provide support for the social cognitive perspective that self-efficacy and physical and mental health status variables play mediator roles in the physical activity and quality of life (McAuley et al., 2006). Further, they also included demographic variables such as age, race, income, education, and chronic health conditions in their model; however, these variables did not improve the overall fit of their hypothesized model (McAuley et al., 2008).

The review of the above studies has demonstrated that self-efficacy exerts an influence on older adults' exercise behaviour (Rejeski, King et al., 2008; Resnick, 2001; Resnick et al., 2000), outcomes such as quality of life (McAuley et al., 2008). However, in terms of how demographic variables influence self-efficacy it appeared to be inconsistent. This may be due to the heterogeneous samples of older adults recruited.

2.2.2.4 Self-efficacy and nutrition related behaviour.

In relation to self-efficacy theory and nutrition behaviours in older adults, Matheson et al. (1991) examined the inter-relationships of psycho-social variables as predictors of self-efficacy relative to nutrition behaviours in non-institutionalized older adults (N = 132). Six variables were measured: self-efficacy towards nutrition behaviours, nutrition attitudes, perceived social support, morale, perceived health status and dietary change. The results from path analyses revealed direct relationships between self-efficacy and nutrition attitudes, and perceived social support. Morale and perceptions of health status were indirectly related to self-efficacy through perceived social support (Matheson, Woolcott, Matthews, & Roth, 1991). In other words, perceived social support had a mediating effect on morale, perceptions of health status and self-efficacy.

Similarly, a health promotion study conducted by Anderson et al. (2007) explored how social support, self-efficacy, outcome expectations and self-regulation influenced healthy community adults' nutrition behaviour in regard to consuming healthier foods and overall diet in the U.S. population (N =712). They applied a structural equation modelling approach to examine the model and found that self-efficacy is the most important determinant of nutrition behaviour such as food intake and purchases. Social support and negative outcome expectations were also important determinants of nutrition behaviour. In addition, the personal variables included in the model such as age, socioeconomic status, and gender all made important contributions to the nutrition behaviour (Anderson et al., 2007). Older adults tended to exhibit healthier fibre, fruit, and vegetable intake which might be due to perceived greater social support and the fact that they were more likely to use self-regulation strategies (Anderson et al., 2007). Women had a better nutritional intake which might be due to their greater self-efficacy and the greater likelihood that they would use self-regulation strategies (Anderson et al., 2007).

Another study focused on testing a model of heart healthy eating behaviour change in adults with a high risk of coronary heart disease (Gaughan, 2003). The model incorporated gender, total serum cholesterol, prior eating behaviour, cholesterol feedback, self-efficacy, and outcome expectancy as independent variables. Outcome variables included the change in consumption of cholesterol, total fat, and saturated fat. Patients who perceived themselves as being high in self-efficacy and outcome beliefs for heart healthy eating were shown to confidently master a low fat and low cholesterol diet. Women were also reported to have higher self-efficacy levels than men; this was possibly due to the fact that they had more experience with food selection, purchasing, and preparation (Gaughan, 2003).

The evidence has continued to show that self-efficacy is an important determinant of health behaviour in nutrition behaviour. Social support has also been demonstrated to be an influential factor in nutrition behaviour. In relation to demographic results, women appear to have higher self-efficacy in nutrition behaviour than men (Anderson et al., 2007; Gaughan, 2003). Older adults were reported to exhibit healthier nutrition behaviour than younger adults (Anderson et al., 2007). However, it should be noted that the target population in the study were healthy older adults with good social support. The extent to which this finding extends to other populations such as older adults with chronic disease and at risk of hospital readmission remains unknown.

2.2.2.5 Self-efficacy and chronic disease self-management behaviour.

Few studies have contained and reported on the moderator and mediator effect in relation to self-efficacy theory and behaviour change in chronic disease self-management behaviour. An example was illustrated by Lorig and colleagues (1989) who designed a disease-specific self-management program for people with chronic arthritis (N = 154). Their study validated Bandura’s (1977) self-efficacy theory in terms of perceiving self-efficacy as a mediator between health outcomes and their participants. Study results showed that as health outcomes improved, the perceived self-efficacy grew (Lorig, Seleznick et al., 1989). However, in their later work, Chronic Disease Self-Management Program (CDSMP), little is concluded regarding moderators and mediators of the effects of the CDSMP.

Identifying moderators’ effects could help healthcare providers and administrators determine which participants are most likely to benefit from the intervention program, and, as a result increase its efficiency (Issel, 2004; Jerant, Kravitz, Moore-Hill, & Franks, 2008). Additionally, identifying mediator effects could help healthcare providers and administrators determine whether interventions are effective in achieving outcomes from the intervention program. Therefore, it is recommended that studies such as randomized controlled trials (RCTs) should routinely include and report such analyses (Kraemer, Wilson, Fairburn, & Agras, 2002).

Recently, a couple of studies have emphasized and examined moderating effects in this field. A RCT study in a program called “the Homing in on Health (HIOH) self-efficacy-enhancing intervention” was developed by Jerant et al. (2008). The HIOH was almost identical to the CDSMP in content, but differed significantly from the CDSMP in terms of delivery process and setting (Jerant, Moore et al., 2008). HIOH was a home-delivery enhancing intervention which aimed to make CDSMP content available to those not able to participate in CDSMP in community settings due to functional limitations, transportation problems, or discomfort with group settings (Jerant, Moore et al., 2008). Overall the goals of the study were to determine whether in-home and telephone versions of HIOH would enhance self-efficacy, and explored whether perceived control over self-management would moderate the self-efficacy-enhancing effects of HIOH (Jerant, Moore et al., 2008). Only in-home visit intervention was found to significantly enhance participants’ self-efficacy for self-managing chronic conditions. The study findings also provided evidence that perceived control moderates the self-efficacy-enhancing effects of the in-home HIOH intervention.

Depressive symptoms were reported to be associated with lower self-efficacy for managing chronic conditions (Barlow et al., 2005; DiIorio et al., 2006). Jerant et al. (2008) hypothesized that the presence and severity of depressive symptoms was putatively a moderator in chronic disease self-management behaviour. The results of structural equation modelling revealed that participants with more depressive symptoms benefited most from HIOH in the self-efficacy enhancement aspect. This finding conflicted with those of past studies. For example, Maciejewski et al. (2000) found that those with prior depression had significantly more severe symptoms of depression, and lower levels of self-efficacy in a cohort of community older adults. However, the discrepancy may be due to a different study population and study design such as a RCT study in patients from a primary care network (N = 415) versus a longitudinal study in community residents (N = 2858) (Jerant, Kravitz et al., 2008).

The mediator effects of self-efficacy in health behaviour and health status are well-established in young and middle-age adults (Abbott, Tyni-Lenné, & Hedlund, 2010; Amir, Roziner, Knoll, & Neufeld, 1999; Anderson, Winett, Wojcik, & Williams, 2010). There is also strong evidence for the beneficial effects of self-efficacy on health behaviours and health outcomes in patients with chronic kidney disease (Curtin et al., 2008), type two diabetes and peripheral arterial disease (Collins, Lunos, & Ahluwalia, 2010; Dutton et al., 2009), and cardiac disease (Allison & Keller, 2004; Bray & Millen, 2009; Woodgate & Brawley, 2008). However, little is known about the mediator effects of self-efficacy between chronic disease self-management and health outcomes in older populations.

A related study examined the relationship between self-efficacy, outcome expectation, health behaviours, health-related quality of life, and socioeconomic status in 2524 community-dwelling older adults (64-74 years), and found that older adults with high self-efficacy had lower health risks in all behaviours and better health (Grembowski et al., 1993). Additionally, self-efficacy accounted for part of the association between socioeconomic status and health status (Grembowski et al., 1993). Although this study had examined the main constructs of SCT such as self-efficacy, outcome expectation, health outcome, and socioeconomic status, the study was not particularly designed for older adults with chronic diseases.

Further, this study contained a great number of participants (N = 2524), which allowed a more sophisticated statistical approach such as structural equation modelling to examine the mediation effects within the model, while only multiple linear regression modelling was used in the study. Another literature review study also focused on older population, and reported that there was increasing evidence for self-efficacy as a mediator of the association between physical activity and disability, and quality of life outcomes in older adults (Motl & McAuley, 2010).

In summary, the review in this section reveals that a number of issues need to be considered in relation to applying the self-efficacy construct in older adults with chronic disease. Firstly, theoretical model testing should be undertaken in relation to chronic disease self-management in older adults so that the complex phenomenon between the constructs such as self-efficacy, social support and depression can be clarified and fully understood. Secondly, the evidence shows that self-efficacy mediates between subjects and their chronic condition self-management behaviour. There is limited study on the joint effect of the role of social support and self-efficacy in chronic disease self-management using the SCT. Thirdly, the majority of studies were targeting people with more than one chronic condition, while there seems to be limited study that has specifically focused on the older population, especially for vulnerable older adults who are at high risk of hospital readmission. Finally, there are also limited studies which have reported the relationship between the characteristics of the study population and self-efficacy in managing chronic disease.

The literature reviewed thus far not only identifies the needs to explore the theoretical model testing in SCT, but also notes that there is little empirical evidence on the relationships between perceived self-efficacy in chronic disease self-management and three health outcomes, namely: nutrition status, functional status, and health-related quality of life in vulnerable older adults who are at risk of hospital readmission. The following literature review focuses on the areas related to the risk factors contribute to hospital readmission, and current studies on preventing hospital readmission in older adults.

2.3 Older Adults at High Risk of Hospital Readmission

Early unplanned hospital readmission is a frequent occurrence in older adults and normally associated with negative outcomes. The rates of readmission vary from 17% to 38% and multiple re-entries normally lead to physical and functional decline (Jayadevappa et al., 2006; Schwarz, 2000). It has been reported that the mortality rates were 6 times higher in elderly readmission patients than others (Lanièce et al., 2008). It is also an economic marker for high cost of care and has been reported to be 24% to 55% more costly than that for first admission (Baker & Wellman, 2005; Lanièce et al., 2008; Marcantonio et al., 1999). Therefore, numbers of studies have been conducted to investigate the risk factors associated with hospital readmission in this population so as to facilitate preventive strategies in the risk group. The following sections critically review the contributory risk factors for hospital readmission among older adults. The current available interventions will also be discussed.

2.3.1 Risk factors associated with hospital readmission.

Many of the studies have endeavoured to examine the risk factors that cause older adults to be readmitted to the hospital. The risk factors can be classified into five domains: (1) demographics or social support, (2) disease or disease severity, 3) physical examination and laboratory tests, (4) health-related quality of life or physical functioning, and (5) previous resource utilization (Damush et al., 2004). Table 2.2 summarised a few key studies in this area. Notably, very few studies have covered all domains and there is no universally defined time interval used to measure readmission rates (Dobrzanska, 2004).

The literature shows an inconsistency of time intervals in measuring readmission rates. The time interval varies from 28 days to one year (Table 2.2). The 28 day interval between discharge from a previous admission and readmission as a time interval was most widely used (Dobrzanska, 2004). However, the majority of studies did not address why the particular time interval had been selected. Caution should therefore be taken when interpreting these studies. According to Krause (1989), it is difficult to select the appropriate time interval to measure change in longitudinal studies as inappropriate time intervals result in bias of the data and study results.

Although there was no agreed standard definition of readmission, the majority of studies yielded similar results. These results highlighted the common risk factors that were associated with hospital readmission in older adults, including advanced age (Inouye et al., 2008; Marcantonio et al., 1999), prior hospital use (Inouye et al., 2008; Lanièce et al., 2008), severity of disease (Lanièce et al., 2008), medication problems (Williams & Fitton, 1988), medical co-morbidity (Inouye et al., 2008; Tierney & Worth, 1995), psychiatric morbidity such as history of depression, lack of social support, living alone, functional deficit (Dobrzanska & Newell, 2006; Schwarz, 2000), and lower body mass index (Damush et al., 2004).

The risk factors associated with hospital readmission in the demographic and social support domain included advanced age, sex, being widowed, mental status questionnaire score less than 9, living alone, and history of depression (Caplan, Brown, Croker, & Doolan, 1998; Dobrzanska & Newell, 2006; Fethke, Smith, &

Johnson, 1986; Marcantonio et al., 1999). These factors indicate lack of proper support from family or social services resulting in readmission.

Severity of illness referred to a number of diagnoses, number of chronic conditions, and number of medications at discharge which was highly correlated with readmission (Donnan, Dorward, Mutch, & Morris, 2008; Fethke et al., 1986). Among the chronic conditions, people with cardiac disease and respiratory disease tended to have higher rates of hospital readmission (Dobrzanska & Newell, 2006). Falls and collapse appeared to be the common diagnoses causing presentation to the emergency department (Caplan et al., 1998). Similarly, older Australians commonly carry at least two to three health conditions such as arthritis, hypertension and heart diseases which put them at high risk of hospital readmission (Australian Institute of Health and Welfare, 2008a).

In regard to the functional impairment factor, Caplan et al. (1998) found that if older adults were dependent in one of the activities of daily living (ADLs) namely, bathing, dressing or taking the stairs or the following instrumental ADL index (IADLs): finance and shopping, they had an increased chance of being admitted to hospital. This result was supported by Lanièce et al. (2008) who disclosed that the loss of the ability to feed oneself was associated with hospital readmission. This finding may also indicate that these subjects are at higher risk of malnutrition.

In addition, both functional impairment and nutritional status were two key risk factors in the physical function and health-related quality of life domain. The nutritional variables, low body mass index and change in weight, were significant predictors of readmission which indicated that functional ability and nutritional status are two vital contributory factors of hospital readmission in older adults. Friedman et al. (1997) found that an unintentional weight loss $\geq$ 4.5 kg (10 lb) was significantly associated with early non-elective readmission.

Lanièce et al. (2008) reported that more than 70% of patients experienced loss of independence, were at risk of malnutrition as measured by the mini-nutritional assessment-short form, and had walking difficulties (N = 1000). However, no further information was given regarding to risk of malnutrition related to hospital readmission. Despite Damush et al. (2004), Friedman et al. (1997) and Lanièce's (2008) work, few studies have included nutritional screening or nutritional status, while many studies have focused on functional disability using ADLs. This suggests that nutritional status may be overlooked within the studies of hospital readmission with older adults and, as a result, preventative strategies may be neglected.

Nutrition is essential for health and well-being, and it can either increase or decrease the risk of chronic illnesses and mortality (Australian Institute of Health and Welfare, 2008a; Baker & Wellman, 2005). Decline in nutritional status may not happen suddenly but progress along a continuum and so is easily overlooked and under-treated (Green & Watson, 2005; Pablo et al., 2003). It follows a general flow of increasing risk, a decrease in body reserves, biochemical and physiological changes, and eventually, manifestations of clinical symptoms of poor nutritional status (Linton & Lach, 2007). Studies in nutritional status, therefore, should be emphasized as being as important as studies of functional status as they interact with each other. Therefore, when implementing preventative interventions for hospital readmission such as comprehensive and effective discharge planning, an assessment of nutritional status should be included and appropriate nutritional support provided if required, to assure continuous care after hospitalisation (Baker & Wellman, 2005).

In brief, the literature indicates that many studies have focused on determining the predictors of early non-elective hospital readmission in older adults in order to tackle their problems. Five domains were derived from the literature, which include: demographics or social support, disease or disease severity, physical examination and laboratory tests, health-related quality of life or physical functioning, and previous resource utilization (Damush et al., 2004).

The highest strength of evidence for an increased risk of hospital readmission was found for: (1) advanced age, (2) prior health care utilised, (3) severity of illness, (4) functional impairment, (5) poor self rated health, (6) number of co-morbidities, (7) history of depression, and (8) lack of social support (Dobrzanska, 2004; Donnan et al., 2008; German et al., 2008; Marcantonio et al., 1999). The review also indicated that there were a limited number of studies which have examined the nutrition status among those older adults at risk of hospital readmission, suggesting the needs for the future study. When the risk factors have been identified, the best health and prevention measures can then be determined. The following review will focus on the current care trends for preventing hospital readmission.

Table 2.2

Studies of Risk Factors Associated with Readmission in Older Adults

Author	Setting	Age	Study Interval	Risk factors
Williams & Freda (1988)	Not specify (Unplanned readmission)	≥ 65	Within 28 days 6% readmission within 12 months 15% readmission	Relapse of original condition, development of a new problem, carers' problem, complications of the initial illness, need for terminal care, problem with medication and service
Tierney & Worth (1995)	Medical & surgical (non-elective readmission)	≥75	Within 3 months 27.7% readmission	Discharge too soon, living alone, prior admission during the past year, chronic condition.
Friedmann et al., (1997)	Not specify (non-elective readmission)	≥ 65	4 months 26% readmission	Serum albumin, total lymphocyte count, change in weight and white blood cell count.
Caplan et al.(1998)	ED (non-elective readmission)	≥ 75	4 weeks 17% readmission	Use of support service (isolation), MSQ score <9/10, live alone, receiving meals on wheels, level of dependency for ADLs.
Marcantonio et al (1999)	ED	≥ 65	30 days 11% readmission	New medication problem, relapse of the initial illness, complications of the initial treatment, discharge to an extended care facility, age 80 year or older previous admission within 30 days, five or more co-morbidities, history of depression.
Schwarz (2000)	Not specify	≥ 65	3 months 33% readmission	Informal social support e.g. family.
Damush et al. (2004)	Not specify	≥ 50	12 months 21% readmission	Disease/disease severity, higher number of medications, previous resource utilization, lower BMI.
Dobrzanska & Newell (2006)	ED	≥ 77	Within 28 days 8.8% readmission	Diagnosis of respiratory or cardiac disease, live alone, no social service input, weekend or bank holiday discharge, out of hours illness, living in a care setting index admission stays < 72.
Lanièce et al (2008)	Medical wards	≥ 75	Within 30 days 14 % readmission	Pressure sores, poor overall condition, loss of the ability to feed oneself, prior hospitalization within 3 months, visual impairment.
Inouye et al (2008)	Not specify	≥ 70	1 year follow up	Deyo-Charlson co-morbidity score ≥ 2, prior hospitalization, ≥ 6 primary care visit, aged ≥ 85 years, unmarried status.

Note: ADL: Activity of Daily Living; ED: Emergency department; MSQ: Mental Status Questionnaire; BMI: Body Mass Index.

2.3.2 Current health care for preventing hospital readmission.

In order to prevent unplanned readmission, many studies have addressed different intervention models in acute care settings to minimize adverse outcomes such as iatrogenic complications in older adults as well as health care utilizations and expenditure. The intervention models vary across the literature, for example from a geriatric multidisciplinary team approach extended to the acute care for elders (ACE) unit, to an emphasis on discharge planning (Amador, Reed, & Lehman, 2007; Jayadevappa et al., 2006; McVey, Becker, Saltz, Feussner, & Cohen, 1989; Naylor et al., 1999). These studies share the common interest in that they were aiming to prevent complications, maintaining or restoring optimal function and self-care ability, planning for a successful discharge to the least restrictive environment, and achieving a high level of patient satisfaction (Amador et al., 2007).

A few key points were noted from the literature to address the hospital readmission. Firstly, a multidisciplinary team approach is recommended to improve the care of older patients such as using gerontological expertise in acute care settings. Secondly, effective discharge planning and communication strategies needed to be emphasised and promoted across the care continuum (Hickman, Newton, Halcomb, Chang, & Davidson, 2007). Thirdly, some studies attempted to use instruments to predict an individual's risk of readmission (Billings, Dixon, Mijanovich, & Wennberg, 2006; Pacala, Boult, & Boult, 1995; Pacala, Boult, Reed, & Aliberti, 1997). Finally, the studies focused on the prevention of functional decline in older adults (Covinsky, Hilton, Lindquist, & Dudley, 2006). These are the key points that will be discussed in more detail through the following review.

2.3.2.1 Multidisciplinary team care.

A multidisciplinary team approach has been implemented widely in geriatric interventions in various settings and has been reported as having substantial outcomes such as reduced functional decline, mortality and medical complications (Cohen, Feussner, Weinberger, & Carnes, 2002; Landefeld, 2003; Slaets, Kauffmann, Duivenvoorden, Pelemans, & Schudel, 1997; Vidán, Serra, Moreno, Riquelme, & Ortiz, 2005). In acute hospital settings, a study by Rubenstein et al. (1984) applied an interdisciplinary team approach to performing a comprehensive geriatric assessment in frail elderly inpatients (N = 123). Patients were randomly assigned to an innovative geriatric evaluation unit as an experimental group. They found patients who were assigned to the geriatric unit had much lower mortality, lower acute hospital readmission, and were less likely to be discharged to a nursing home than patients in the control group. Furthermore, they reported that patients in the intervention group were significantly improved in functional status and morale than controls, and health care costs were lower for the experimental group. Their intervention approach was also known as Geriatric Evaluation and Management and was reported continuously to be associated with improvements in patients' functional status (Landefeld, 2003).

A recent study by Vidán et al. (2005) tested the effects of daily multidisciplinary geriatric care intervention in an acute phase of hospitalization for hip fracture patients aged ≥ 65 (N = 319). The results revealed that the early multidisciplinary geriatric care reduces in-hospital mortality and medical complications. Although the geriatric evaluation and management intervention approach seems promising with positive effects, some effects were not sustained after discharge, especially functional ability (Landefeld, 2003). Therefore, Landefeld et al. (1995), embraced the concept of Geriatric Evaluation and Management incorporated with human systems improvement, and further developed a new microsystem of care for older patients from hospital admission to discharge.

This new microsystem, called Acute Care for Elders, was implemented on a hospital ward, the Acute Care for Elders Unit (ACE) (Landefeld, 2003). The Acute Care for Elders Unit consisted of four key elements: a prepared physical environment that suits elderly patients, patient-centred care such as interdisciplinary teamwork, discharge planning, and medical care review (Landefeld, 2003). The ACE approach thus far has demonstrated improvement in several outcomes at discharge, including ADLs, IADLs ability to walk, symptoms of depression, lower medical care costs, shorter length of stay, (Amador et al., 2007; Jayadevappa et al., 2006; Landefeld, 2003; Landefeld et al., 1995).

However, the ACE model is based in acute health care settings aiming to improve the processes of hospital care and emphasizing maintaining and promoting independence in ADLs (Landefeld, 2003). Definitive evidence on the effects of the program on sustainability of ADLs after discharge and preventing hospital readmission has not been revealed. On the other hand, there is increasing evidence to suggest that emphasis on discharge planning potentially reduces length of hospital stay and prevents readmission (Hickman et al., 2007; Naylor et al., 1994; Parker, 2005). Therefore comprehensive discharge planning and its interventions are reviewed in the next section.

2.3.2.2 Hospital discharge planning.

Comprehensive discharge planning aims to assure the safe and effective transfer of older people between inpatient hospital care, and community-based homecare (Parker, 2005). Patients' recovery from acute illness normally requires ongoing management and evaluation after discharge (Halasyamani et al., 2006). This is especially important for older adults as they are more vulnerable than before their acute illness (Landefeld, 2003). A number of approaches to improved discharge planning for elderly patients have been tested across different specialties, such as the emergency department, intensive care and cardiac ward (Australian Bureau of Statistics, 2006; Kleinpell, 2004; Mion, Palmer, Anetzberger, & Meldon, 2001). However, very few studies have focused on high risk readmission older adults and emphasized hospital to community transition care, based on nursing interventions (Brand et al., 2004).

The period following discharge is a critical transition point for elderly patients. Elderly patients at high risk with multiple medical conditions are challenged with multifaceted adjustments including changes to the medication regimen, new self-care responsibilities and complex discharge instructions (Kripalani, Jackson, Schnipper, & Coleman, 2007). A study showed that about half (49%) of patients experienced at least one medication error, patients with a work-up error were 6.2 times more likely to be rehospitalised following post hospitalization (Moore, Wisnivesky, Williams, & McGinn, 2003). A review of the literature revealed interventions such as involvement of advance practice nurses or family members in the transition may help to overcome the difficulties inherent in the discharge of the vulnerable geriatric patient (Cumbler, Carter, & Kutner, 2008).

Comprehensive discharge planning by advanced practice nurses has been tailored for older adults (Naylor et al., 1999; Naylor et al., 1994). Naylor et al. (1994)

developed an advanced practice nurse-centred discharge planning and home follow-up intervention, which was reported consistently to have effects in reducing hospital readmission, health costs, improving the physical dimensions of quality of life, and patient satisfaction (Australian Bureau of Statistics, 2006; Naylor et al., 1999; Naylor et al., 1994). The intervention by advanced practice nurses (APNs) extended from hospital admission through 4 weeks after discharge. Since this innovative nurse-centred intervention approach seems to be the only study focused on transition care in the high-risk of readmission older adults, it is essential to review the strategies that have been applied in their program.

The patients and their caregiver received a standardised comprehensive discharge planning and home follow-up protocol designed specifically for the elderly at high risk for poor post discharge outcomes. The protocol guided patient assessment and management and specified a minimum set of APN visits. Three main nursing interventions were included in the program, namely (1) hospital visit, (2) home visit, telephone availability and outreach, (3) discharge summaries (Naylor et al., 1999; Naylor et al., 1994).

(1) Hospital visit: Within 24 to 48 hours of admission, the APNs visit the patient and caregivers to complete the initial patient and caregivers' assessment and document the preliminary discharge plan. The assessment included: age-related change, physical, functional, cognitive, and emotional health status and discharge goals. Caregiver assessment included social support, knowledge and skills, strain, and the need for formal support. Based on this information, APNs collaborated with other interdisciplinary members such as physicians and designed an individualized discharge plan. The APN implemented the plan through direct clinical care, validation of patient and caregiver education, and coordination of needed home services. APNs scheduled the initial home visit within 24 hours of discharge.

(2) Home visit, telephone availability, and outreach: The APNs completed physical and environmental assessments and focused on increasing patients' and caregivers' ability to manage unresolved health problems. APNs evaluated individuals' needs, and focused on care for medications, symptom management, diet, activity, sleep, medical follow-up, and the emotional status of patients and caregivers. Through home visits and telephone follow-up, APNs addressed questions or concerns from patients, caregivers, or health team members; monitored patients' progress; and collaborated with physicians in order to adjust treatments if needed.

(3) ***Discharge summaries:*** After completing the intervention, APTs sent written summaries to patients, caregivers, physicians, and other providers to whom APNs had referred patients, which included details of the plans, goal progression, and ongoing concerns (Naylor et al., 1999).

(4) ***Outcome measures:*** Outcome measures included hospital readmission, length of hospital stay, number of unscheduled acute care visits after discharge, estimated cost of post index hospitalization health service, functional status, depression, and patient satisfaction (Naylor et al., 1999).

As suggested by Parker (2005) effective and safe comprehensive interventions to reduce hospital readmission in the transition period should include: a multidisciplinary teams approach, use of the principles of comprehensive geriatric assessment; use of defined protocols by discharge co-coordinators; and patient empowerment through education approaches. The advanced practice nurse-centred discharge planning and home follow-up intervention have demonstrated sound and comprehensive and consistent nursing care in the transition period from hospital care to home care. However, a recent study which surveyed chronically-ill adults in eight countries, Australian, Canada, France, Germany, the Netherlands, New Zealand, the United Kingdom, and the United States, found that insufficient transitional care such as engaging and supporting patients to manage their conditions exists in all countries (Schoen et al., 2009). This finding highlights the need for targeting the highest risk patients, and building the evidence base for chronic care (Schoen et al., 2009).

Well-coordinated transition care is vital for older adults with chronic conditions, especially those at high risk of hospital readmission. When evaluating this intervention in relation to the risk of hospital readmission in older adults, it is noted that the outcome measures did not include nutritional status. A great number of studies have measured outcome variables as mentioned earlier, yet limited study has explored the evidence of health outcome in terms of nutritional and functional status as well as health-related quality of life. In addition, there is little evidence that improving management of older patients with chronic conditions may shed light on reducing hospital readmission rates in older adults at high risk of hospital readmission. These are the two areas which need to be explored so that more effective transition care interventions can be developed.

2.3.2.3 Prediction of early readmission methods.

An effective means of identifying older adults at high risk for hospital readmission, is increasingly seen as an important strategy for preventing hospital readmission (Donnan et al., 2008). Pre-discharge identification of patients at high risk could facilitate the introduction of appropriate interventions to reduce avoidable readmissions, decrease health care costs, and minimize hospital-associated risks (Novotny & Anderson, 2008). However, only two instruments were identified in the literature (Novotny & Anderson, 2008). These two instruments are the probability of repeated admission (Pra) (Pacala et al., 1995; Pacala et al., 1997), and the algorithm for patients at risk of rehospitalisation (PARR) (Billings et al., 2006).

These two instruments were developed in heterogeneous populations using a sample of patients 65 years and older. The purpose of PARR was to develop a method of identifying patients at high risk of readmission to hospital in the next 12 months in the national health system in England. Using demographic data and available information concerning patients' prior 5 years of hospital admission the creation of a "risk score (from 0 to 100)" was undertaken (Billings et al., 2006). The findings found that the key factors predicting subsequent admission included age, sex, ethnicity, number of previous admissions, and clinical condition (Billings et al., 2006). The sensitivity and specificity were 54.3% and 72.2%, respectively, at a risk score threshold of 50 (Billings et al., 2006).

Numbers of concerns have arisen from the PARR algorithm method. Firstly, the PARR showed higher specificity than sensitivity, indicating the PARR algorithm performed better in correctly identifying patients who were not at risk of hospital readmission than those at risk of hospital readmission. Further, Billings et al. (2006) stated that the PARR algorithm identified particular types of high risk patients who had a substantial history of hospital resource use and high diagnostic severity, which might have targeted the patients who were less likely to prevent and avoid future admissions. These concerns meant that a complete understanding of the most effective design of interventions for high risk patients identified by the PARR algorithm was difficult to achieve (Billings et al., 2006).

On the other hand, the use of the probability of repeated admission (Pra) seems more appealing as it included static and dynamic factors to predict hospital readmission (Novotny & Anderson, 2008). The Pra screening instrument consists of eight questions, including: age, sex, caregiver available, coronary artery disease, diabetes, doctor visits in the past year, hospitalizations in the past year, and self-rated health status (Pacala et al., 1995). Although, the Pra was validated in 6802 community-dwelling older adults aged 65 years and older, the instrument did not include functional impairment and co-morbidities, which were also identified as major risk factors for hospital readmission (Caplan et al., 1998; Marcantonio et al., 1999). Since increasing age is associated with long-term health conditions and higher rates of disability (Australian Bureau of Statistics, 2006), these two important factors cannot be overlooked in the context of screening for hospital readmission.

As Pacala et al. (1997) stated the Pra is the best validated method available for screening older populations at this time. However, the Pra may not be sensitive enough to detect the older adults who are chronically ill, functionally impaired, and with more co-morbidities (Caplan et al., 1998; Marcantonio et al., 1999). These results in minimizing the Pra's predictive ability, and suggest a need for further development of a valid and reliable screening instrument for identifying older adults at risk of hospital readmission. Further, there seems to be limited study that has applied a structural equation modelling approach to examine the relationship between the risk factors of hospital readmission and chronic disease self-management based on theoretical aspects. This suggests that there is a need to investigate the relationship between chronic disease self-management based on an approach such as social cognitive theory and risk factors of hospital readmission using structural equation modelling techniques. As a result, the phenomenon of these relationships can be understood better, and this will also help in developing a screening instrument for identifying risk factors for hospital readmission.

2.3.2.4 *Prevention of functional decline.*

Older adults are more vulnerable to experiencing declines in physical strength, mobility, and functioning during and after discharge (Covinsky et al., 2003; Hirsch, Sommers, Olsen, Mullen, & Winograd, 1990; McVey et al., 1989). Those who are especially at high risk of readmission are even more in danger due to their poorer post discharge condition. Literature shows that hospitalizations reduce muscle strength and aerobic capacity, reduce bone density and result in increased risk for falls (Cameron et al., 2005; Creditor, 1993; Shobha, 2005). In addition, functional status normally refers to ADLs and IADLs in the literature. Covinsky (2003) studied the dynamic change in ADL function before and after hospital admission. They found 35% of patients declined in ADL function between baseline and discharge, and only 45 % maintained their pre-morbid ADL function both during the 2 weeks before hospitalization and through the course of hospitalization. Millán-Calenti et al. (2010) also found that there was an association between IADLs, and the days of hospitalization.

Prevention studies incorporating exercise training programs have been demonstrated to be beneficial for older patients as the programs focused on progressive muscle strengthening, balance training, and exercise plans and were individually tailored for each participant by trained health professionals (Cameron et al., 2005; Shobha, 2005). Meyer (2007) reviewed the effectiveness of inpatient exercise programs for older patients and revealed that a multidisciplinary intervention program that incorporated exercise tended to be the most beneficial program for older patients. It is also noted the exercise alone program appeared to have no impact in reducing length of hospital stay, or health costs in hospital settings (Meyer, 2007).

Furthermore, the evidence highlighted that physical exercise also improved depressive symptoms, morale, and social integration in healthy older adults (Singh, 2008). The exercise training program should be initiated as early as hospital admission and continued through the course of hospitalization (Meyer, 2007). Numerous studies have focused on acute hospital care, however, few programs have examined home-based interventions, which were also reported to reduce the progression of functional decline among the physically frail elderly (Gill et al., 2002).

Gill et al. (2002) undertook a random study for 188 persons who were 75 years of age or older, physically frail and living at home for a six-month, home-based intervention program. The program included physical therapy and focused primarily on improving underlying impairments in physical abilities, which included balance, muscle strength, ability to transfer from one position to another, and mobility. They found that participants in the intervention group had less functional decline over time, indicating that the continuing prevention of functional decline interventions, such as a multidisciplinary exercise training program in the transition period, is important.

In summary, the literature review in this section has presented the risk of contributory factors to hospital readmission, followed by the review of the current available intervention programs such as multidisciplinary team care and hospital discharge planning. A few gaps are identified through this review. Firstly, the nutritional status among older adults who are at risk of hospital has not yet been well investigated. Secondly, there is scant study that has measured the fundamental health outcomes, namely nutritional status, functional status, and health-related quality of life in relation to preventing hospital readmission studies. Thirdly, there seems to be limited study that has applied a structural equation modelling approach to examine the relationship between the risk factors of hospital readmission and chronic disease self-management based on theoretical aspects. In addition, as a valid and reliable screening instrument of hospital readmission is yet to be developed, further study is required in this area. The next section of the literature review will focus on nutritional status in older adults, as the high prevalence of malnutrition continues to affect older adults with chronic conditions.

2.4 Nutritional Status in Older Adults

Nutritional status is a vital determinant of health, especially for older adults with chronic disease. Estimates indicate that up to 72% of hospitalized older adults suffer from malnutrition (Heersink, Brown, Dimaria-Ghalili, & Locher, 2010). This significantly high prevalence is of concern because older people are more likely to experience nutritional status deterioration over the period of hospitalization caused by eating difficulties, the side-effects of medication and severity of the disease (Cowan, Roberts, Fitzpatrick, While, & Baldwin, 2004; Gariballa & Forster, 2007; Westergren, Unosson, Ohlsson, Lorefält, & Hallberg, 2002). Studies have shown that hospitalized older adults who are malnourished at the time of admission are likely to have increased risk of experiencing adverse events while in the hospital and following discharge, as well as increased risk of not being able to recover from malnutrition (Gariballa & Forster, 2007; Gary & Fleury, 2002; Heersink et al., 2010). This has brought to light the importance of early and routine identification of malnutrition for older adults in acute hospital settings.

Malnutrition is also associated with undesirable clinical outcomes, including increased morbidity (Isabel, Correia, & Waitzberg, 2003; Neumann et al., 2005) resulting in increased length of hospital stay (Martineau, Bauer, Isenring, & Cohen, 2005; Middleton et al., 2001; Neumann et al., 2005), and healthcare costs (Isabel et al., 2003), decreased quality of life (Isabel et al., 2003; Neumann et al., 2005), and increased mortality (Isabel et al., 2003; Middleton et al., 2001).

The following literature review of nutritional status in older adults studies is presented in the sequence of: (1) malnutrition: definition and prevalence of malnutrition; (2) nutritional screening and assessment tools; (3) factors contributing to malnutrition in older people; and (4) the effects of malnutrition concerning functional outcome and quality of life in an aging population. These four broad areas will be discussed, and the rationales for conducting this study will be provided.

2.4.1 Malnutrition: Definition and prevalence of malnutrition.

Malnutrition is a broad term which describes both under-nutrition and over-nutrition. In this document it refers to under-nutrition, which occurs when nutritional requirements are not being met (Dietitians Association of Australia). In the literature, the terms ‘malnutrition’ and ‘under-nutrition’ are often used interchangeably (Chen, Schilling, & Lyder, 2001). Clinically, malnutrition is characterized as insufficient intake of protein, energy and micronutritients, which causes susceptibility to infection or disease (Watson et al., 2006). Symptoms of malnutrition may include: weight loss, muscle wasting, hair loss, pale skin, and mental confusion (Dietitians Association of Australia).

Older people are at increasing risk of malnutrition (Nowson, 2007). More than 78% of hospitalized patients were malnourished on admission, and the incidence increases with age (≥ 65y) (Pablo et al., 2003). Kubrak and Jensen (2007) employed a narrative review methodology to investigate the current prevalence of malnutrition in acute care patients, and revealed that malnutrition ranges from 13-78% (Table 2.3). For hospitalized older adults, it ranges between 12.2% to 72%, depending on the different patient populations, settings and the different definitions of malnutrition used (Heersink et al., 2010). The prevalence of malnutrition was similar to ten years ago, indicating that malnutrition continues to be a significant global problem among acute care patients and older adults (Heersink et al., 2010; Kubrak & Jensen, 2007).

Table 2.3 shows the prevalence of malnutrition in acute health care settings in different countries. When interpreting these studies, a few considerations should be taken into account. Firstly, these studies were conducted in different specialized settings, which could lead to a great range of variations. For example, factors related to high prevalence of malnutrition include disease severity, degree of disability, complexity of treatment, and health care practices (Kubrak & Jensen, 2007). Secondly, lack of consistency of measuring tools has impeded comparison of rates of malnutrition (Kubrak & Jensen, 2007). Thirdly, these reports were based on research in various populations and they provided an overall picture of the prevalence of malnutrition in acute adult hospital settings. Finally, some studies had a small sample size with high prevalence of malnutrition, indicating these studies might not have enough statistical power. For instance, Pablo (2003) assessed the nutritional status in 60 patients (age range: 27-86 years), and found that 78.3% of patients were suffering from malnutrition on 48 hours of admission using a combined index.

In older adults, the prevalence of malnutrition ranges from 6% to 50% in different health care settings in Australia (see Table 2.4). The results in Table 2.4 demonstrate that Australia had similar rates of prevalence of malnutrition in older adults with other countries such as Canada (Chevalier, Saoud, Gray-Donald, & Morais, 2008; Singh, Watt, Veitch, Cantor, & Duerksen, 2006). Lazarus and Hamlyn (2005) used SGA to assess the nutritional status in 324 patients on various wards in acute private hospitals (general surgery, cardiology, neurosurgery, orthopaedics, and urology) in New South Wales. They found 43% of patients were malnourished. In Queensland, a cross-sectional study of acute and residential aged care facilities also using SGA found 50% of older people in acute age care facilities and 49% of older people in residential age care were malnourished (Banks, Ash, Bauer, & Gaskill, 2007). Similar results were also reported by Gaskill et al. (2010), in which 43.1% (N = 149) were moderately malnourished and 6.4% (N = 22) severely malnourished.

However, the results shown in Table 2.4 should be analysed with caution due to the different methods of assessment employed (e.g. SGA, MNA), and the small sample size used by different authors. Information provided from Table 2.4 also indicates that not many studies have been conducted recently regarding the prevalence of malnutrition in Australia (Lazarus & Hamlyn, 2005). Furthermore, there is a paucity of studies evaluating the nutritional status of older adults who are at risk of hospital readmission. Since older adults are more likely to experience nutritional status deterioration over the period of hospitalization and hospital readmission (Westergren et al., 2002), it is important to investigate nutritional status at admission for older adults at high risk of hospital readmission.

Table 2.3

Prevalence of Malnutrition/Malnutrition Risk in Acute Care Adult patients

Authors	**Country**	**N**	**Prevalence (%)**	**Method of assessment**
Braunschweig et al. (2000)	USA	404	54	Subjective Global Assessment (SGA)
Kelly et al. (2000)	United Kingdom	337	13	BMI, MUAC, waist circumference
Middleton et al. (2001)	Australia	819	36	SGA
Isabel et al. (2003)	Latin America	9348	50.2	SGA
Kyle et al. (2003a, b)	Switzerland Germany	1760	48	BMI, serum albumin, fat-free mass, body fat
Robinson et al. (2003)	USA	320	33	Serum pre-albumin, serum albumin, retinnol binding protein
De Kruif and Vos (2003)	Netherlands	334	86	Nursing Nutritional Screening form (NNSF)
RocandioPablo et al. (2003)	Spain	60	78.3	SGA, Nutritional Risk Index (NRI), Gassull classification Instant Nutritional Assessment (INA)
Corish et al. (2004)	Ireland	359	44 46	NRI Nutrition Risk Score (NRS)
Pichard et al. (2004)	Switzerland	952	57.8	SGA, BMI, fat-free mass, fat free-mass Index, fat-mass index
Raja et al. (2004)	Singapore	681	22.3	Malnutrition Screening Tool, SGA
Rasmussen et al. (2004)	Denmark	590	39.9	BMI, recent weight loss, recent food intake
Stratton et al. (2004)	United Kingdom	794	34.8	Malnutrition universal screening tool (MUST)
Sungurtekin et al. (2004a)	Turkey	100	44	SGA, NRI
Sungurtekin et al. (2004b)	Turkey	251	30 36	SGA NRI
Weekes et al. (2004)	United Kingdom	100	20	Nutrition Screening Tool
Kyle et al. (2005)	Germany	794	22	SGA
Singh et al. (2006)	Canada	69	69%	SGA
Chevalier (2008)	Canada	182	53%	MNA

Note this table is adopted from (Chevalier et al., 2008; Kubrak & Jensen, 2007; Singh et al., 2006).

Table 2.4

Prevalence of Malnutrition in Older Adults in Australia

Authors	Setting	N	Prevalence (%)	Assessment Tools
Middleton et al. (2001)	Acute care setting (median age 65)	819	36%	SGA
Visvanathan et al. (2003)	Domiciliary care service (mean age 79.45)	250	4.8%, 38.4% (at risk)	MNA
Visvanathan et al (2004)	Sub-acute care facility	65	35.4 to 43.1%	MNA, Standardized Nutritional Assessment (SNA)
Martineau et al. (2005)	Acute stroke unit (mean age 72 ± 12.9)	73	19.2%	Generated- subjective Global Assessment (PG-SGA), BMI, serum albumin
Neumann et al. (2005)	Rehabilitation unit (mean age 81 ± 6)	133	6% 47% (at risk)	MNA,BMI, corrected arm muscle area (CAMA)
Isenring et al. (2006)	Oncology outpatient (mean age 59.1± 13.8)	50	26%	PG-SGA
Bauer et al. (2007)	Acute care setting (age ≥ 80)	64	45%	SGA
Banks et al. (2007)	Acute age care facility Residential age care	381 458	50% 49.2%	SGA SGA
Gaskill et al. (2009)	Residential age care	377	49.5%	SGA

Note: Patient-Generated Subjective Global Assessment (PG-SGA) as a nutrition assessment tool (Bauer, Capra, & Ferguson, 2002).

2.4.2 Nutritional screening and assessment tools.

Malnutrition is amenable to prevention by early identification and appropriate nutritional intervention (Ferguson et al., 1999; Isenring, Bauer, Banks, & Gaskill, 2009; Watterson et al., 2009). Assessing nutritional status in older adults generally includes medical, nutritional and medication history, physical examinations, anthropometric data, biochemical parameters and body composition analysis (Visvanathan, Penhall, & Chapman, 2004). A combination of measurements has been recommended in clinical practice to detect malnutrition (American Dietetic Association, 1994).

The terms “screening” and “assessment” are used when evaluating nutritional status and they are often used interchangeably in the literature (American Dietetic Association, 1994; Green & Watson, 2005). However, nutrition screening is considered to be a simple process to identify malnutrition risk, whereas, nutrition assessment refers to a more in-depth and comprehensive evaluation of nutritional status including, dietary medical history, physical assessment, anthropometric measurements, and laboratory data to confirm a diagnosis of malnutrition (American Dietetic Association, 1994; Green & Watson, 2005). A single nutrition parameter test will not allow measurement of the multitude of factors that affect nutritional status, and thus, a combination of measurements have been recommended in clinical practice to detect malnutrition (American Dietetic Association, 1994).

A number of nutrition screening and assessment tools have been developed and validated for use in older adults (Stratton et al., 2004; Vellas et al., 1999). Examples of validated and commonly used nutrition screening tools in the Australian older adult population include the Mini Nutritional Assessment-Short Form (MNA-SF) (Rubenstein, Harker, Salva, Guigoz, & Vellas, 2001), the Malnutrition Universal Screening Tool (MUST) (Stratton et al., 2004) and the Malnutrition Screening Tool (MST) (Ferguson et al., 1999). It has been suggested that simple, accurate and highly sensitive and specific screening tools are best in clinical practice (Ferguson et al., 1999). The simplicity and accuracy of the MST suggests it is easier to use than the other two methods as it does not require calculations such as Body Mass Index (BMI). The most commonly used nutritional screening tools and nutritional assessment tools in hospital settings for the older adults are presented in Table 2.5 and Table 2.6 respectively.

The MST was developed by Ferguson et al. (1999) in acute hospital settings (N = 408), and it consists of two questions on recent unintentional weight loss and the presence of reduced food intake due to poor appetite. A score of 0-1 indicates low risk; a score of 2 indicates that the individual is at risk and requires further assessment; 3-4 indicates higher level of risk; and a score of 5 indicates a very high risk of malnutrition (Ferguson et al., 1999; Leggo, Banks, Isenring, Stewart, & Tweeddale, 2008). The MST is the simplest and most widely used tool in Queensland hospitals, and has been tested for validity in inpatients and oncology outpatients in

Australia (Ferguson et al., 1999; Isenring, Cross, Daniels, Kellett, & Koczwara, 2006).

Although many nutrition screening tools have been developed, few have been solidly validated (Jones, 2004). While the MST inpatient validation did include older adults (mean age 57.7 years, range 19 – 94 years), this was a heterogeneous population. As Jones (2004) stated, applying the tool in different populations requires new validity, as the tool may require modification for that particular population. The MST has not been validated specifically in frail and at high risk of hospital readmission older populations. It is important to validate a nutrition screening tool that can be used across different health care settings so that older adults and frontline health care providers, usually nurses, can utilise these for the benefit of patients.

In regard to nutrition assessment tools, SGA and MNA are two commonly used nutrition assessment tools in older populations. The SGA evaluates nutritional status and is based on the patient's history and physical examination (Detsky et al., 1987). The tool was originally developed for patients with gastrointestinal disease. SGA includes questions about weight loss, change in dietary intake, gastrointestinal symptoms and functional capacity. In the physical examination part, subcutaneous tissue loss, muscle emaciation and presence of oedema are assessed. The examiner is recommended to focus on the features of weight loss, poor dietary intake, loss of subcutaneous fat and muscle wasting (Detsky et al., 1987). The results are subjectively classified into three different categories: well nourished (SGA A), moderately malnourished (SGA B), or severely malnourished (SGA C).

The MNA has been specifically developed to assess the risk of malnutrition in frail older adults (Guigoz, Vellas, & Garry, 1996). It contains 18 questions, involving four nutritional areas: including anthropometric measurements (BMI), mid-upper arm circumference (MUAC), calf circumference (CC) and weight loss. The tool also includes global assessment such as lifestyle, medication and physical and mental status; a dietary assessment, self perception of whether food intake is sufficient; and self-rated health status. The total score is 30 points. A score of less than 17 points is regarded as representing malnutrition (MNA 3), 17-23.5 as at risk of malnutrition (MNA 2), and more than 24 points that the elderly person is well nourished (MNA 1) (Guigoz et al., 1996). Although both MNA and SGA have been used in elderly populations, they may be different in terms of functioning and purpose. It is suggested that MNA is useful for identifying risk of malnutrition, while the SGA has the most diagnostic value (Christenson, Unosson, & Ek, 2002; Kubrak & Jensen, 2007). In other words, SGA is more useful in detecting older adults with established malnutrition than MNA (Christenson et al., 2002).

Anthropometric measurements may include body weight, height, skin fold thickness and limb muscle circumference (Tierney, 1996). Body mass index (BMI) is calculated as weight (kg) divided by height squared (m^2). Corrected Arm Muscle Area (CAMA) will also be assessed to indicate body protein and fat stores and has been associated with morbidity and mortality in older people (Miller et al., 2002; Neumann et al., 2005). CAMA will be calculated from mid-upper arm circumference (MUAC) and triceps skin fold (TSF). The amount and change in body energy stores and protein mass can thus be assessed and dramatic depletion of these two components is an indication of a person at risk of malnutrition (Tierney, 1996). Although these nutrition parameters are widely used, both CAMA and TSF require trained health care staff to perform, such as dietitians.

Studies have also revealed that the under-recognition of nutritional problems was due to nurses and junior doctors not always carrying out nutritional screening (Lennard-Jones, Arrowsmith, Davison, Denham, & Micklewright, 1995; Perry, 1997). Since nurses are front-line carers it has been suggested that they are in an ideal position to carry out nutritional screening so that the risk of malnutrition can be detected among patients, and proper interventions such as referral to dietitians for further evaluation and sufficient nutrition support can be introduced (Arrowsmith, 1999). The advantages of the MST include: (1) it is a simple screening tool and easily incorporated into the usual assessment procedure used by health care providers; (2) it does not require any complicated measurements or calculations; (3) the MST score provides indication for prioritization of referrals based on level of risk and urgency of conditions (Leggo et al., 2008). Therefore, validating the simple and quick screening tool, MST, can benefit patients and nurses, and allow nurses to detect risk of malnutrition more effectively.

Table 2.5

The Commonly used Nutrition Screening Tools for Hospitalized Older Adults

Screening tools	Tool description	Reliability	Validity	Clinical practicality
Malnutrition Screening Tool (MST) (Ferguson et al., 1999)	Assess weight loss and poor appetite. Screening score (Total max. 5 points): ≥ 2 = At risk of malnutrition	The Inter-rater reliability was high between 93-97%.	Convergent and predictive validity Sensitivity of 93%, Specificity of 93% (against SGA).	Easy and quick to use.
Short-Form Mini Nutritional Assessment (MNA-SF) (Rubenstein et al., 2001)	Assess BMI, weight loss, dietary intake, food intake declined, mobility, psychological problem, neuropsychological problem. Screening score (Total max. 14 points) : ≥ 11 = At risk of malnutrition	Inter-rater reliability between nurses, physician, and dietician (k = .67)	Predictive validity Sensitivity of 97.9%, Specificity of 100% (against MNA).	Useful in acute setting when nutritional support is acutely needed.
Malnutrition Universal Screening Tool (MUST) (Bapen, 2003)	Assess Body Mass Index (BMI), weight loss, and acute disease effect. Scoring: Low risk = 0 Medium risk =1 High risk ≥ 2	Inter-rater reliability completed with nurses, doctors, and dieticians (k = .809-1.0) Predictive of mortality and length of stay in elderly patients.	Assessed against other NSTs but agreement varied from poor to excellent (k = .40-.75)	Practical in clinical setting. Developed to screen people live in the community
Rapid Screen (Visvanathan et al., 2004)	Assess BMI, weight loss, the two question “rapid screen” Positive = under nourished; Negative = nourished.	Not reported	High sensitivity of 78.6%, specificity of 97.3% (against MNA)	Fast and easy to use, but require BMI calculation.

Note: This table was adjusted from (Kubrak & Jensen, 2007, p. 1043); (Ferguson et al., 1999; Isenring et al., 2006; Sieber, 2006; Visvanathan et al., 2004).

Table 2.6

The Commonly used Nutrition Assessment Tools for Hospitalized Older Adults

Assessment tools	Tool description	Reliability	Validity	Clinical practicality
Subjective Global Assessment (SGA) (Detsky et al., 1987)	Assess weight loss, dietary intake, gastrointestinal symptoms, disease state, and functional capacity; subjective physical assessment Rating: Well nourished = A Moderately malnourished = B Severely malnourished = C	Inter-rater reliability established with nurses, physicians and dietitians. 81 % predictive of mortality and morbidity post-operative infections.	Assessed against clinical indicators ($p < .001$) and other NST, considered a validated NST.	Requires training to use.
Mini Nutritional Assessment (MNA) (Vellas et al., 1999)	First section of assess food intake, weight loss or acute disease, neuropsychological problems, and BMI. Scoring: No risk > = 12 Risk and continued assessment of 12 additional items in second section < = 11 At risk = 17-23.5 Malnutrition < 17	Inter-rater reliability not completed with nurses. Other reliability between observers not specific ($k = .51$)	Assessed against weight loss, percent weight change and other NST ($p \leq .001$)	Required training to complete. Especially developed for the elderly.

Note: This table was adjusted from Kubrak & Jensen (2007, p. 1043).

2.4.3 Factors contributing to malnutrition in older adults.

The causes of malnutrition in older people are presumably multifactorial and are associated with physical and physiological impairments and psychosocial influences (Brownie, 2006). Additionally, a natural consequence of aging is changing body composition, including reduction in lean body mass and increase in body fat, known as sarcopenia (Brownie, 2006; Visvanathan, 2003). The consequences of these changes are reduced metabolic rate, reduced energy requirements, decreased physical activity, and impaired oral intake (Visvanathan, 2003). As a result of this declining strength, balance, and muscle mass, occur which thus also increase the risks of falls and infections in older people (Forster & Gariballa, 2005; Watson et al., 2006).

Other physical and physiological causes include: changes in gastrointestinal tract such as oral problems, resulting in poor appetite; changes in sensory function, for instance diminished sense of taste and smell, which may be related to medications and disease (Brownie, 2006). Aging also increases the likelihood of developing a range of chronic diseases such as stroke, cancer, arthritis, depression, and dementia (Brownie, 2006). Chronic diseases can generate disabilities in older people and as a result they might alter their oral intake because of pain, restricted mobility and fatigue, which can all contribute to the development of malnutrition (Brownie, 2006; Watson et al., 2006).

Psychosocial factors, such as reduced ability to prepare and consume food, contribute to impaired nutritional status (Brownie, 2006). This especially affects older people who have chronic diseases because of the impact of physical, psychological, or financial factors, which increase the risk of malnutrition (Kubrak & Jensen, 2007). Brownie (2006) reported that depression, isolation, financial restraints and decreased social interaction might have an influence on food and eating practices among older people. This is also supported by Kowank (1997) who pointed out that factors contributing to malnutrition prior to hospitalization include disease, disability, poverty, isolation, and poor eating habits. As a result, it can be concluded that malnutrition in older people results from interactions between the physical, physiological, and psychosocial aspects of their lives (Martin et al., 2007).

2.4.4 The Effects of malnutrition: Functional ability and quality of life.

Malnutrition is well documented to be associated with poor health outcomes such as increased length of stay (LOS) in hospital, increased incidence of complications, increased readmission rate and increased mortality rates, which significantly affect quality of life and are costly to individuals, families and the community (Bauer et al., 2002; Friedman et al., 1997; Kowanko, 1997; Middleton et al., 2001; Raja et al., 2004). Middleton et al. (2001) conducted a prospective study of two Sydney teaching hospitals and revealed that malnutrition is associated with increased LOS and mortality rates, and it remains a health concern in Australian hospitals.

Furthermore, nutritional status in older people is closely associated with functional status, which influences the older people’s ability to live independently, such as their ability to perform activities of daily living (ADLs), and thus it is closely tied to quality of life (Martin et al., 2007). Gill et al. (1997) conducted a study in finding the predictor of recovery in activities of daily living among disabled community-dwelling older adults. They found that good nutritional status which was assessed with body mass index was independently associated with ADLs recovery. Brownie (2006) pointed out that with advancing age there is a higher incidence of frailty and disability, and as the levels of frailty and disability rise, so do the incidence and consequences of inadequate nutrition. Muscle wasting, weight loss and poor appetite may be caused by deficient nutrition intake, and as a result, the quality of life for malnourished individuals is severely compromised (Brownie, 2006).

Similar results were supported by Balcombe et al. (2001) who conducted a study in community dwelling older adults by using BMI to assess nutritional status. They found that poor nutrition status was associated with low levels of well-being and good nutritional status was associated with the highest levels of well-being. As malnutrition affects older adults’ functional ability and quality of life, it is important to detect and establish the prevalence of malnutrition among this population, especially in those at high risk of hospital readmission.

In summary, it is evident from the literature examined that the prevalence of malnutrition in older adults is a continuing health concern in Australia. Much research has endeavoured to discover the prevalence of malnutrition in various settings and with different populations. The majority of these studies are focused on acute care settings, and the negative outcomes of malnutrition such as increased LOS, mortality rates, disability, and quality of life issues in older adults. The literature review highlights that there is a lack of literature on nutritional status in hospitalisation and following discharge in older adults at high risk of hospital re-admission in Australia. Furthermore, although the MST has been validated in an acute hospital setting, it has not been validated specifically in older adults, especially older adults who are at high risk of hospital readmission. Consequently, these are the areas that need to be explored.

Conclusion

This literature review has been presented in four sections. The first section provides an overview of the older adults' health status. Section two discusses chronic disease in older adults, especially focusing on the studies related to chronic disease self-efficacy, and important issues, such as model testing. As chronic diseases in older adults are associated with a risk of hospital readmission, the studies related to older adults who are at high risk of hospital readmission were reviewed next in section three. Current prevention and intervention programs for readmission were also illustrated. The final section presented studies related to nutritional status in older adults. This review has identified a number of important research gaps that need to be addressed in future studies. They are presented below.

The review suggested that there is lack of knowledge concerning theoretical model testing in relation to applying the SCT in chronic disease self-management in older adults at high risk of hospital readmission. Additionally, it is also noted that there are scant studies that have applied structural equation modelling approaches to undertake the model testing in this field. Since the prevalence of chronic disease and co-morbidities are high in older adults especially for those who are at risk of hospital readmission, it is important to investigate to what extent this population are managing their chronic conditions. Furthermore, through testing the theoretical model, the mediator effects, the directions, and the relationships between the concepts can be clarified and understood comprehensively.

In addition, as identified through the literature review, there are limited instruments for screening hospital readmission. The Pra is the one that has been noted in the literature; however, it was developed for community-dwelling older adults, and hence may not be valid in a hospital setting. Moreover, the Pra does not include a few major risk factors of hospital readmission such as functional impairment and co-morbidities, indicating its questionable validity. This suggests there is a need for further developing an instrument for detecting older adults at risk of hospital readmission. Thus, a comprehensive examination of the relationships between the risk factors of hospital readmission, self-efficacy for chronic disease self-management, and health outcomes are required, in order to enhance further instrument development.

The review also underlines that there are limited studies that have included all three important health determinant elements, nutritional status, functional ability and health-related quality of life in the health outcome measures. Nutritional status in older adults at risk of hospital readmission needs to be explored, and the MST requires further validation in this population.

In conclusion, the nutritional status of older adults who are at risk of hospital readmission needs to be investigated, and whether the MST is a valid tool for this population also needs to be examined. In addition, theory testing based on the SCT to examine the relationships between the major concepts such as participants' characteristics, self-efficacy beliefs, social support, and three heath outcomes (nutritional status, functional status, and health-related quality of life) needs to be examined to fill both empirical and knowledge gaps. An understanding of these relationships may contribute to the interventions that are tailor-made for older adults at risk of hospital readmission, and shed light on preventing hospital readmission and improving self-management for chronic disease sufferers which, in turn, will improve quality of life for older adults.

Chapter 3: Theoretical Framework

Introduction

The theoretical framework for this study is based on social cognitive theory (SCT), also known as the self-efficacy model, developed by Bandura (1977). Original tests of the concept were conducted with persons who had a phobia of snakes (Bandura, 1977). Self-efficacy beliefs form the central core of the theory. People with a strong sense of self-efficacy are empowered to accomplish actions required to produce a desired outcome (Bandura, 1977). The theory proposes that self-efficacy beliefs directly affect how individuals perceive outcome expectations, and goal setting, obstacles or facilitators, and as a result determine whether individuals will take action to achieve their desired outcomes.

This chapter consists of two main sections. The first section provides an overview of social cognitive theory. The components within social cognitive theory are discussed, which include the concept of self-efficacy, such as how self-efficacy regulates health behaviour and the three dimensions to influence behaviour: magnitude, strength, and generality. Outcome expectations and the four major information sources for influencing self-efficacy beliefs are also discussed. Additionally, how the elderly perceive self-efficacy beliefs is reviewed in this section as well. The second section addresses how self-efficacy underpins this study. Thus, the rationale of choosing the self-efficacy model is discussed, along with a hypothesized model to be tested, and the justification for selecting variables within the model for this study.

3.1 Social Cognitive Theory

Social cognitive theory (SCT), introduced by Albert Bandura, is a widely applied theory in the health field as it both illustrates determinants of health behaviour and methods of promoting changes (Nutbeam & Harris, 2004). Social cognitive theory which was derived from social learning theory, indicates the interaction between individuals, the environment, and personal matters in determining people's behaviour (Bandura, 1986). Bandura (1986) stated that people make causal contributions to their own motivation and action with a system of triadic reciprocal causation. In this theory, the concept of reciprocal determinism is referred to as: 1) the internal personal factors in the form of cognition, affect, and biological events; 2) behaviour, and 3) the external environmental influences created that result in a triadic reciprocality (Bandura, 1986). The relative importance of each of these dimensions varies according to the individual, the circumstances, and the activity (Bandura, 1997).

Although social cognitive theory recognises how environments shape behaviour, it focuses on individuals' potential abilities to change and construct environments to suit purposes that they invent for themselves (Glanz et al., 2008). The central construct of social cognitive theory is known as self-efficacy, which was known as an individual's judgment of his or her capabilities to organise and execute the courses of action to accomplish specific tasks (Bandura, 1986). In the literature, social cognitive theory and self-efficacy seem to be used interchangeably. Therefore, it is important to distinguish between social cognitive theory and the self-efficacy component of the theory.

Social cognitive theory posits a multifaceted causal structure that addresses both the development of competencies and the regulation of action, while the self-efficacy component of the theory operates as a primary determinant in concert with other determinants in the theory to govern human thought, motivation, and action (Bandura, 1986, 1997). Figure 3.1 illustrates the structural paths of social cognitive theory, and shows the structural paths of influence wherein perceived self-efficacy affects health behaviours both directly and through its impact on goals, outcome expectations, and perception of socio-structural facilitators and impediments to health behaviour (Bandura, 2004). For example, the individuals who perceived stronger self-efficacy set the higher goals for themselves and were more likely to persevere with their commitment (Bandura, 2004). The key concepts of social cognitive theory are reviewed in the following section.

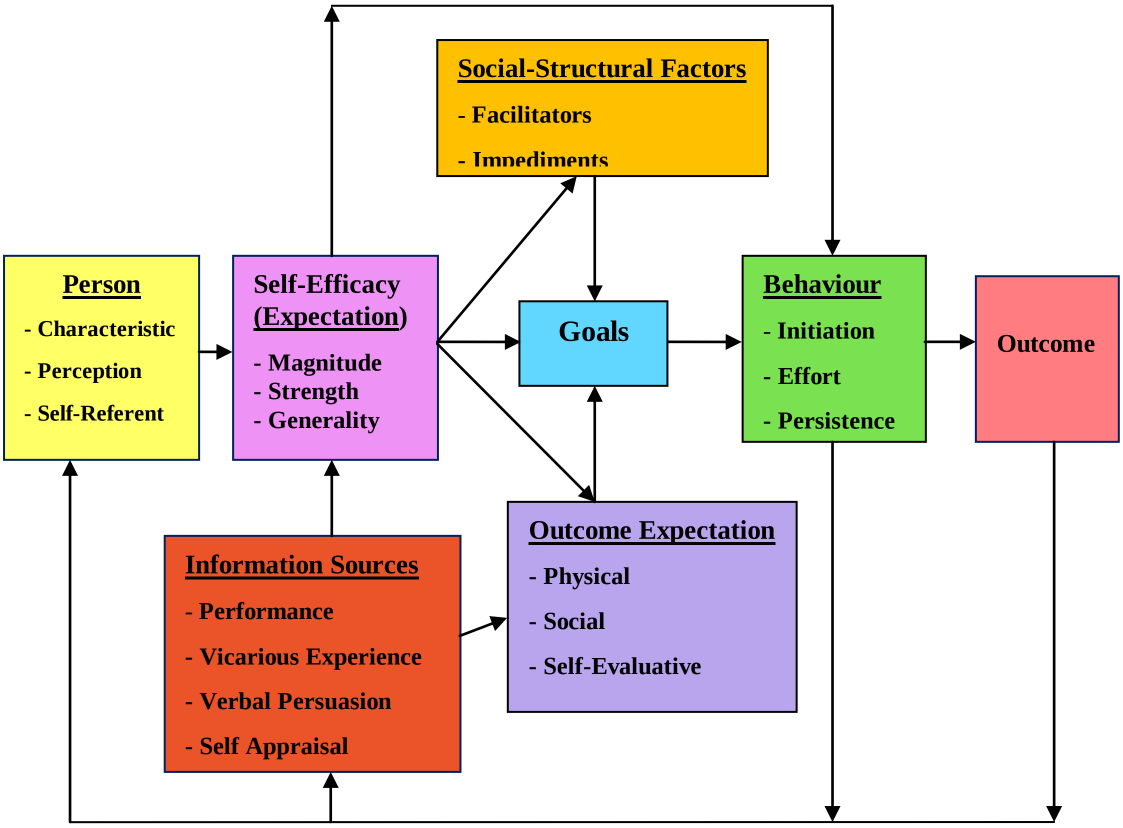


Figure 3.1. Social Cognitive Theory and Self-Efficacy Model.

This Figure is adapted from Bandura 2004, p. 146, and Shortridge-Bagget & Van der Biji, 1996).

3.1.1 Self-efficacy and outcome expectations.

Social cognitive theory includes the factors that operate as regulators and motivators of established cognitive, social, and behavioural skills, and these factors operate through the anticipative mechanism of forethought (Bandura, 1997). This cognitive control of behaviour is based on two types of expectations: (1) self-efficacy (self-efficacy expectations), which is referred to as "people's judgment of their capabilities to organize and execute the course of action which require designated types of performances" (Bandura, 1986, p. 391), and (2) outcome expectancies, which are defined as a person's estimate that a given behaviour will lead to certain outcomes (Bandura, 1977, p. 193). Self-efficacy and outcome expectations are different because an individual may believe that certain behaviour will result in a specific outcome; however, they may not believe that they are capable of performing that particular behaviour in order to achieve the desired outcome (Bandura, 1977, 1997). The following section introduces the concept of self-efficacy, outcome expectations, and the sources of information.

The role of self-efficacy in human function is that "people's level of motivation, affective states, and actions are based on what they believe rather than on what is objectively true" (Bandura, 1997, p. 2). Efficacy beliefs play a central role in personal change (Bandura, 2004). This main belief is the foundation of human motivation and action. People have little incentive to act or to persevere in the face of difficulties, unless they believe they can produce the desired effects by their actions (Bandura, 2004). Based on this concept, how people behave can be effectively predicted through the beliefs they hold about their capabilities (Pajares, 2002). For example, if people believe they have no capability to produce results, they will not attempt to make things happen. To pursue this further, self-efficacy determines how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences (Bandura, 1977). The stronger the perceived self-efficacy, the greater the efforts (Bandura, 1977).

Bandura (1977) posited that self-efficacy varies on three dimensions to influence behaviour: magnitude, strength, and generality. Magnitude refers to the difficulty of the task; strength considers the conviction a person holds that the task or behaviour can be done, and generality refers to how experiences of self-efficacy can either be specific to one task in one situation or generalised to new or challenging situations (Bandura, 1977). As a result, self-efficacy is measured by obtaining ratings of magnitude, strength, and generality (Amber, Mieke, & Jaap, 2001).

Self-efficacy influences how people feel, think, motivate themselves, and act (Bandura, 1997). Self-efficacy regulates human behaviour through four major processes: cognitive, motivational, affective, and selection processes (Bandura, 1997). They are discussed as follows. In cognitive processes, efficacy beliefs affect thought patterns that can uplift or diminish performance. A key important belief system that affects how efficacy information is cognitively processed is conceptions of ability, which exert strong effects on the self-regulatory mechanisms governing cognitive functioning and performance accomplishments (Bandura, 1997). Another important belief system is people's beliefs about the extent to which their environment is influence-able or controllable (Bandura, 1997).

In motivational processes, Bandura (1997) stated that the root of cognitive activity is the capability of self-motivation and purposive action. People motivate themselves and guide their actions anticipatorily through the exercise of forethought (Bandura, 1997). As a result, in cognitive motivation, people form their beliefs according to perceived causes of success and failure, anticipate likely positive and negative outcomes, and goal motivation (Bandura, 1997). For example, people form beliefs about what they can do, foresee likely outcomes, and set goals and plan courses of action designed to benefit the future and avoid aversive ones (Bandura, 1997). Additionally, people set goals which help to build efficacy beliefs by structuring activities and providing incentives and markers for estimating personal capabilities, and accomplishments with goal markers increase perceived efficacy and self-satisfaction (Bandura, 1997). Furthermore, self-efficacy beliefs determine how obstacles and impediments are viewed, therefore, playing a central role in the cognitive regulation of motivation.

The self-efficacy mechanism also plays a central role in the self-regulation of affective states (Bandura, 1997). Efficacy beliefs influence peoples' affective state through the exercise of personal control over three aspects: thought, action, and affect (Bandura, 1997). Firstly, the self-regulation of thought processes plays a vital role in the maintenance of emotional well-being as to the extent that people can regulate what they think, and results in influencing how they feel and behave (Bandura, 1997).

For instance, some people can sufficiently control what they think, yet others feel powerless to free themselves of agitation, which results in mental distress. Secondly, in the action mode of affective control, efficacy beliefs regulate stress and anxiety through their impact on coping behaviour. People who have a high sense of coping efficacy adopt strategies and are bolder in taking on stress and problematic challenges, creating a more benign environment (Bandura, 1997). Thirdly, regarding affective control efficacy, Bandura (1997) suggested that people can exercise control over their affective states by palliative means, without changing the environmental or cognitive sources of emotional arousal, through using techniques such as self-relaxation, calming self-talk, and seeking solace in social supports.

In terms of the selection process, Bandura (1997) stated that people are partly influenced by their environment, and by choosing their environment, people can influence what they can become. He further stated that the choices we make are influenced by beliefs in our own personal capabilities. Therefore, beliefs about personal efficacy play a key role in shaping our environments (Bandura, 1997). People tend to stay away from activities and environments they believe exceed their capabilities, however, they willingly undertake activities and select social environments they judge themselves capable of managing (Bandura, 1997). The higher they perceive self-efficacy, the more challenging the activities they select and stay in power in those pursuits (Bandura, 1977, 1997). The four processes mentioned above usually work together to regulate people's actions.

Although self-efficacy is a strong predictor of behaviour change, self-efficacy alone will not produce the desired performance. Bandura (1997) claimed that self-efficacy theory distinguishes degrees of controllability by personal means, and controllability influences the extent to which efficacy beliefs shape outcome expectancies and how much outcome expectations add incrementally to predict behaviour. As a result, outcome expectations play an influential role in motivating people. Outcome expectations can take three forms: physical, social, and self-evaluative (Bandura, 1997). Within each form, the positive expectations serve as incentives, the negative ones as disincentives. The positive and negative physical effects form the first class of outcomes. For example, pleasant sensory experiences and physical pleasures result in the positive forms, while pain and discomfort in the negative forms.

The second classes of outcomes are formed by positive and negative social effects. Positive social effects include social reactions of others as expressions of interest, and social recognition, while disinterest, social rejection, and deprivation of privileges are negative social effects. The third major class of outcomes includes the positive and negative self-evaluation reactions to one's own behaviour (Bandura, 1997). People do things that give them self-satisfaction and a sense of pride and self-worth, and avoid behaving in the ways that increase self-dissatisfaction and self-devaluation (Bandura, 1997). There is no single relationship between efficacy beliefs and outcome expectations; it depends on how tightly contingencies between actions and outcomes are structured (Bandura, 1997).

In brief, self-efficacy beliefs can enhance individual accomplishment and well-being through behaviour change. They influence the choices people make, the courses of action they pursue, and an individual's thought patterns and emotional reactions. They also affect an individual's judgment on how much effort to expend on an activity, and how long they should persevere when facing obstacles (Pajares, 2002). In addition, self-efficacy should not be confused with outcome expectation, which is the judgments about the consequences an act will likely produce (Bandura, 1977; Pajares, 2002).

3.1.1 Sources of information for self-efficacy.

Self-efficacy beliefs are based on four important sources of information: performances accomplishments, vicarious experience, verbal persuasion, and physiological information (Bandura, 1977, 1986, 1997).

3.1.1.1 Performance accomplishments.

This is the most influential source of efficacy information because it is based on a person's own mastery experience (Bandura, 1977, 1997). Experiences of success enhance self-efficacy, while repeat failure decreases self-efficacy, particularly when the failure occurs early in the learning process. Once strong self-efficacy beliefs are developed through repeated success, the negative impact of occasional failure is likely to have less effect. The effects of failure depend on the timing in the learning process and the total pattern of experiences (Amber et al., 2001; Bandura, 1977).

Once a person establishes high self-efficacy, he or she tends to generalise from one experience to another and even the situation and performance skills are irrelevant from the former experience. Experience of success and failure in behaviour and the attributions are important sources for the development of self-efficacy. People with strong self-efficacy tend to attribute failure to other factors rather than doubt their own capability, such as not enough effort or wrong strategy, while people with low self-efficacy will associate the attribute failure with their own incapability (Amber et al., 2001; Bandura, 1977).

Additionally, mastery experience produces stronger and more generalised efficacy beliefs than modes of influence, relying solely on other sources such as vicarious experiences, verbal persuasion, and physiological information (Bandura, 1997). Four modes of inductions are introduced to enhance self-efficacy beliefs. They are participant modelling, performance desensitisation, performance exposure, and self-instructed performance (Bandura, 1977). Although mastery experiences are the most influential sources, other sources also facilitate the development of self-efficacy beliefs.

3.1.1.2 Vicarious experience.

Vicarious experiences influence efficacy appraisal through modelled attainments, observing others performing tasks, and, as a result, modelling serves as another effective tool for enhancing self-efficacy beliefs (Bandura, 1997). Self-efficacy appraisals are especially sensitive to vicarious information when people are uncertain about their own abilities, or when they have limited prior experience with the task, they rely more heavily on modelled indicators (Bandura, 1997). Even experienced and self-efficacious people will have positive effects if models present them with a better way of mastering things (Bandura, 1997; Pajares, 2002).

Although vicarious experiences are generally less impacting than direct ones, under some conditions vicarious influences can overtake the impact of direct experience (Bandura, 1997). For example, vicarious influences are particularly powerful when people observe similarities in an attribute and then assume the model's performance is diagnostic of their own capability (Bandura, 1997; Pajares, 2002). Observing the successes of such models contributes to the observer's beliefs about their own capabilities in the sense of "if they can do it, so can I". In contrast, observing models with perceived similar attributes that fail can diminish the observers' beliefs about their own ability to successfully master a task (Bandura, 1989).

When people perceive the model's attributes as relatively different from their own, the impact of vicarious experience is heavily minimised (Pajares, 2002). This is because they do not share common ground, and it does not carry elements for which the observer is looking, like a model that possesses qualities they admire and capabilities to which they aspire (Pajares, 2002). The methods of modelling can operate through live modelling, such as people who suffer from the same chronic disease, and symbolic modelling, such as using mass media, or video (Bandura, 1977, 1997).

3.1.1.3 Verbal persuasion.

Verbal persuasion is the most commonly used source of self-efficacy as it is easy and convenient (Bandura, 1997). This source of information involves exposure to the verbal judgments that others provide (Pajares, 2002). For example, it is often used in the evaluative feedback given to performers. Persuasory efficacy information can be conveyed in ways that undermine or enhance people's self-efficacy beliefs (Bandura, 1997). Thus, persuaders play an important part in the development of an individual's self-beliefs in this regard. Effective persuaders must promote people's beliefs in their capabilities while at the same time ensuring the anticipated success is attainable (Shortridge-Baggett, 2001). Because positive persuasions exert to encourage and empower, negative persuasions can work to defeat and weaken self-efficacy beliefs (Bandura, 1997; Pajares, 2002).

Verbal attempts to persuade people they have the ability to perform a behaviour are weaker than the other two sources mentioned above, due to a lack of concern for one's own experiences (Amber et al., 2001). However, to some extent the persuasive boosts in perceived efficacy lead people to try harder to succeed, and self-affirming beliefs promote development of skills and efficacy beliefs (Bandura, 1997). Therefore, persuasory efficacy attributions do have an impact on people who have some reason to believe that they can produce effects through their performances, especially those in difficult situations (Bandura, 1997). The methods of induction include suggestion, exhortation, self-instruction, and interpretive treatments (Bandura, 1977).

3.1.1.4 Physiological information.

Physiological and emotional states also provide information about judging people's capabilities (Bandura, 1997). Somatic indicators of perceiving efficacy are especially applicable in the domains that involve physical accomplishments, health functioning, and coping with stressors (Bandura, 1997). People experience tension, anxiety, and depression as signs of vulnerability to dysfunction. High arousal can diminish performance, and people tend to expect success more when they are not bothered by aversive arousal than if they are under stress (Bandura, 1997). People see physical fatigue, aches, and pains as indicators of physical inefficacy. Additionally, when people experience negative thoughts and fears about their capabilities, those affective reactions can themselves lower self-efficacy perceptions and trigger extra stress, which helps ensure the inadequate performance they fear, resulting in the circulation of lower efficacy beliefs (Bandura, 1997; Pajares, 2002).

People's self-efficacy beliefs are influenced by what people believe about their physical condition, and how they interpret their emotional and mood states. Therefore, the ways to elevate self-efficacy beliefs need to improve physical and emotional well-being and ease negative emotional states (Pajares, 2002). These can be operated through attribution, relaxation, biofeedback, symbolic desensitisation, and symbolic exposure (Bandura, 1977). The sources of self-efficacy information are not directly translated into judgment of self-efficacy but through cognitive process (Bandura, 1986; Pajares, 2002). People interpret the results of events, and these interpretations provide the information on which judgments are based. The types of information people focus on and employ to make efficacy judgments, and the regulations they use for weighting and integrating them, form the basis for interpretations. Therefore, the selection, integration, interpretation, and recollection of information influence judgments of self-efficacy (Pajares, 2002).

There is hierarchy in the four information sources of self-efficacy (Amber et al., 2001). The first source, the performance accomplishments, is the most influential source as it is based on the direct information such as people immediately experiencing success or failure. The remaining three sources are based on indirect information. For example, modelling and observing people demonstrating the desired behaviour can provide important self-efficacy information; however, it is not based on one's own experience (Amber et al., 2001). Persuasion is a weaker source when used alone; however, it is useful to support the other sources. The last source, the physiological information, is the least concrete but essential as it relies on people's physical and emotional states to judge their capabilities (Amber et al., 2001; Bandura, 1997).

3.1.2 Aging and self-efficacy.

Older adults normally have to adapt and cope with major life transitions, bio-psychological change, and social barriers (Bandura, 1997). To maintain social connectedness is an important aspect of successful aging (Bandura, 1997). Major life changes in social life in later years are caused by retirement, relocation, and loss of friends or spouses (Bandura, 1997). Such changes lay demands on interpersonal skills to develop new social relationships that can contribute to positive functioning and personal well-being. A low sense of social efficacy increases older people's vulnerability to stress and depression and both directly and indirectly confines the development of social support (Bandura, 1997).

Social support is usually seen as a buffer against life stressors (Bandura, 1997). The enabling function of social support enhances perceived coping efficacy. The relationship between efficacy belief and social support is bidirectional, which means that a strong sense of social efficacy facilitates the development of socially supportive relationships, and social support, in turn, enhances perceived efficacy (Bandura, 1997). Social dependency is commonly regarded as a part of the aging process, presumably due to physical impairments. The inevitability of dependency is another aspect of the stereotypical view of aging (Bandura, 1997). The majority of the elderly are independent in managing their daily activities. Others may suffer from chronic conditions or some disability, or live independently with a few supportive services. Social factors are suggested as influential contributors to dependent behaviour in the elderly (Bandura, 1997).

Older adults who respond to opportunities to exercise control over their daily lives vary (Bandura, 1997). Compared to young adults, older adults in general express less desire for personal control (Bandura, 1997). The variations in desire for personal control are heavily linked to efficacy beliefs. Older people desire personal control in areas in which they think they can achieve outcomes, but not in domains they doubt they can have an impact on (Bandura, 1997). Some domains are more subjective to personal control than others. The mediation by self-efficacy of desire for personal control is particularly obvious in the area of health functioning, where some people view health as a biological consequence and others consider it as changeable by psychosocial means (Bandura, 1997). Age affects on the desire for personal control over daily activities are partially mediated by variations in efficacy beliefs (Bandura, 1997).

Older adults can maintain a high sense of efficacy through several processes in spite of declines in reserve capability. One process operates through strategies of social comparison (Bandura, 1997). The capabilities of these strategies used for comparative self-appraisal have a strong effect on people's beliefs about their personal efficacy and, as a result, affect the quality of their functioning. If older adults do not experience a major decline in a given area of functioning and avoid social comparison with younger people, they can achieve a continuing sense of personal efficacy through favourable self- comparison over time (Bandura, 1997). Thus, self-comparison of change over time is most conducive to positive self-appraisal when skills are being improved (Bandura, 1997). However, when skill levels have remained stable or capabilities have begun to decline with increasing age, perceived self-efficacy is better facilitated by the use of social comparative standards (Bandura, 1997).

Another process operates through the selective integration of multifaceted efficacy information (Bandura, 1997). Multiple experiences in using different skills in varied activities offer a heterogeneous foundation of information for judging personal efficacy. Therefore, people can have some flexibility in self-appraisal by how heavily they weigh different domains or aspects of functioning (Bandura, 1997). By assessing the domains of functioning at which they surpass, and minimising those they consider as less important, people can conserve their sense of efficacy amidst a decline of functioning in their advanced years (Bandura, 1997).

Another main process of efficacy maintenance operates through selective optimisation and compensation in late life (Bandura, 1997). With increasing age, older adults face cognitive and functioning slowdown, they require more time and effort to improve performance. Thus, they can optimise their functioning by selecting and focusing their efforts on the things that are more important to them, rather than the things that have less impact on their lives (Bandura, 1997). Additionally, older adults with some decline in reserve function can improve their performance by compensatory changes such as through re-arranging their activities (Bandura, 1997). For example, older adults may experience a decline in physical functioning in advanced age, so in order to make life more manageable they can simplify their activities and restructure their physical environment (Bandura, 1997).

In summary, this section has discussed social cognitive theory and the core of this theory, self-efficacy. In the concept of self-efficacy, the differentials between self-efficacy and outcome expectations were clarified, four self-efficacy regulated processes were presented, and the four main information sources for self-efficacy were reviewed. Finally, the discussion was focused on how older adults exercise their control over daily activities based on self-efficacy. How social cognitive theory is applied and underpinned in the present study is presented next.

3.2 Self-Efficacy Model for the Current Study

Bandura’s social cognitive theory provides the conceptual basis for this study. The following section covers the rationale behind choosing the self-efficacy model for this study. The variables selected for this study are also justified with presenting the hypothesised model to be tested.

3.2.1 The rational of choosing the self-efficacy model for this study.

The reasons and considerations of selecting self-efficacy for use in this study are discussed as follows. Older adults who are at high risk of hospital readmission, normally suffer from more than one chronic condition and require continuous management. Successful chronic condition management requires lifestyle change, health-related behaviour change, and learning new skills and knowledge. At the individual level of health behaviour changes, social cognitive theory provides a comprehensive theoretical basis in terms of recognizing the fundamental importance of individual beliefs, values and self confidence in determining health behaviour (Nutbeam & Harris, 2004).

Additionally, it explicitly identifies the importance of social norms and environmental influences on health behaviour, and the continuous interaction between these factors, unlike other cognitive-behaviour theories such as The health belief model, the stage of change model (transtheoretical model) and theory of planned behaviour that overlook social-economic status and cultural factors (Nutbeam & Harris, 2004). This is particular important for older adults as previous mentioned in section 3.1.3 as social relationships can contribute to positive functioning and personal well-being and act as a buffer against life stressors (Bandura, 1997). Moreover, most of the models of health behaviour emphasize the prediction of health behaviour, however, the self-efficacy model provides both predictors and principles on informing, guiding, motivating and enabling people to make behaviour changes (Bandura, 2004).

Although a substantial amount of research has been done to validate the concept of self-efficacy as introduced by Bandura (1977), the conceptualization of self-efficacy across various chronic illnesses in older adults especially those at high risk of hospital re-admission has not been explicitly examined. Therefore, the self-efficacy model serves as a guide to reveal the phenomenon of how chronic disease self-efficacy management influences this particular group, so the important moderators and mediators can be identified.

3.2.2 Hypothesised self-efficacy model in this study.

Variables selected for this study were based on the concepts of social cognitive theory, a review of the literature for older adults at high risk of hospital readmission, self-efficacy related to chronic disease self-management, and nutritional aspects. In order to understand the relationship between each component within the theory, two items of terminology, mediators and moderators, need to be clarified. Baron and Kenny (1986, p. 1174) conceptualized moderators as variables that affect the direction and/or strength of the relation between an independent or predictor variable and an outcome variable. The basic causal chain of the moderator model is shown in Figure 3.2. In contrast, they conceptualized mediators as variables that carry active mechanisms to intervene between independent variables and outcome variables (Baron & Kenny, 1986, p. 1176). The basic causal chain of the mediator model is demonstrated in Figure 3.3.

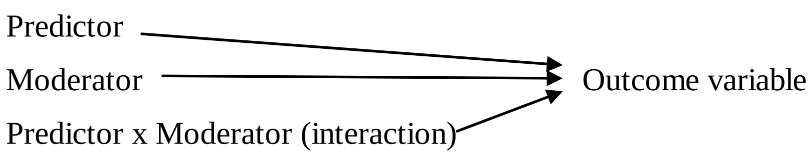


Figure 3.2. Moderator Model.

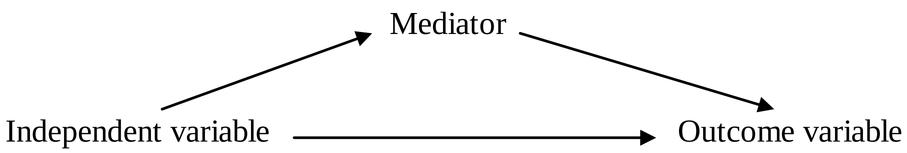


Figure 3.3. Mediator Model.

This study focuses on examining the relationship between the population of older adults at high risk of hospital readmission, chronic disease self-efficacy and their health outcomes. Thus, only partial components of SCT were tested, which included the following constructs: person, self-efficacy beliefs, information sources (mainly social support), and outcomes. As Glanz et al. (2008) stated SCT aims to provide explanations for substantially all human phenomena, which is a very broad and ambitious concept, and it is difficult to be tested comprehensively. Additionally, they suggest that to reveal the usefulness and feasibility of different concepts and principles in SCT more fully for particular behaviours or types of behaviour change, experiments are needed to measure, realize, and manipulate variables systematically and replicate these over diverse behaviours and populations.

In this study, the hypothesized model is illustrated in Figure 3.4. The instruments that were used to measure the concepts are also presented in Figure 3.4. Within the model, the personal factors included age, education, income, cognitive status, depression, co-morbidities, and risk factors of hospital readmission. Two mediators were hypothesized. They were chronic disease self-efficacy and social support. Three major outcomes were measured, which included two important components to peoples' health, and quality of life. These two elements were nutritional status and functional status, as nutritional status and functional ability are the bases and the most essential elements for health.

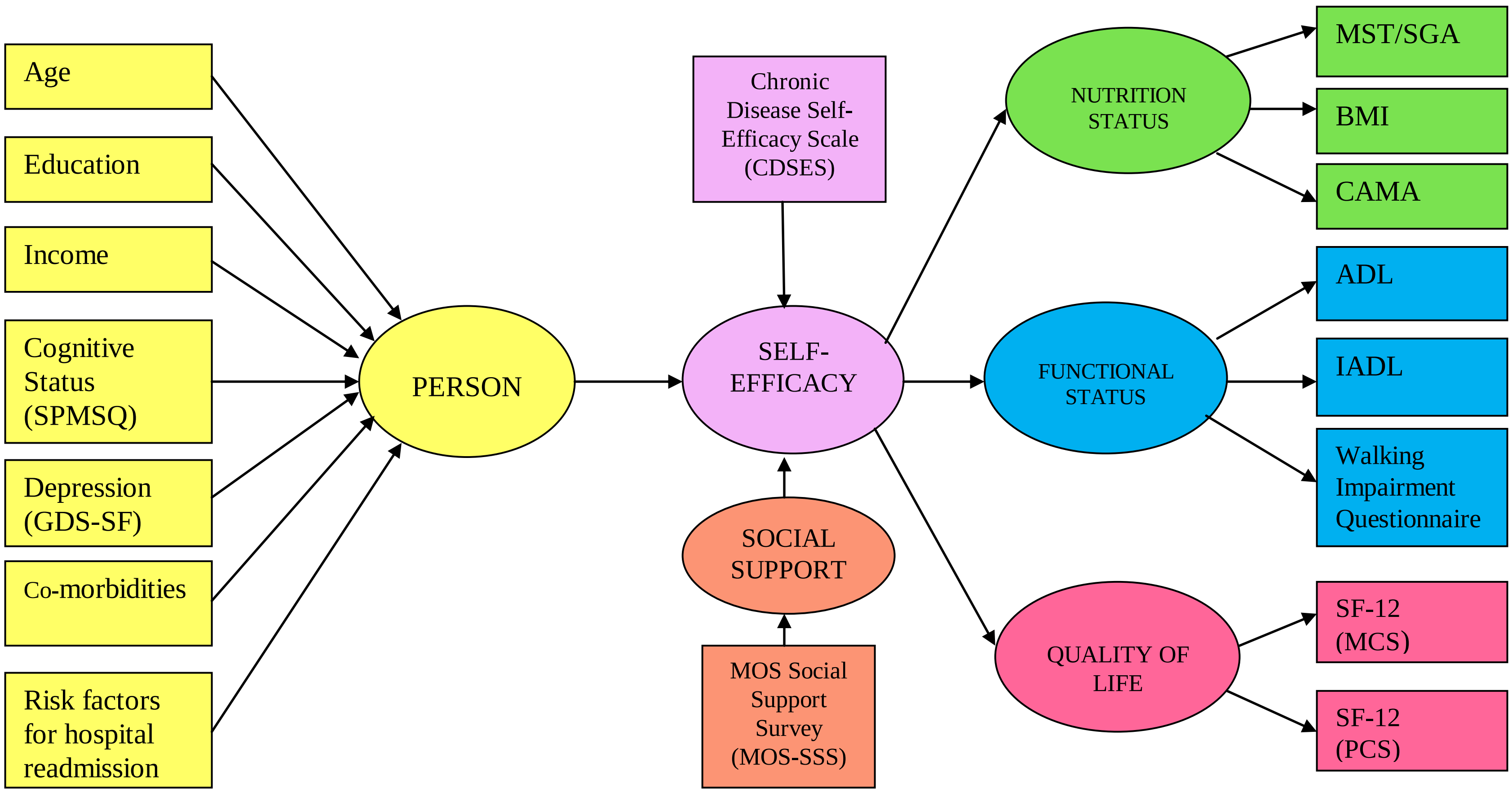


Figure 3.4. Hypothesized Model for This Study

Note: The Short Portable Mental Status Questionnaire (SPMSQ), Geriatric Depression Scale – Short Form (GDS-SF), Malnutrition Screening Tool (MST), Subjective Global Assessment (SGA), Corrected Arm Muscle Area (CAMA), Index of Activities (ADL), Instrumental Activities of Daily Living (IADL), Short Form – 12 health survey (SF-12).

Conclusion

Social cognitive theory and the concept of self-efficacy has been applied and validated widely in the health field, yet, it has not been validated in the area of chronic disease self-management in older adults at high risk of hospital readmission. Therefore, this study aims to test the self-efficacy model in regard to chronic disease self-management in this particular population. In order to understand how this study is grounded in the social cognitive theory, this chapter started with a brief description of social cognitive theory, and the concepts of self-efficacy which included the clarifications of the differentials between self-efficacy beliefs and outcome expectations, how self-efficacy beliefs are regulated, and the four main information sources for enhancing self-efficacy.

As this study focuses on older adults at risk of hospital readmission, how the older adults perceive self-efficacy beliefs in their later life is reviewed. This review suggested that older adults are able to sustain a high sense of efficacy through three processes, namely, social comparison, integration of multifaceted efficacy information, and optimization and compensation (Bandura, 1997).

The second part of this chapter focuses on the application of social cognitive theory in this study. The rationale for selecting social cognitive theory for this study is based on its comprehensive theoretical basis in terms of recognizing the fundamental importance of individual beliefs, values and self confidence in determining health behaviour (Nutbeam & Harris, 2004). The justification of choosing variables based on the self-efficacy model and literature review is provided and, thereby, the hypothesised model for this study has a strongly theoretical base.

Chapter 4: Methodology

Introduction

The review of the literature in Chapter 2 suggested that there was limited information available on theoretical model testing in relation to applying social cognitive theory (SCT) in chronic disease self-management in older adults at high risk of hospital readmission. The overall research was therefore focused on exploring the relationship between the variables using SCT and focusing on three health outcomes; nutritional status, functional status, and health-related quality of life. Three studies were undertaken using quantitative explorative designs. The first study focused on assessing the nutritional status for older adults at risk of hospital readmission. The second study explored the factors that influenced nutritional status, functional status, and health-related quality of life. The third study examined the proposed hypothesised model based on SCT for this study (Figure 3.4).

This chapter describes the methods and procedures involved in the study. The research design, setting, and sampling issues, are first presented, followed by the instruments, recruitment and procedures. Finally, data management and analysis plans and ethical considerations are presented.

4.1 Research Design

A cross-sectional study design was employed for the study, and it ran in conjunction with the parent study in terms of data collection. The rationale of applying a cross-sectional research design in this study was to examine the relationship between self-efficacy in chronic disease management and nutritional status, functional ability and quality of life for older adults at risk of hospital readmission. This research design approach was different to that of the parent study, which is described below.

The parent study, a randomized controlled trial, was conducted to evaluate interventions which include the effectiveness of exercise-based and/or in-home telephone follow-up strategies for older patients at risk of hospital readmission in reducing readmission rates, time to readmission and acute care visits after discharge and their impact on patients' functional status and psycho-social well-being. After baseline data were collected, participants were randomly assigned to one of four groups. They were (1) the usual care control group; (2) the exercise and in home and telephone follow-up group; (3) the exercise only intervention group; (4) the telephone follow-up only group.

However, three studies were undertaken for the current study. Study One focused on measuring the prevalence of malnutrition and validating the Malnutrition Screening Tool (MST). The second study explored the factors that influenced self-efficacy in managing chronic disease, nutritional status, functional status, and health-related quality. The third study examined the proposed hypothesised model based on the SCT for this study (Figure 3.4). Figure 4.1 shows the outline of the current study in conjunction with the parent study.

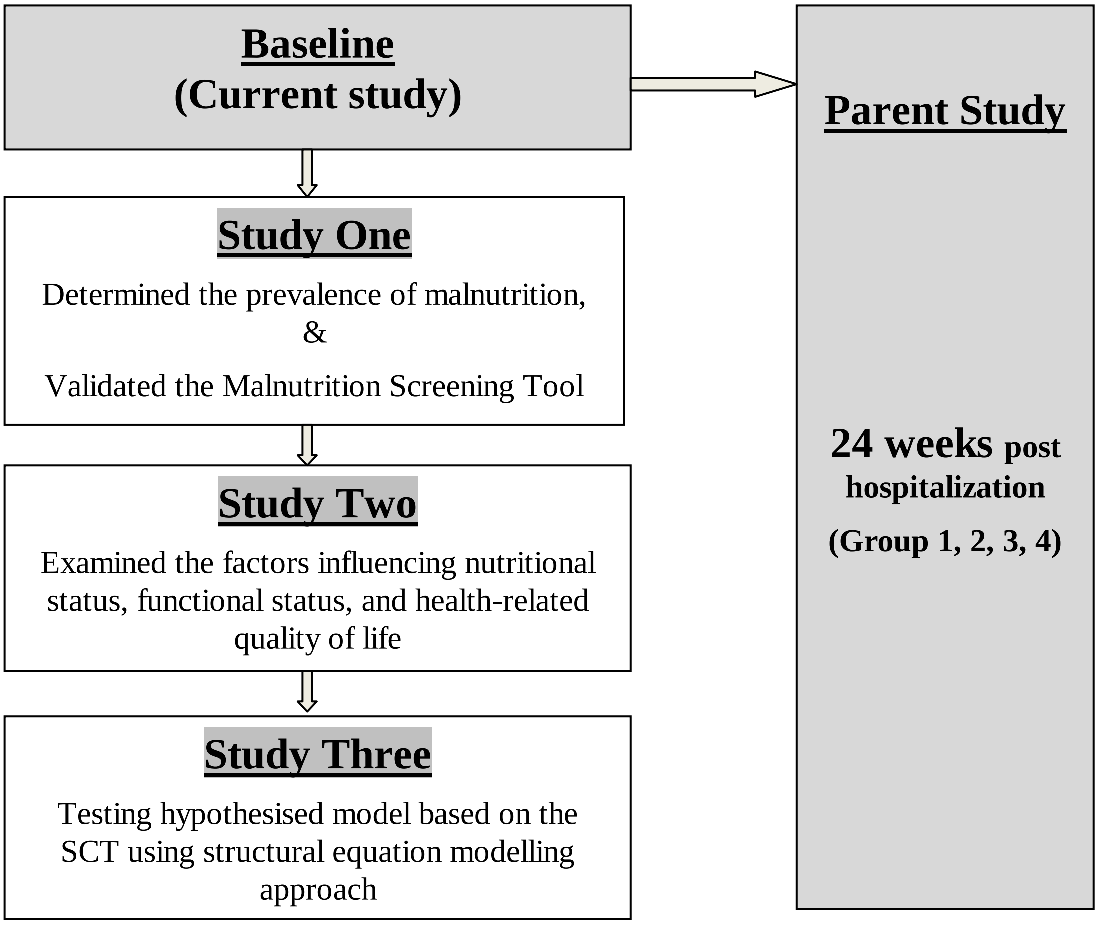


Figure 4.1. Outline of the Current Study Conjunction with the Parent Study.

4.2 Setting

The study was conducted at the Mater adult hospital. The Mater adult hospital is a 250 bed tertiary metropolitan hospital in Brisbane, Queensland.

4.3 Sample

A total of 157 participants were recruited for the study. The sample size calculations were performed prior to commencement of the study, and the results suggested at least 150 participants would be required. Study One, with 155 subjects, achieved 90% power to detect discrepancy rates of 6.5% or higher as statistically significant at the two-trailed, 5% level, indicating a sufficient sample size for this study (Kirkwood & Sterne, 2003). For Study Two, 150 participants would be sufficient to examine the multiple regressions and test individual predictors to detect a medium-size relationship between the independent variables and dependent variables, $\alpha = .05$ and $\beta = .20$ (Tabachnick & Fidell, 2007).

For Study Three, the sample size for testing the self-efficacy model using the structural equation modelling (SEM) approach was determined according to a few SEM guidelines, as there is less consensus about sample size issues through the SEM literature. Ding, Velicer and Harlow (1995) noted that 100 to 150 subjects is the minimum satisfactory sample size. Kline (2005) suggested that a sample size of between 100 and 200 subjects would be considered as a medium sample size, and over 200 cases could be considered as a large sample size. Although 200 cases would have been preferable, the time available for recruiting this population to reach maximum available cases was restricted. The medium sample size (N = 150), however, was sufficient for a complex model in this study.

4.3.1 Inclusion criteria.

1. Aged over 65 years;
2. Admitted to hospital from their homes;
3. Are admitted with a medical diagnosis (eg. heart disease, respiratory disease);

4. Have approval from their hospital medical officer for inclusion in the study;
5. Able to speak English;
6. Able to be contacted by telephone following discharge;
7. Are in at least one of the following high risk for poor post-discharge outcome groups:
   - aged over 75 years;
   - living alone;
   - lacking a social support system;
   - moderate-severe functional impairment;
   - multiple hospital admissions in the previous six months;
   - hospitalization in the past thirty days;
   - fair or poor self-rating of health;
   - history of depression.

4.3.2 Exclusion criteria.

1. patients who required home oxygen;
2. were dependent on a wheelchair or unable to walk independently for three metres (patients independently using walking aids were not excluded);
3. lived in nursing home;
4. had a cognitive deficit or progressive neurological disease.

4.4 Data Collection and Measures

Baseline data on demographics, health and medical history were collected from medical records, and the nutritional data were collected by two registered nurses (RN). A number of instruments were employed to measure health outcomes in terms of nutritional status, functional ability and quality of life; measurement of mediators;

and demographic data and characteristics of the participants. The details of each instrument are presented below.

4.4.1 Measurement of nutritional status.

Nutritional parameters included the Malnutrition Screening Tool (MST), Subjective Global Assessment (SGA), Body Mass Index (BMI), and Corrected Arm Muscle Area (CAMA).

The Malnutrition Screening Tool (MST) (Ferguson et al., 1999) is a quick and easy tool to screen for malnutrition risk. It consists of two questions: (1) unintentional weight loss in the last six months, (2) eating poorly because of a decreased appetite. Scoring between zero and five to identify whether participants are at risk of malnutrition (score ≥ 2) or not at risk of malnutrition (score 0, or 1). The inter-rater reliability was high, and convergent and predictive validation of MST was established (Ferguson et al., 1999).

The Subjective Global Assessment (SGA) (Detsky et al., 1987) is one of the few nutritional assessment tools that have established reliability and validity in older adults (Christenson et al., 2002). The tool was originally developed by Detsky et al., for the prediction of nutritional status associated with complications in patients undergoing gastrointestinal surgery, however it has been applied in several different health care settings including geriatric care (Christenson et al., 2002; Detsky et al., 1987). The SGA comprises two main areas: (1) medical history assesses participants' weight change, dietary intake, gastrointestinal symptoms and functional impairment; (2) physical examination consists of loss of subcutaneous fat, muscle wasting, oedema, and ascites (Detsky et al., 1987). Participants were characterized as being well nourished (A), moderately malnourished (B) or severely malnourished (C) (Detsky et al., 1987).

The Body weight and composition were measured using Tanita Foot-to foot bioelectrical impedance analysis (BIA). BIA provides assessment information such as percentage of fat, and percentage of fat free mass (Allard et al., 2004). Foot-to-Foot BIA has also been reported as a valid tool in measuring percentage of body fat in older people (Ritchie, Miller, & Smiciklas-Wright, 2005). Body mass index (BMI) is the most commonly used tool to determine nutritional status, and it is calculated as weight (kg) divided by height squared (m^2) (Kubrak & Jensen, 2007). For older adults generally a BMI < 22 kg/m^2 is defined as underweight, a BMI of 22-29 kg/m^2 as acceptable weight, and a BMI > 30kg/m^2 as overweight (Bannerman et al., 2002). To minimize the practical difficulties in obtaining accurate height without causing discomfort in older patients, the knee height calliper measurement technique was adopted to estimate height (Neumann et al., 2005).

Knee height was measured to the nearest 0.1cm using a portable knee height calliper. Knee height measurements were made with the Ross knee height calliper, which has been shown to have acceptable accuracy and reliability (Cockram & Baumgartner, 1990). Measurement techniques were as follows: using the callipers provided, have knee bent at right angles (can be performed in bed or sitting down), ankle also needed to be at right angles and the base of the calliper placed under the heel and the top of the calliper to 2 cm behind the knee bone, with the measuring process repeated (Chumlea, Roche, & Steinbaugh, 1985; Hickson & Frost, 2003). The measuring procedure was performed on the right-hand side unless there was a restriction from disability or injury. Stature was estimated from knee height using the established formula (Chumlea et al., 1985).

The Corrected Arm Muscle Area (CAMA) was assessed as indicating nutritional status in body protein and fat stores and has been associated with morbidity and mortality in older people (Miller et al., 2002; Neumann et al., 2005). CAMA was calculated from mid-upper arm circumference (MUAC) and triceps skin fold (TSF). MUAC was measured to the nearest 0.1 cm mid way between the acromion and olecranon processes on the posterior aspect of the right arm using a measuring tape with the participant’s arm hanging relaxed at their side. Harpenden skin-fold calipers were used to measure TSF to the nearest 0.2 cm (Stolz et al., 2002). CAMA was calculated as CAMA = MUAC – 0.1 ($\prod$ x TSF), and cut off values for CAMA $\leq$ 21.4 cm^2 for males and $\leq$ 21.6 cm^2 for females (Friedman, Campbell, & Caradoc-Davies, 1985; Neumann et al., 2005).

4.4.2 Measurement of functional status.

Functional status was measured using the Index of Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), and modified Walking Impairment Questionnaire (WIQ-modified).

The Index of Activities of Daily Living (ADL) (Katz & Akpom, 1976) is used widely in measuring physical functioning in older people and chronic illnesses in various health care settings and the community. It encompasses six basic human functions: bathing, dressing, toileting, transfer, continence, and feeding (Katz & Akpom, 1976). Each item was assessed as without assistance, partial assistance, and receives assistance, then the scales were re-coded as 0 = Independent, and 1 = Dependent to create a total score range from 0 to 6. The higher scores indicated lower functional ability.

The Instrumental Activities of Daily Living (IADL) (Lawton & Brody, 1969) measures higher levels of physical functioning than the Index of ADL in community settings. It consists of seven items measuring independence in using the telephone, travelling, shopping, preparing meals, housework, taking medicine, managing money (Lawton & Brody, 1969). It was measured in a trichotomous scale (0 = Independent, 1 = Assistance required, 2 = Dependent). Then the scales were re-coded as 0 = Independent, and 1 = Dependent to get a final sum scores rage of 0 to 7 where the higher scores reflect an indication of more dependency. IADL has been reported as a valid and reliable tool. Inter-rater reliability was established at 0.85 in twelve subjects (Lawton & Brody, 1969). Validity was tested against another four scales that measured domains of functional status in 180 subjects. The correlation between the IADL scale and other four measures were .40 and .61 (Lawton & Brody, 1969).

The Walking Impairment Questionnaire (Modified-WIQ) (Regensteiner, Steiner, & Panzer, 1990) was originally developed to assess the degree of walking limitation in patients with peripheral arterial diseases (PDA). The full WIQ consists of four subscales: pain severity (2 items), walking distance (7 items), walking speed (4 items), and stair climbing (3 items). The WIQ was further modified and validated on community walking ability in patients with and without PAD and on two methods of administration, the self-administered and telephone-administered methods (Coyne et al., 2003; McDermott et al., 1998). Therefore, the modified WIQ was employed for this study.

Only three subscales were measured. Pain measurement (2 items) was excluded from this study as its questions were more disease-specific for PDA patients. To measure walking distance, participants were asked to rank their ability to walk specific distances on a 1 to 6 Likert scale, in which 5 represents the inability to walk the distance, 1 represents no difficulty and 6 represents did not do for other reasons (Coyne et al., 2003). Walking speed was evaluated by asking participants to rank their degree of difficulty walking a block slowly, at average speed, quickly, or running/jogging on a 1 to 6 Likert scale. In the stair climbing component, the degree of difficulty in stair-climbing was ranked on a 1 to 6 scale where stair-climbing was assessed for completing one to three flights of stairs, where one flight of stairs was roughly equal to 14 steps (Coyne et al., 2003).

Scoring of the modified WIQ was by subscale, which was guided by Coyne et al (2003) and McDermot et al (1998). A total of 14 items were reversed from 0 to 4 on a Likert scale (4 = best) where the lower score indicated the greater walking impairment (McDermott et al., 1998). For the WIQ distance score, each distance was multiplied by the Likert scale score with the corresponding distance. Then, the products were summed and divided by the maximum possible score to get a percentage score that ranged from 0 to 100.

For the WIQ speed score, each speed item was given a “weight,” which ranged from 1 mile per hour to 5 miles per hour. Participants’ responses on the Likert scale were multiplied by the corresponding weight (number of miles per hour), then the resultant score was divided by the maximum possible score to achieve a percent score that ranged from o to 100. Similarly, for the WIQ stair-climbing score, each item was given a “weight,” which ranged from 12 stairs to 36 stairs and was multiplied by the corresponding Likert scale response. The products were summed and divided by the maximum possible score to obtain the WIQ stair-climbing score (McDermott et al., 1998).

The WIQ has been validated against treadmill walking and was suggested to have good validity and reliability (Coyne et al., 2003; Regensteiner et al., 1990;

Regensteiner et al., 2002). The modified WIQ was also reported as a validated tool for people with PAD and in general medical patients without PDA when validated against a 6-minute walking test with the Spearman rank correlation coefficient between .48 to .56 (McDermott et al., 1998).

4.4.3 Measurement of quality of life.

Quality of life was measured using The Short Form – 12 health survey (SF-12). The SF-12 is a 12 item version of the SF 36. It contains specific domains that measure general health perception (GH-item 1), physical functioning (PF-item 2a and 2b), physical role limitations (RF-item 3a and 3b), mental role limitation (RE-item 4a and 4b), social functioning (SF-item 7), mental health (MH-item 6a and 6c), vitality (VT-item 6b) and body pain (BP-item 5). These eight domains are aggregated into a physical component score (PCS) and a mental component score (MCS). Scores for subscales are expressed on a scale of 0 to 100, where higher scores indicate better health-related quality of life (Ware, Kosinski, & Keller, 1996).

Norm-based scoring (NBS) was employed for this study to make an interpretation of comparing subscale profiles and summary measures easier (Ware, Kosinski, Turner-Bowker, & Gandek, 2005). NBS is calculated by performing linear transformations of scores to get a mean of 50 and a standard deviation of 10 in the general U.S population for both PCS and MCS (Ware et al., 2005). The standard SF-12 scoring algorithms were chosen for this study as they provided a major advantage to standard scoring and set a standard benchmark in comparability across countries (Ware et al., 2005).

The SF-12 health survey was reported with high validity and reliability by Ware et al. (1996). The SF-12 health survey was cross-validated with the SF-36. SF - 12 showed high satisfactions in the prediction of PCS-36 at a multiple R^2 of .911 and in the prediction of MCS 36 at a multiple R^2 of .918 in the general U.S. population (N = 2474) (Ware et al., 1996). Test-retest (2-week) reliability coefficients were .89 and .76 for the PCS and MCS summary respectively (Ware et al., 1996).

4.4.4 Measurement of mediator variables.

Levels of self-efficacy in the management of chronic disease and social support were the two hypothesised mediators in this study. Levels of self-efficacy in managing chronic disease were measured using the Chronic Disease Self-efficacy Scale (CDSES), and social support was measured by the Medical Outcomes Study Social Support Survey (MOS SSS).

The Chronic Disease Self-Efficacy Scale (CDSES) (Lorig et al., 1996) derives from the Chronic Disease Self-Management Program (CDSMP) which was developed for the people with chronic conditions (Lorig et al., 1996). The CDSES specifically measures 3 main aspects of self-efficacy. They are: (1) self-efficacy to perform self-management behaviour; (2) self-efficacy to manage disease in general; and (3) self-efficacy to achieve outcomes. These three aspects contain ten subscales: (1) Exercise regularly scale – 3 items; (2) seeking information about their condition scale – 1 item; (3) obtaining help from others and community resources scale – 4 items; (4) communicate with physician scale – 3 items; (5) manage disease in general scale – 5 items; (6) do chores scale – 3 items; (7) social/recreational activities scale – 2 items; (8) manage symptoms scale – 4 items; (9) manage shortness of breath item – 1 item; (10) control/manage depression scale – 6 items (Lorig et al., 1996). The CDSES is a 10-point Likert scale, and it asks participants to rate how confident they are in doing certain activities from 1 *not al all confident* to 10 *totally confident*. The score for each scale is the mean of the item. Higher scores indicate higher self-efficacy. Sound validity and reliability was established by Lorig et al., (1996) where internal consistency reliability was between .77 to .92, and test-retest reliability was .72 to .89.

The Medical Outcomes Study Social Support Survey (MOS SSS) (Sherbourne & Stewart, 1991) was developed to evaluate multidimensional social support for patients with a chronic condition. The survey contains 19 items measuring 4 domains of social support, and one additional single-item measures the structural indicators of social support (e.g. the number of close friends and relatives. The four domains of social support are:

1. tangible support (material aid or behavioural assistance – item - 2, 5, 12, 15);
2. affectionate support (item - 6, 10, 20);
3. positive social interaction (item - 7,11,14,18); and
4. emotional/ informational support (empathetic understanding, advice guidance & feedback- item-3, 4, 8, 9, 13, 16, 17, 19).

Each item was measured by a 5 point-Likert scale to assess how often the respondents received the support, with 1 representing *None of the time* and 5 representing *All of the time*. In terms of scoring the survey, the MOS SSS survey can be presented in four subscale scores and the overall functional social support index ranging from 0 to 100. The higher scores indicate better perceived social support (Sherbourne & Stewart, 1991). Scale scores can be transformed by using the following formula:

100 x ((observed score – minimum possible score) / (maximum possible score – minimum possible score)) (RAND Health).

Good evidence of validity and reliability was reported by Sherbourne & Stewart (1991). The MOS SSS was reported to be a reliable measure, with a Cronbach's alpha of .97 for the overall scale and .91 to .96 for the four subscales in 2987 patients with chronic conditions. The test-retest reliability was conducted a year later with Pearson Product Moment correlations as high as .78 (Sherbourne & Stewart, 1991).

4.4.5 Demographic data and the characteristics of the participants.

The demographic data included: age, gender, ethnicity, education, employment status, income levels, living arrangements, and hospital insurance status. Three important geriatric examinations for cognitive status, depression and risk factors of hospital readmission were assessed as the health characteristics of the study population.

The Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer, 1975) is a 10-item screen tool for cognitive functioning designed for both institutional and community settings in elderly persons. This tool offers a rapid screen for cognitive impairment in assessing short- and long-term memory, orientation to surroundings and knowledge of current events. Items evaluate orientation to time (day of the week and date) and place (name of the place), memory of personal information (birth date, age, telephone number and mother's maiden name), public information (current prime minister, and his predecessor), and concentration (serials 3's) (Pfeiffer, 1975). Pfeiffer (1975) established four classes of intellectual functioning.

They include: (1) intact intellectual functioning, (2) mild (or borderline) intellectual impairment, (3) moderate (or definite) intellectual impairment, (4) severe intellectual impairment. The differentiations of the four levels of cognitive impairment are based on the distribution-of-error scores on SPMSQ. Each error response receives 1 point and a correct response receives a 0 point to generate a total score range of 0–10 points. Patients with a SPMSQ score of two errors are defined as having normal mental functioning. Mild cognitively impaired patients obtain scores of 3-4; Moderate impairment is reflected by scores of 5-7 and severe impairment by 8 or over (Pfeiffer, 1975).

Reliability and validity of the SPMSQ were conducted by Pfeiffer (1975). Test-retested reliability (4 weeks interval) was undertaken on two small groups of elderly participants (N = 30; N = 29), and found moderately high correlations of .82 and .83. The concurrent validity of the SPMSQ was assessed on elderly patients and elderly participants residing in institutions. The results showed there was a high percentage of agreement (92%) between the SPMSQ scores that indicated definite impairment and the clinical diagnosis of organic brain syndrome, and 82 percent agreement when the SPMSQ indicating either no impairment or only mild impairment.

The Geriatric Depression Scale – Short Form (GDS-SF) (Sheikh & Yesavage, 1986) is a 15-item instrument for screening for depression in older populations. The GDS short form was developed by selecting 15 questions from the long form, the GDS Long Form (GDS-LF) (Yesavage et al., 1982), where the questions were highly correlated with depression symptoms (Sheikh & Yesavage, 1986). The scale uses a yes/no answer format, and inquires into participants' depression experienced over the last week. Of the 15 items, 10 indicated the presence of depression when answered "yes", whilst the rest indicated depression when answered "No" (item 1, 5, 7, 11, 13). Scores of 0-4 indicate no depression; 5-8 are considered mild depression; 9-11 suggest moderate depression and 12-15 indicate severe depression (The Stanford Aging Clinic Resource Centre; The Stanford Aging Clinic Resource Centre (ACRC)).

The GDS is a valid and reliable screening instrument for depression in geriatric health care. Sheikh and Yesavage (1986) conducted a small validation study (N = 35) to compare the two forms and found they were highly correlated ($r = .84$, $p < .001$). Lesher and Berryhill (1994) further tested the diagnostic validity in hospitalized older adults (N = 72) and suggested that the GDS-SF has similar sensitivity and specificity to the GDS-LF. They found the sensitivity for both forms was .91 when the cut-off is set to detect mild depression, and the complementary specificity for the GDS-SF was .54 and .42 for the GDS-LF. In a recent study, Friedman and colleagues (2005) examined the GDS-SF in 960 older primary care patients. They reported moderate internal consistency reliability with a Cronbach α coefficient of .75; good construct validity with significant associations between the GDS-SF and measures of depression mood and life satisfaction; and a sensitivity of 89.5% with a cut-off score of 5 and specificity of 65.3% with a cut-off score of 5.

Risk factors for hospital readmission measurements were based on Courtney and colleagues' study (2009) and the literature review. It is a yes/no answer format, to detect 8 items of risk factors, including aged ≥ 75, multiple admission in previous 6 months, multiple co-morbidities, live alone, lack of social support, poor self-rated health, moderate to severe functional impairment, and history of depression.

4.5 Recruitment and Procedure

4.5.1 Nutrition assessment training for data collection.

The nutritional assessment training was conducted by a senior dietitian research fellow. The training sessions contained both subjective assessments and objective assessments. The subjective assessments included MST and SGA and objective assessments consisted of measuring knee height, CAMA, and operating BIA. The participants included the author and research assistant (RA) who is also a geriatric nurse (GN). Inter-rater reliability was performed after the training was completed.

4.5.2 Data collection.

Potential participants were identified through medical wards by the author and a research assistant to determine if there had been any admissions within the last 24 hours. The author and a research assistant then would check the potential participants' medical records to screen their eligibility for the study. Following screening patients for their eligibility, the author and a research assistant would check if the patient's condition was stable and they were comfortable, and if so, approach the patient, provide the participant information package and explain the project. Written informed consent was obtained at an appropriate time for the patient, which was within 72 hours of admission. The participants were assessed for their cognitive function by using SPMSQ. Then, the nutritional assessment was performed by the author or the research assistant.

Several nutritional parameters were measured. MST and SGA were undertaken in accordance with the instructions given by Ferguson et al. (1999) and Detsky et al. (1987). Knee height was measured to estimate stature if height was problematic to obtain. MUAC and TSF were measured using the standard techniques (Friedman et al., 1985). MUAC was measured twice and an average value was used. TSF was measured twice and an average value was used. The participants were referred to the hospital dietician if they were identified as suspected to be undernourished.

The majority of the patients were interviewed by the author to complete baseline questionnaires. Only a few patients were well enough and comfortable enough to complete baseline questionnaires themselves. All the baseline data were collected within 72 hours of hospital admission. Following collection of baseline data, the participants were allocated to one of four study groups for the parent study. A brief outline of the data collecting procedures is presented in Figure 4.2.

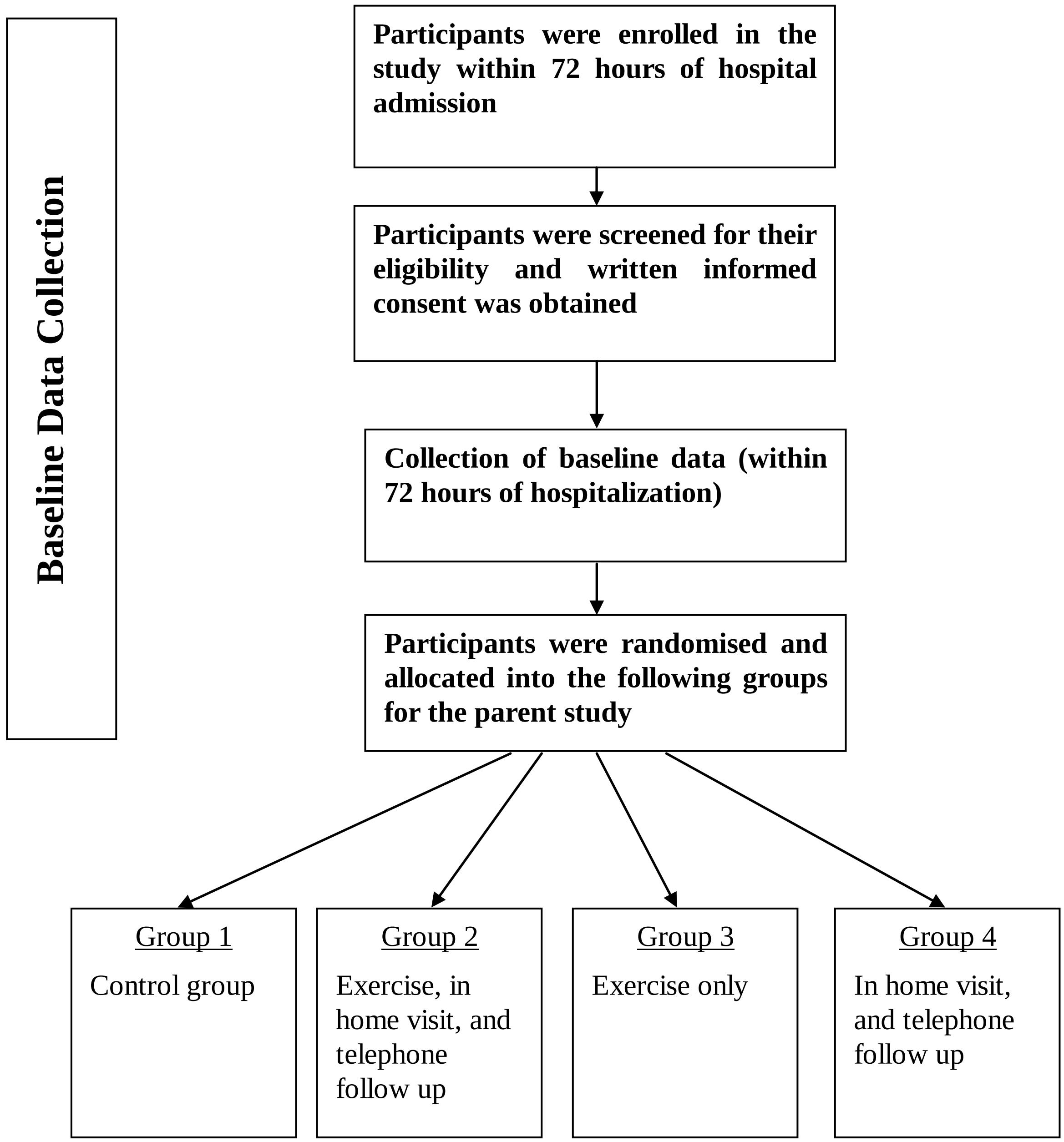


Figure 4.2. Outline of Recruitment Procedure.

4.6 Data Management

Data were entered into the Statistical Packages for the Social Sciences Version 17 (SPSS Inc., Chicago, IL, USA). The original instruments were stored in a locked filing cabinet with the parent study's data.

4.6.1 Data cleaning.

Data were double entered to verify accuracy and minimise potential typographical errors. To check for errors, all variables (both categorical and continuous variables), including all of the individual items that made up the scales were inspected using the frequency distribution before undertaking the data analyses (Pallant, 2007). Any error found in the file was checked against the original data. All the data were correct and within an acceptable range.

4.6.2 Missing data.

Missing data are normally handled in two steps. The first step is to determine the pattern of missing data, which can be characterized as missing completely at random (MCAR), missing at random (MAR), and missing not at random (MNAR) (Tabachnick & Fidell, 2007). The second step is to deal with the missing data according to the first step's results. Most methods to deal with missing data assume that the data loss pattern is MAR or MCAR such as single imputation methods and model-based imputation methods (Kline, 2005). In this study, Little's Missing Completely At Random (Little's MCAR) Chi-Square statistic was used to determine the patter of missing data. If this statistic is not significant at an alpha level of .05, this missing data may be assumed to be missing at random (Tabachnick & Fidell, 2007). None of the variables showed statistical significance, indicating the data is missing at complete random.

Study One and Two used the excluded cases pair-wise option for missing data as suggested by Pallant (2007). However, the mean substitution method was employed to deal with the missing data for Study Three, which is one of the single imputation methods. This method involves replacing a missing score with an overall sample average prior to the analysis (Kline, 2005). This approach is simple and conservative, and in the absence of all other information, the mean is the best guess about the value of a variable (Kline, 2005; Tabachnick & Fidell, 2007).

4.6.3 Checking for normality.

Normality of variables can be assessed by either statistical or graphical methods (Tabachnick & Fidell, 2007). These two methods include: median is within 10% of the mean; the value of skewness and kurtosis is between -3 and +3; and histogram looks approximately symmetrical and bell-shaped; and normal probability plots with the points for the cases fall along the diagonal line running from lower left to upper right (Kirkwood & Sterne, 2003; Tabachnick & Fidell, 2007). In this study, the normal distribution of all the continuous variables were assessed using frequency histograms, normal probability plots, skewness and kurtosis (± 3) to determine descriptive and bivariate analyses.

4.6.4 Checking for multicolinearity, outliners, and assumptions.

When performing the multiple linear regressions, preliminary analyses were undertaken to detect multicolinearity, outliners, and ensure the assumptions of the models were valid. Multicolinearity was detected using the Variance Inflation Factor (VIF). If two variables were co-linear with a VIF over 10, then one variable would be removed from the model (Tabachnick & Fidell, 2007). The outliers and influential observations were identified using Cook's distance statistics. If the value of Cook's distance was greater than 1, then further investigation was conducted, such as outliners were checked against the raw data for accuracy (Tabachnick & Fidell, 2007). Adjusted R-squared was applied to select the best model. Additionally, residual analysis was performed to determine that the main assumptions of the models were valid. Residual assumptions included: (1) residuals were normally distributed; (2) residuals had a mean of zero; (3) residuals had a constant variance (homoscedacisity) (Tabachnick & Fidell, 2007). The results of the preliminary analyses were reported and attached to the results of Study Two and Three in Chapter 5 and 6 respectively.

4.7 Data Analysis

Data analyses for Study One and Two were undertaken using the Statistical Packages for the Social Sciences Version 17 (SPSS Inc., Chicago, IL, USA), and the version 17.0 of the Analysis of Moment Structures (AMOS) program was used for Study Three. Statistical significance is reported at the conventional $p < .05$ level (two-tailed).

4.7.1 Data analysis for Study One.

Descriptive analyses were conducted for all variables. The categorical variables were summarised using percentages and counts. The continuous variables were summarised and presented using mean and standard deviation or median and ranges, depending on the normality of the variables (Kirkwood & Sterne, 2003). Bar charts were also presented to summarise the categorical variables, such as demographic data and the prevalence of malnutrition assess by the different nutritional tools.

The kappa statistic was used to determine the proportion of agreement between MST and SGA. The value of k varies from 0 to 1, a value of < .20 = poor, .20 to .40 = fair, .41 to .60 = moderate, .61 to .80 = substantial, and > .81 = almost perfect (Landis, Beal, & Tesluk, 2000). A contingency table was used to examine sensitivity (percentage of malnourished correctly identified), specificity (percentage of well-nourished correctly identified) and predictive value (likelihood that the tool correctly predicts the presence or absence of malnutrition) of the MST in detecting patients at risk of malnutrition, compared to the SGA (Gibson, 2005).

4.7.2 Data analysis for Study Two.

The univariate analyses were undertaken using descriptive statistics for all variables. The Pearson's product moment correlation coefficient (γ) (for normally distributed data) or Spearman's Rho (γ_s) (for non-normality data) were used to examine the correlation coefficient based on the hypothesized self-efficacy model (Figure 3.4) for the bivariate analyses (Tabachnick & Fidell, 2007). According to Cohen's (1988, p. 79-81) guidelines to determining the strength of the relationship, γ = .10 to .29 indicates a small relationship; γ = .30 to .49 indicates a medium relationship; γ = .50 to 1 indicates a strong relationship. For multivariate analyses, the standard multiple regression, the hierarchical multiple regression, and logistical regression were undertaken according to the types of the outcome variables, and logical and theoretical considerations (Tabachnick & Fidell, 2007). Table 4.1 summarised the multivariate analyses for Study Two.

Table 4.1

A Summary of Multivariate Analysis for Study Two

Outcome variable	**Statistic method**
Self-efficacy in managing chronic disease	
▪ CDSES	Hierarchical multiple regression
Nutritional status	
▪ MST	Standard multiple regression
▪ SGA	Logistic regression
▪ BMI	Hierarchical multiple regression
Functional status	
▪ IADL	Standard multiple regression
▪ WIQ-walking distance	Standard multiple regression
▪ WIQ-walking speed	Standard multiple regression
▪ WIQ-stairs climbing	Standard multiple regression
Health related quality of life	
▪ PCS	Standard multiple regression
▪ MCS	Standard multiple regression

Note: CDSES: Chronic Disease Self-Efficacy Scale; MST: Malnutrition Screening Tool; SGA: Subjective Global Assessment; BMI: Body Mass Index; IADL: Instrumental Activities of Daily Living; WIQ: Walking Impairment Questionnaire; PCS: Physical Component Score; MCS: Mental Component Score

4.7.3 Data analysis for Study Three.

A Structural equation modelling (SEM) approach was taken to test the hypothesized self-efficacy model (Figure 3.4). As Kaplan (2009) stated the SEM is particularly suited to the testing of mediators because it permits the simultaneous estimation of the direct and indirect paths, it estimates each path after the effects of all other paths are accounted for, and it provides fit indices that facilitate comparison of models. Due to the complexity of chronic disease health-related behaviour change, it is important that the determinants of health behaviour are identified and that the relationships among them are examined through a comprehensive statistical approach.

Multiple regression analyses are widely applied in studies to predict variables that are associated with healthy behaviours. However, this analytical technique is restricted in that it can only show the direct effects on a single outcome, which may not adequately reflect the complexity underlying relationships among variables (Hoyle, 1995; Musil, Jones, & Warner, 1998). An extension of regression analysis, path analysis, is another commonly used statistical approach. Although path analysis allows for assessment of indirect causal paths to outcomes, it does not permit representation of latent variables, or underlying factors in the path model (Musil et al., 1998).

On the other hand, structural equation modelling (SEM) examines a whole hypothesized multivariate model which tests the hypothesized structural linkages among variables, and between each variable and its individual measure (Musil et al., 1998). SEM is known as a hybrid of factor analysis and path analysis (Musil et al., 1998). Thereby, it provides a function of parsimonious summary of the interrelationships among variables like factor analysis does, and it is comparable to path analysis in that hypothesized relationships between constructs can be tested (Weston & Gore, 2006). SEM also allows for testing of the concepts and measurements at the same time, and it tests the latent variable structures which include multiple measures of outcome variables and addresses the issue of measure-specific error (Weston & Gore, 2006). This approach is particularly important to establish the construct validity of factors (Weston & Gore, 2006).

In this study, SEM was a tool that was used to explore pathways among variables so as to provide a greater understanding of how determinants of chronic disease self-management self-efficacy in older adults at high risk of hospital readmission were related to each other. By modelling pathways, SEM was able to identify both direct and indirect effects of variables, on a dependent variable such as nutritional status, functional ability and health-related quality of life. SEM is a powerful technique in enabling the entire hypothesised model of this study to be tested (Figure 3.4), as it allowed multiple pathways among variables to be assessed simultaneously as well as incorporating multiple measures that reflect a latent or underlying construct. Thus, the results of SEM give a better understanding of health outcome measures and the relationships between biological, clinical and individual variables as they relate to health (Hays, Revicki, & Coyne, 2005). When using the SEM approach, the following issues need to be taken into account.

4.7.3.1 Multivariate normality.

Most estimation methods used in SEM assume multivariate normality. However, to test whether the assumptions for multivariate normality are met is impractical as it involves examining an infinite number of linear combinations (Weston & Gore, 2006). Kline (2005) stated that multivariate non-normality is detectable through examination of univariate distributions. The univariate normality could be determined through examining the distribution of each observed variable for skewness and kurtosis (Kline, 2005). The rough guide to detect non-normality is that variables with absolute values of the skew index out of ± 3.0 ranging indicate positive skew or negative skew. For the kurtosis index, absolute values higher than 10.0 may suggest a problem and values higher than 20.0 may indicate a serious problem (Kline, 2005).

4.7.3.2 Constructing Item parcels for latent variables.

In general, there are two approaches to construct latent variables in SEM (Little, Cunningham, Shahar, & Widaman, 2002). The first approach is to understand fully the relations among items and the construct (Little et al., 2002). The primary goal of this approach is to understand fully the pattern of observed data at the item level (Little et al., 2002), establishing the psychometric properties of instruments is an example of this approach. However, this was not a goal for the current study. On the other hand, this study focused principally on the relations among latent variables, which is the second approach. From this perspective, item indicators are tools that allow one to build a measurement model for a desired latent construct, and hence parcelling of items are warranted in this approach (Bandalos & Finney, 2001; Little et al., 2002).

A parcel can be defined as an aggregate-level indicator comprised of the sum (or average) of two or more items (Little et al., 2002). All scale items were used in constructing the parcels, and each item was assigned to one parcel without repeating (Kishton & Widaman, 1994). A first-order factor defined by two to four parcels of items, at least two, is adequate to represent the latent construct (Kishton & Widaman, 1994; Schumacker & Lomax, 2004). According to Kishton and Widaman (1994), two broad methods for item parcelling may be distinguished, which depend on whether the scale is unidimensional or domain representative.

Although, there are various techniques that are available to build parcels, the techniques applied in the current study were based on the considerations of the reliability of the parcel such as internal consistency of the items, dimensionality of the items as well as the parsimony of the methods. Thus, the following techniques were undertaken: the domain-representative approach (Kishton & Widaman, 1994) was applied for self-efficacy in managing chronic disease (CDSES), social support (MOS SSS), health-related quality of life (SF-12); item-to construct balance/ single factor method (Little et al., 2002) was undertaken for depression (GDS); and the systematically group items method (Bandalos & Finney, 2001) was employed for functional status (IADL). The results of the internal consistency of the parcels are showed in Table 6.1.

4.7.3.3 Score reliability.

The reliability of the measurement scales are essential for study, especially in SEM analysis. The scale most commonly used to estimate reliability is Cronbach's coefficient alpha (α) which measures the internal consistency reliability (Kline, 2005). In general, Cronbach's alpha coefficient values of greater than .70 are "acceptable", values around

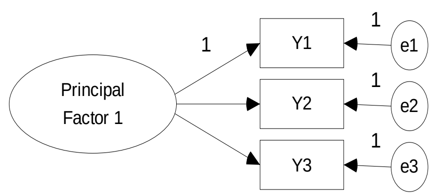
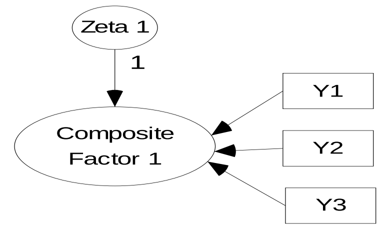
.80 suggest “very good”, and values greater than .90 indicate “excellent” internal consistency reliability (Kline, 2005). Cronbach alpha values are, however, sensitive to the number of items in the scale. It is common to find lower Cronbach values in a scale with fewer items (Pallant, 2007). In such instances, Briggs and Cheek (1986) suggested to report the mean inter-item correlation for the items, and an optimal range for the inter-item correlation is .20 to .40. Thus, the Geriatric Depression Scale (GDS), and Instrumental Activities of Daily Living (IADL) were assessed for their reliability using the mean inter-item correlation for the item parcels. The results are shown in Table 6.2.

4.7.3.4 Latent variables: Formative indicators versus reflective indicators.

Two types of measurement models are recognized in SEM, which are the reflective model and formative model (Jarvis, Mackenzie, Podsakoff, Mick, & Bearden, 2003). These two measurement models could be distinguished through their conceptual and statistical properties (Jarvis et al., 2003; Roberts & Thatcher, 2009). A consequence of incorrectly choosing between a reflective and a formative measurement results in a Type I error or Type II error (Diamantopoulos & Siguaw, 2006). Table 4.2 summarized the conceptual and statistical properties of the reflective and formative measurement model. Based on these criteria, the following measurement models were undertaken in the current study. Six latent variables were operationalized as reflective models: depression (GDS), chronic disease self-efficacy (CDSES), social support (MOS SSS), nutritional status (CAMA, and BMI), functional status (IADL), and health-related quality of life (SF-12); and one latent variable, the health characteristics, was operationalized as a formative model with three indicators: (1) number of risk factors for hospital readmission, (2) the number of co-morbidities, and (3) cognitive functioning.

Table 4.2

Conceptual and Statistical Properties of the Reflective and Formative Models

Concept	Reflective Model	Formative Model
Model		
Causality	Direction of causality is from construct to measure (Jarvis et al., 2003).	Direction of causality is from measure to construct (Jarvis et al., 2003).
Interchangeable	Interchangeable – the removal of an item does not change the essential natural of the construct (Little, Lindenberger, & Nesselroade, 1999).	Not interchangeable – omitting an indicator is omitting a part of construct (Bollen & Lennox, 1991).
Validity	Validity of indicators can be assessed through the measurement model (Roberts & Thatcher, 2009).	Indicators are exogenously determined; hence, correlations are not explained by the measurement model (Bollen, 1989).
Internal consistency	Indicators should be internally consistent (Jarvis et al., 2003).	Internal consistency for indicators are not implied (Jarvis et al., 2003).
Error variance	Takes measurement error into account at the item level (Jarvis et al., 2003).	Takes measurement error into account at the construct level (Jarvis et al., 2003). Error variance represented in the disturbance term. Disturbances represent all causes of an endogenous variable that are omitted from the structural model (Diamantopoulos, 2006).
Identification	The number of free parameters is less than or equal to the number of observations, and every latent variable must have a scale (Kline, 2005).	The model can only be estimated if it is placed within a larger model that incorporates consequences of the latent variable in question (Bollen, 1989). Condition for identifying the disturbance term is that the latent variable emits at least two paths to other latent variables measured with reflective indicators (MacCallum & Browne, 1993).
Latent variable of the current study	Depression, chronic disease self-efficacy, social support, nutritional status, functional status, health-related quality of life.	Health characteristics with three indicators: (1) number of risk factors for hospital readmission, (2) the number of co-morbidities, (3) cognitive status.

This table is adapted from (Jarvis et al., 2003, p 201; Petter, Straub, & Rai, 2007; Roberts & Thatcher, 2009, p. 12, 15).

4.7.3.5 *Assessing model fit.*

The primary purpose of the SEM is to determine whether the hypothesized model reflects and fits the observed data, which can be evaluated through various indices of model fit (Kline, 2005; Newman, Vance, & Moneyham, 2010). As Hoyle (1995) recommended, several indices of overall model fit should be assessed, as there is no single index that can account for perfect population fit. A particular set of fit indexes has been recommended to interpret and report the results of SEM analyses in the literature (Boomsma, 2000; Kline, 2005; McDonald & Ho, 2002; Weston & Gore, 2006). These indices include (1) the model chi-square, (2) the Goodness-Fit Index (GFI), (3) the Adjusted Goodness-Of-Fit Index (AGFI), (4) the Root Mean Square Error of Approximation (RMSEA), (5) the Standardized Root-Mean-Square Residual (SRMR), and (6) the Comparative Fit Index (CFI). Thus, these indexes are proposed for the current study and they are discussed below.

The model chi-square is the most common and basic fit statistic, which is referred to as χ^2_{M}, and it is also known as the likelihood ration chi-square or generalized likelihood ration (Kline, 2005). The chi-square statistic tests the significant discrepancies between the matrix of implied variances and covariances, and the matrix of empirical sample variances and covariances (Schumacker & Lomax, 2004). If the chi-square test is not significant it indicates the data supports the hypothesized model, while when the chi-square test is significant it suggests the model does not fit the data, thus Kline (2005) stated the chi-square test is actually a "badness-of-fit" index, as the higher its value, the worse the model fits the data.

It is, however, well recognized in SEM that the chi-square index is sample size sensitive; if the sample size is large it is more likely to increase the chance of rejecting the model (Hair, Black, Babin, Anderson, & Tatham, 2006; Weston & Gore, 2006). In order to reduce the sensitive of the chi-square test to sample size, it has been suggested to apply the normal chi-square (NC), which is the chi-square value divided by the degrees of freedom (χ^2_m/df_m) (Kline, 2005). The NC value of less than 3 is associated with better fitting models, and hence is considered a minimally acceptable NC value for the model fit (Byrne, 2001; Hair et al., 2006).

The Goodness-fit Index (GFI) is an absolute fit index that estimates the proportion of variability in the sample covariance matrix explained by the model (Kline, 2005). It measures the amount of variance and covariance in the observed correlation matrix that is predicted by the model implied correlation matrix (Schumacker & Lomax, 2004). The GFI also refers to the variance explained for in the entire model, which is similar to R^2 used in regression to summarize the variance explained in a dependent variable (Weston & Gore, 2006). The ranges of GFI between 0 and 1 with values exceeding .95 reflects a good model fit (Schumacker & Lomax, 2004).

The Adjusted Goodness-of-fit Index (AGFI) accounts for the model complexity by correcting the value of the GFI based on the degree of freedom of the model relative to the number of variables (Kline, 2005). The AGFI has a range of 0 to 1, and values adjusted for *df* with exceeding .95 indicating a good model fit (Schumacker & Lomax, 2004).

The Root Mean Square Error of Approximation (RMSEA) is a parsimony-adjusted index which corrects for a model's complexity (Kline, 2005). This means that when two models explain the observed data similarly well, the simpler model will have a more favourable RMSEA value (Weston & Gore, 2006). According to Hu and Bentler (1999), the RMSEA is less sensitive to distribution and sample size, moderately sensitive to sample model misspecification, and very sensitive to complex model misspecification. Additionally, the RMSEA is a "badness-of-fit" index in that a value of 0 suggests the best fit and higher values indicate worse fit (Kline, 2005).

A unique statistical feature of the RMSEA is a confidence interval (90%) which has provided additional assistance in assessing of model fit (Browne & Cudeck, 1992). Browne and Cudeck (1992) suggested that the lower bound of the RMSEA value of .05 or less indicates a model of close fit, while values between .05 and .08 indicate reasonable fit, and if the upper bound of the confidence interval exceed .10 it indicates poor fit.

The Standardized Root-Mean-Square Residual (SRMR) is a measure of the mean absolute correlation residual, the overall difference between the observed and predicted correlations (Kline, 2005). In other words, the SRMR is a summary of how much discrepancy exists between the observed data and the model (Weston & Gore, 2006). Because the units of measurement are in standardized form, the average value of the SRMR less than .08 may be considered as an acceptable model fit, as an SRME of .00 indicates perfect fit (Hu & Bentler, 1999; Weston & Gore, 2006).

The Comparative fit Index (CFI) is an incremental fit index and widely used in SEM (Kline, 2005). It assesses the relative improvement in fit of the hypothesized model compared with a more restricted model, called an independence or null model, which assumes zero population covariances among the observed variables (Kline, 2005; Weston & Gore, 2006). The CFI ranges from 0 to 1.0, and a rule of thumb for the CFI is that values greater than approximately .90 may suggest reasonably good fit of the hypothesized model (Hu & Bentler, 1999). Table 4.3 summarised the model fit indices and acceptable fit interpretation.

Table 4.3

Model Fit Indices and Acceptable Fit Interpretation

Model fit indices	Acceptable level	Interpretation
Chi-square	Non-significant χ^2	Reflects a good model fit
χ^2/df ratio	< 3	Indicates a good model fit
Goodness-Of-Fit (GFI)	0 (no fit) to 1 (perfect fit)	Value close to .95 reflects a good model fit
Adjusted GFI (AGFI)	0 (no fit) to 1 (perfect fit)	Value close to .95 indicates a good model fit
Root Mean Square Error of Approximation (RMSEA)	<.05 90% CI (.05, .08)	Value less than .05 indicates an acceptable model fit
Standardized Root-Mean Square Residual (SRMR)	0 (perfect fit) - .08	Value less that .08 indicates an acceptable model fit
Comparative Fit Index (CFI)	0 (no fit) – 1 (perfect fit)	Value close to .90 indicates a good model fit

This table is adopted from (Schumacker & Lomax, 2004, p 73-74).

4.7.3.6 Two-Step SEM analysis approach.

The SEM is a combination of factor analysis and path analysis which comprises two primary components: the measurement model and the structure model (Quintana & Maxwell, 1999). The measurement model describes the relationships between observed variables and the construct, while the structure model explains interrelationships among constructs (Weston & Gore, 2006). When the measurement model and the structure model are tested simultaneously, the model is called a full structural model (Weston & Gore, 2006).

Using the SEM approach in theory testing and development, Anderson and Gerbing (1988) proposed a Two-Step approach, which assesses the measurement model prior to the simultaneous estimation of the measurement and structural models. The measurement model provides a confirmatory assessment of convergent validity and discriminant validity (Anderson & Gerbing, 1988). After giving acceptable convergent and discriminant validities, the second step is then to test the structural model which constitutes a confirmatory assessment of nomological validity (Anderson & Gerbing, 1988). In other words, the rationale for this approach is that the testing of the hypothesized structural model may be meaningless unless the measurement model is valid (Schumacker & Lomax, 2004).

In the first step, the confirmatory factor analysis is usually used in testing the measurement model for reflective construct, where single indicators are strongly discouraged, and three indicators are preferable (Weston & Gore, 2006). With regard to assessing the formative construct, three processes are involved: (1) to estimate the construct validity by examining the indicators that contribute significantly to the construct, and the conceptual considerations must always be taken into account when respecifying the model (Bollen & Lennox, 1991; Roberts & Thatcher, 2009); (2) to examine the error term or the “disturbance term” by following Cohen’s (1988) guidelines for multiple regression: f2 values of .02 (R^2 = .0196) refer to a small effect size, .15 (R^2 = .13) suggest moderate effect size, and .35 (R^2 = .26) indicate large effect size; and (3) to examine nomological validation by linking the formative construct to other reflective constructs which would be expected to be related (Roberts & Thatcher, 2009; Straub, Boudreau, & Gefen, 2004).

Once the acceptable validities are grounded from both reflective constructs (convergent and discriminant validities) and a formative construct (construct and nomological validity), the test proceeds to examine the structural model which establishes a confirmatory assessment of nomological validity (Anderson & Gerbing, 1988).

4.8 Ethical Considerations

Ethical approval was obtained from the University Human Research Ethics Committee (UHREC) at QUT for the ARC Discovery grant, participants were assured of their anonymity and the confidentiality of the data. The QUT ethics approval number for this project is: 0800000219. Ethical approval was also granted from the participating hospital for the ARC Discovery grant. An amendment to collect additional nutritional data was approved. There were no potential risks to the participants when completing the nutritional assessment and questionnaire. Participants were not disadvantaged if they chose not to participate in this study, and if they chose to discontinue during the period of study. All information of participants remained confidential, and the completed questionnaires were stored in a securely locked file cabin and only the research team was able to access the data. Permission to use all the instruments was granted for the parent study, thus, no further application for approval to use the instruments was required.

Conclusion

The overall aim of this research focused on theory testing based on social cognitive theory in relation to chronic disease self-management in older adults at high risk of hospital readmission. Three studies were derived from this aim, and this chapter has presented the methodology which was tailored to achieve the study aim, including: research design, the participants, the data collection and measurements, the instruments used for the study, a comprehensive statistics approach for data analysis for each part of the study, and the ethical considerations. The next chapter, therefore, presents the results of Study One and Study Two. The results of Study Three are presented in Chapter Six.

Chapter 5: Results of Study One and Study Two

Introduction

This chapter presents the results from Study One and Study Two in which Study One aimed to investigate the nutritional status and validate the Malnutrition Screening Tool (MST), and Study Two aimed to identify relationships between self-efficacy in managing chronic disease, social support and three health outcomes (nutritional status, functional status, and health-related quality of life) in older adults at high risk of hospital readmission. The chapter begins with describing the demographic data, followed by the results of Study One which include the results of nutritional status such as the prevalence of malnutrition and the sensitivity and the specificity of the MST. The results of Study Two are then presented next in the sequence of the statistical analyses. They start with results of univariate analyses, followed by results of bivariate analyses, and finally the results of multivariate analyses are presented.

5.1 Demographic and Health Characteristics of the Participants

One hundred and fifty seven hospitalised patients aged between 65 to 93 years (mean 77.6 ± 6.4 years) were recruited. The majority of participants were female (77.1%, n = 121), Australian (84.1%, n = 132), live alone (49.76%, n = 78), and had private health insurance (56.7%, n = 89). Over one third of the participants had between 7 to 12 years of education or had completed high school, being 32.9% (n = 51) and 19.7% (n = 31) respectively. Most participants were non smokers (93%, n = 146), did not consume alcohol (61.1%, n = 96), and were pensioners with an income of less than $30,000 per annum (79%, n = 124) (see Table 5.1 for details).

In terms of health characteristics, 80.9% (n = 127) of participants were admitted through the emergency department while 18.5% (n = 29) were elective hospital admissions. The most common diagnoses on admission were respiratory disease (39.5%, n = 62) and cardiac disease (19.7%, n = 31). 95.5% (n = 150) of participants had more than one chronic condition especially related to cardiac and respiratory diseases, which was 78.3% (n = 123) and 53.5% (n = 84) respectively. About 75.8% (n = 119) of participants also reported having co-morbidities other than the listed conditions shown in Table 5.1. The most common of the other co-morbidities were muscular skeletal conditions (39.5%, n = 62) such as arthritis and osteoporosis. Concerning the risk factors for hospital admission, over half of the participants were over 75 years old (67.5%, n = 106), lived alone (52.2%, n = 82), and had multiple co-morbidities (95.5%). The median number of co-morbidities was 3, and risk factor of hospital readmission was also 3. See Figure 5.1 and Table 5.1 for additional information.

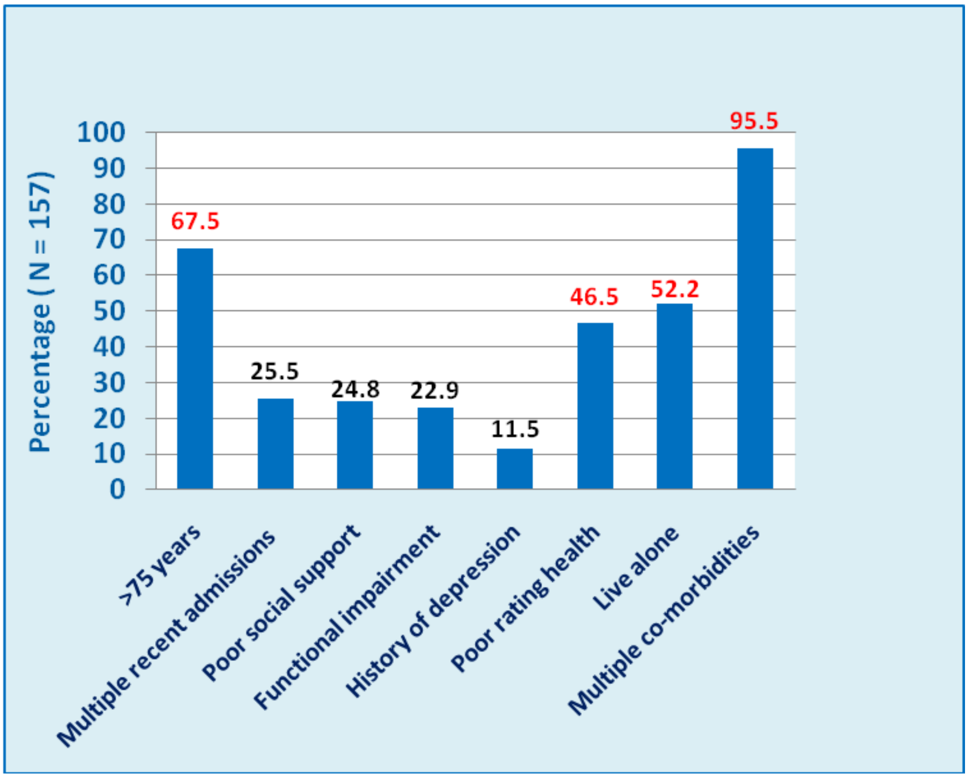


Figure 5.1. The Frequency of the Risk Factors for Hospital Readmission.

Table 5.1

Demographic Characteristics of the Participants

Characteristics	Number	Percentage (%)	Mean (SD) (N = 157)
Age (years)			77.6 (± 6.4)
Gender			
Male	36	(22.9)	
Female	121	(77.1)	
Ethnicity			
Australia	132	(84.1)	
ATSI	1	(0.60)	
UK	9	(5.70)	
European	5	(3.20)	
African	2	(1.30)	
Asian	1	(0.60)	
South Pacific	2	(1.30)	
Other	5	(3.20)	
Living arrangement			
Partner	50	(31.8)	
Other family or friend	23	(14.6)	
Alone	78	(49.7)	
Residential village/ Hostel	6	(3.80)	
Hospital insurance status			
Medicare	61	(38.9)	
Private insurance	89	(56.7)	
DVA	7	(4.50)	
Education			
< 7 years	8	(5.10)	
Completed primary school	26	(16.6)	
7- 12 years	52	(33.1)	
Completed high school	31	(19.7)	
Post secondary school	15	(9.60)	
Tertiary education	25	(15.9)	
Income			
< $ 30, 000	124	(79.0)	
$ 30 -$ 60, 000	26	(16.6)	
> $ 60, 000	7	(4.50)	

ATSI: Aboriginal and Torres Strait Islander, DVA: Department of Veterans' Affairs, UK: United Kingdom

Table 5.1
Demographic Characteristics of the Participants (continue)

Characteristics	Number	Percentage (%)
Tobacco consumption		
Non smoker or ceased smoking	146	(93.0)
< 1 pack per week	5	(3.20)
2 – 3 packs per week	3	(1.90)
> 4 packs per week	3	(1.90)
Alcohol consumption		
Non drinker (no longer drink)	96	(61.1)
< 1 standard drink/ wk	20	(12.7)
1-2 standard drinks/ wk	14	(8.90)
2-3 standard drinks/ wk	3	(1.90)
3-4 standard drinks/ wk	9	(5.70)
> 4 standard drinks/ wk	14	(8.90)
Type of admission		
Elective	29	(18.5)
Emergency	127	(80.9)
Transfer	1	(0.60)
Admission diagnosis		
Cardiac disease	31	(19.7)
Respiratory disease	62	(39.5)
GIT	11	(7.00)
Falls	7	(4.50)
Renal	10	(6.40)
Skin	8	(5.10)
Endocrine	1	(0.60)
Back Pain	2	(1.30)
Other	25	(15.9)

5.2 Results of Study One

This section presents the results of Study One which focuses on determining the nutritional status and prevalence of malnutrition in older adults at high risk of hospital readmission, and determines a valid and reliable nutritional screening tool in this population. Nutritional status was assessed using the Malnutrition Screening Tool (MST), Subjective Global Assessment (SGA), Body Mass Index (BMI), Corrected Arm Muscle Area (**CAMA),** and Bioelectrical Impedance Analysis (BIA). The descriptive analysis of the above mentioned nutritional variables is presented first, and then the research questions related to Study One are addressed. Two key research questions are addressed here. They are:

Research question1-1: What is the prevalence of malnutrition risk in high risk older people in an acute hospital setting?

Research question 1-2: Is the simple Malnutrition Screening Tool (MST) a valid nutrition screening tool compared to the comprehensive nutritional assessment method, the Subjective Global Assessment, in high risk older adults at admission?

There was a small amount of missing data across the nutritional measurements. A total of 157 participants had completed the MST and BMI data, 155 completed SGA, 147 completed CAMA with only 127 completing BIA. Several factors contributed to the missing data. Firstly, some participants were discharged before the data collection was completed. Secondly, some participants were unwilling or unable (i.e., fragile skin around arm area) to comply. For the BIA assessment, the missing data were due to participants having pacemakers or cellulitis on their feet. There were no significant differences in demographic data between participants who had completed the nutritional assessment and those who had completed a partial nutritional assessment.

5.2.1 Results of nutritional status in older adults at high risk of hospital readmission.

A total of 157 hospitalised older adults were assessed for their nutritional status within 72 hours of hospital admission. Height and weight were collected to calculate body mass index. The average of the participants was 161 cm (min 147, max 195) with an average weight of 69 kg (min 39.5, max 140). The average recorded BMI of the participants was 26.8 kg/m^2 (SD = 6.3) and there was no significant difference between males (26.79 kg/m^2 ± 5.21) and females (26.90 kg/m^2 ± 6.52). The median of the CAMA was 34.0 cm^2 (min 12.60, max 89.3). In terms of BIA measurements, the Fat Free Mass (FFM) was positively skewed with median at 42.9 kg (min 31.3, max 79). The average of Fat Mass (FM) was 24.3 kg (SD = 11.3) with an average of body fat at 34.8% (min 1.6, max 51.60). It is noted that females had a higher percentage of body fat (mean = 36.3, SD = 9.3) compared to males (mean = 24.60, SD = 8.1). See Table 5.2 for additional information.

In order to address the first research question to detect the risk of malnutrition, the following continuous variables were re-classified: 1) for data analysis purpose cut off values for a BMI < 22 kg/m^2 is defined as underweight, a BMI of ≥ 22-29 kg/m^2 as acceptable weight, and a BMI > 30kg/m^2 as overweight; 2) cut off values for CAMA ≤ 21.4 cm^2 for males and ≤ 21.6 cm^2 for females as an indication of risk of malnutrition.

Research question1-1: What is the prevalence of malnutrition risk in high risk older people in an acute hospital setting?

The results of the prevalence of malnutrition risk varied among the tools used, range from 10.9% (n = 16) to 27.4% (n = 43). Based on the MST, 27.4 % (n = 43) of subjects screened positively as they had MST score ≥ 2 and 72.2% (n = 114) of subjects were “not at risk” of malnutrition. According to SGA, 80% (n = 124) of subjects were well nourished and 20.6 % malnourished (n = 31, 30 moderately and 1 severely malnourished). The BMI classified 22.9% (n = 36) of the subjects as underweight, 51.6% (n = 81) of subjects as within acceptable weight, and about a quarter of subjects (25.5%, n = 40) were overweight. On the basis of CAMA, 10.9% (n = 16) of subjects were classified as suffering malnutrition and 89.1% (n = 131) of subjects were within the desirable ranges with CAMA ≥ 21.4 cm^2 for males and ≤ 21.6 cm^2 for females.

The prevalence of malnutrition according to the above mentioned measurements, namely MST, SGA, BMI and CAMA is summarized in Figure 5.1. For the purpose of analysis, SGA and BMI were reclassified as dichotomous variables (well nourished and malnourished). Figure 5.2 illustrates that a greater prevalence of malnutrition risks was discovered using MST compared to SGA, BMI and CAMA, while the CAMA assessment identified the lowest frequency of malnutrition risk or malnutrition in the study population.

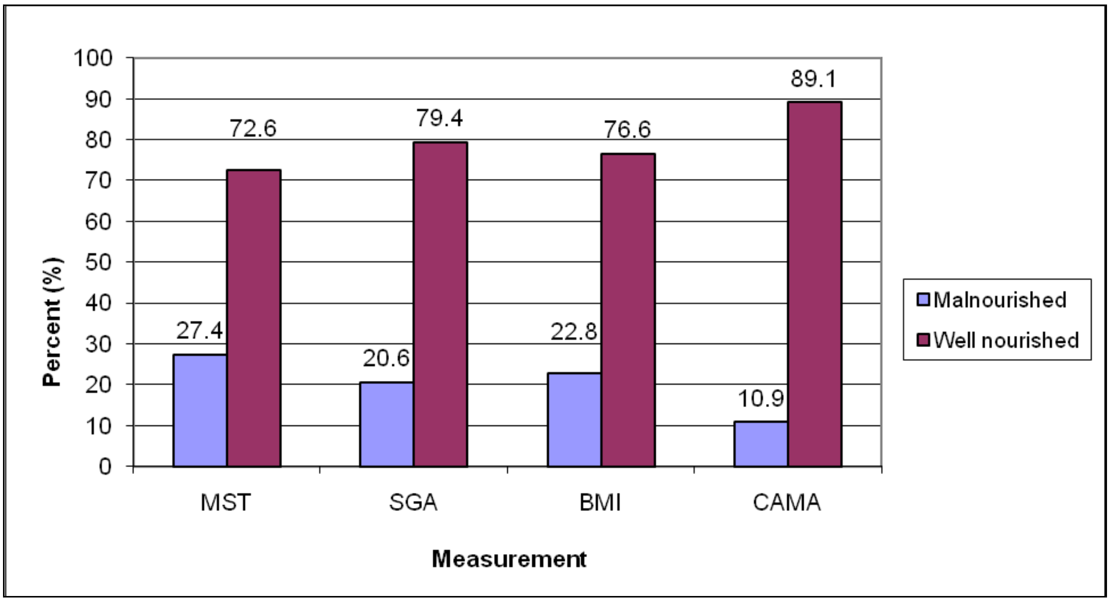


Figure 5.2. The Prevalence of Malnutrition in High Risk Hospital Readmission Older Adults.

Table 5.2

Indicators of Nutritional Status in Older Adults at High Risk of Hospital Readmission

Variable	Mean	(SD)	Median	Min	Max	N
Height (cm)	**161.8**	**(9.70)**	**161.0**	**147.0**	**195.0**	**157**
Male	173.8	(8.84)	172.5	152.0	195	n = 36
Female	158.3	(6.62)	157.0	147.0	175	n = 121
Weight (Kg)	**70.70**	**(18.7)**	**69.00**	**39.50**	**140.0**	**157**
Male	81.12	(17.7)	81.60	40.20	129.0	n = 36
Female	67.56	(17.9)	65.00	39.50	140.0	n = 121
BMI (kg/m^2)	**26.81**	**(6.32)**	**26.40**	**13.20**	**50.20**	**157**
Male	26.79	(5.21)	26.50	13.20	43.10	n = 36
Female	26.90	(6.52)	26.40	17.00	50.20	n = 121
CAMA (cm^2)	**36.08**	**(14.5)**	**34.02**	**12.60**	**89.31**	**151**
Male	35.62	(9.77)	37.09	13.58	52.64	n = 36
Female	30.00	(15.62)	33.20	12.60	89.31	n = 115
Fat Free Mass	**45.63**	**(10.8)**	**42.90**	**31.30**	**79.00**	**127**
Male	59.88	(10.0)	61.10	37.10	79.0	n = 30
Female	41.23	(11.5)	40.80	31.30	67.20	n = 97
Fat Mass	**24.29**	**(11.3)**	**22.8**	**0.70**	**57.40**	**127**
Male	21.09	(10.3)	20.45	0.70	56.60	n = 30
Female	25.28	(11.5)	24.10	2.80	57.40	n = 97
% Body Fat	**33.50**	**(10.3)**	**34.80**	**1.60**	**51.60**	**127**
Male	24.60	(8.05)	25.05	1.60	43.90	n = 30
Female	36.25	(9.29)	37.50	6.30	51.60	n = 97

5.2.2 The results of validating the Malnutrition Screening Tool.

The following section focuses on addressing the validation of the MST. Firstly, the Kappa statistic is presented to determine the proportion of agreement between MST and SGA. The sensitivity and specificity of the MST are calculated next, and finally the positive and negative predictive values are reported.

Research question 1-2: Is the simple Malnutrition Screening Tool (MST) a valid nutrition screening tool compared to the comprehensive nutritional assessment method, the Subjective Global Assessment, in high risk older adults at admission?

Two of the 32 participants (1.3% of 155 subjects) who were assessed as being malnourished by SGA were not detected by the MST (Table 5.3). Thirteen of the 123 (8.4%) participants assessed as well nourished by SGA were identified as "risk of malnutrition" by the MST (Table 5.3). Comparison of the MST and SGA using the Kappa statistic revealed a substantial agreement ($k = .74$, $p < .001$; 95% CI .62, .86) between the two methods.

Using SGA as the benchmark for the assessment of malnutrition, the MST achieved high sensitivity (94%) and specificity (89%). The positive and negative predictive values of the MST were 70% and 98%, respectively (Table 5.4). These results indicated that the MST was a valid tool in screening risk of malnutrition among the study population.

Table 5.3

Cross-Classification of Nutritional Risk Categories (MST) Compared to Nutritional Status (SGA)

SGA	Malnourished	Well Nourished	Total
MST			
Positive (at risk)	30 (TP)	13 (FP)	43
Negative (not at risk)	2 (FN)	110 (TN)	112
Total	32	123	155

TP: True Positive; FP: False Positive; FN: False Negative; TN: True Negative.

Table 5.4

Sensitivity and Specificity of the MST using SGA as Categorisers of Malnutrition Risk

Numerical definitions of sensitivity, specificity, predictive value, and prevalence	Study results
Sensitivity (Se) = TP / (TP +FN)	30 / (30+2) = **.94**
Specificity (Sp) = TN / (FP + TN)	110 / (13 + 110) = **.89**
Predictive value = (TP +TN) / (TP +FP+TN+FN)	(30 + 110)/ (30 + 13 + 110 + 2) = **.90**
Positive predictive value (PPV) = TP / (TP+FP)	30 / (30+13) = **.70**
Negative predictive value (NPV) = TN / (TN+FN)	110 / (110 + 2) = **.98**
Prevalence (P) = (TP +FN) / (TP +FP + TN + FN)	(30+2) / (30+13+110+2) = **.206**

TP: True Positive; FP: False Positive; FN: False Negative; TN: True Negative. This table was adjusted from Gibson (2005, p. 16).

In conclusion, the findings of Study One suggested that the prevalence of malnutrition (20.6%) remains high according to the SGA in this population. It also highlights the value of the MST as a valid screening tool with high sensitivity and specificity. The MST identifies as many and more of the participants at risk of malnutrition as other more complicated and time-consuming instruments, such as BMI and CAMA.

5.3 Results of Study Two

Study Two aims to determine the relationship between self-efficacy, social support and three health outcomes (nutritional status, functional ability, quality of life) in this study population. The descriptive analysis results of the demographic data were presented in an earlier section (Section 5.1), thus, this section starts with the results of the descriptive statistics for the outcome variables and assumed mediator variables. Two outcome variables, functional status and quality of life, are presented in this section, as the results of the nutritional status were presented in the previous section (Section 5.2). The results of the bivariate correlations are explored next. Finally, the results of the multivariate analysis are presented to address how well the hypothesised variables can predict the level of perceived self-efficacy in managing chronic disease and health outcomes. Additionally, in order to ensure there is no violation of the assumptions, the assumptions for each statistical test were performed and reported throughout the text.

5.3.1 Results of univariate analysis for Study Two.

5.3.1.1 IADL and ADL.

Participants' functional status was measured using Instrumental Activities of Daily Living (IADL) and Activities of Daily Living (ADL). IADL contains seven items with a summary score from 0 (high function) to 7 (low function) (Lawton & Brody, 1969). ADL consists of six items ranging from 0 to 6, and the higher scores indicate lower functional ability (Katz & Akpom, 1976). Both instruments were measured in a trichotomous scale (0 = Independent, 1 = Partially dependent, 2 = Dependent). The percentage of each item is presented below in Table 5.5 to identify specific functional disability. Then, the scales were recoded as 0 = Independent, and 1 = Dependent to create a final sum score.

In terms of ADL scores, over 94.0% of participants are independent in dressing, toileting, transferring, and feeding. 89.8% of participants are independent in bathing and about 10.0% required some or a lot of assistance. Among the ADL items, the continence item showed the lowest percentage of independence with 75.6% of participants able to control urination and bowel movement, whilst 18.6% reported having occasional accidents. The average of the final sum score for IADL was 1.0 (min 0, max 6). The average of the ADL score was 0 (Median = 0) with 25 percentiles of 0, and 75 percentiles of 1, which also reflected an indication of high functional ability in this sample. See Table 5.6 for details.

Table 5.5

Summary of IADL and ADL Scores

Sum scores	Mean (SD)	Median	Minimum	Maximum	Percentiles		
					25	50	75
IADL	1.63 (1.4)	1.00	0.00	6.0	1.0	1.0	3.0
ADL	0.52 (1.0)	0.00	0.00	6.0	0.0	0.0	1.0

As Table 5.6 shows in the IADL section that the majority of participants were independently using the telephone (99.4%), taking medication (97.5%), and managing money (95.5%), while only 24.2% of participants reported being able to do heavy housework and 67.5% were able to do light housework. In the shopping item, 65.6% of participants reported being able to take care of their food and clothes independently, and more than a quarter of participants (27.4%) needed someone to shop with them. Both travelling and preparing meal items had over 77.0% of participants showing independence, 20.4% need someone to travel with them, and 21.0% of participants were able to prepare light foods but unable to cook full meals alone.

Table 5.6

Frequency of Scores on IADL and ADL

Items	Independent (%)	Partially dependent (%)	Dependent (%)
IADL items			
Using telephone	99.4 % (n = 156)	0.60% (n = 1)	-
Travelling	77.1% (n = 121)	20.4% (n = 32)	2.5% (n = 4)
Shopping	65.6% (n = 103)	27.4% (n = 43)	7.0% (n =11)
Preparing meals	77.7% (n = 122)	21.0% (n = 33)	1.3% (n = 2)
Housework	24.2% (n = 38)	67.5% (n = 106)	8.3% (n = 13)
Taking medications	97.5% (n = 153)	2.50% (n = 4)	-
Managing money	95.5% (n = 150)	3.20% (n = 5)	1.30% (n = 2)
ADL item			
Bathing	89.8% (n = 141)	7.00% (n = 11)	3.20% (n = 5)
Dressing	94.3% (n = 148)	4.50% (n = 7)	1.30% (n = 2)
Toileting	96.8% (n = 152)	2.50% (n = 4)	0.60% (n = 1)
Transfer	94.3% (n = 148)	5.70% (n = 9)	-
Continence	75.6% (n = 118)	18.6% (n = 29)	5.80% (n = 9)
Feeding	96.8% (n = 152)	3.20% (n = 5)	-

5.3.1.2 *Walking Impairment Questionnaire (WIQ).*

The modified Walking Impairment Questionnaire (WIQ) contains three subscales: the distance, speed and stairs scales. Scoring of the subscale was instructed by Coyne et al. (2003) and McDermott et al. (1998), which involved weighting each response, summing the weighted responses, and dividing by the total possible weighted score to gain a percent score. Each subscale has a range of 0% to 100%, where the lower scores indicate the greater impairment (Coyne et al., 2003). The WIQ scale was reversed to a 0 to 4 scale (4 = best). According to Coyne's et al (Coyne et al., 2003) instructions, if there were more than 50% of the subscale items coded as "Didn't do for other reasons", the subscale was coded as missing, which was the case in this study. Thus, the final valid data for the WIQ distance scale was 139, WIQ walking speed scale 129, and WIQ stair-climbing scale 127.

As Table 5.7 shows the average of WIQ distance score was 38.07, with 25 percentiles of 2.56 and 75 percentiles of 68.0. The median of speed score was 32.61 with 25 percentiles of 14.7 and 75 percentiles of 50.0, and the average stair-climbing score was at 4.17 (min 0, max 100). Since the lower scores indicate greater impairment, the participants had more difficulty in stair-climbing than the other two walking functions in this study. This was possibly due to the majority of participants having significant co-morbidities, such as arthritis, cardiac vascular disease, and respiratory disease, which might potentially limit participants' walking ability, especially in stair-climbing. Additionally, an advanced age might also input this result, as over 67% (n = 106) of participants were over 75 year.

Table 5.7

Descriptive Statistics for Walking Impairment

Measure	Mean (SD)	Median	Percentiles			N
			25	50	75	
Distance score	41.12 (35.4)	38.07	2.6	38.1	68.0	139
Speed score	32.94 (24.1)	32.61	14.7	32.7	50.0	129
Stair-climbing score	21.19 (30.0)	4.17	0.0	4.17	29.2	127

Minimum = 0, Maximum = 10

5.3.1.3 Health- related quality of life (SF-12).

The Short Form -12 (SF 12-2) was scored according to Version 2 of the SF-12 Health survey manual (Ware et al., 2005). In order to make the interpretation of health status and outcomes easier, Norm-Based Scoring (NBS) was performed. NBS is calculated by performing linear transformations of scores to achieve a total score of 0 to 100, a mean of 50 and SD of 10 in the general U.S. population, for both the SF-12 physical and mental health summary measures. The advantages of NBS are that it allows a basis for meaningful comparisons across the eight dimensions of scales, and physical component score (PCS) and mental component score (MCS) summary measures (Ware et al., 2005).

As shown in Figure 5.3, differences between the transformed scale scores and the population norm of 50 provides a clear comparison between eight dimensions. Overall, the average of the eight dimension scale was below 50, which indicates that the risks of hospital readmission have a great impact on both the mental health profile and the physical health profile of older adults. This is particularly reflected in the physical health profile. The average physical function scale of the participants was 32.34 (SD = 10.6), with an average role physical scale of 35.28 (SD = 9.8), and the average general health scale at 35.75 (SD = 10.7). On the other hand, the average of the mental health scale was much closer to the norm, at the mean of 48.50 (SD = 10.9).

Similar results were also shown on the summary measure in PCS and MCS. The average of PCS was 32.66 (SD = 9.5) and the mean score of MCS was 47.80 (SD = 11.2). The PCS and MCS measures take into account the correlations among the eight SF-12 scales, and only the PCS differs from the norm for older adults at high risk of hospital readmission. Table 5.8 shows the risk of hospital readmission has a great impact on physical health profile and there is less effect on the mental component summary score. Both PCS and MCS were normally distributed.

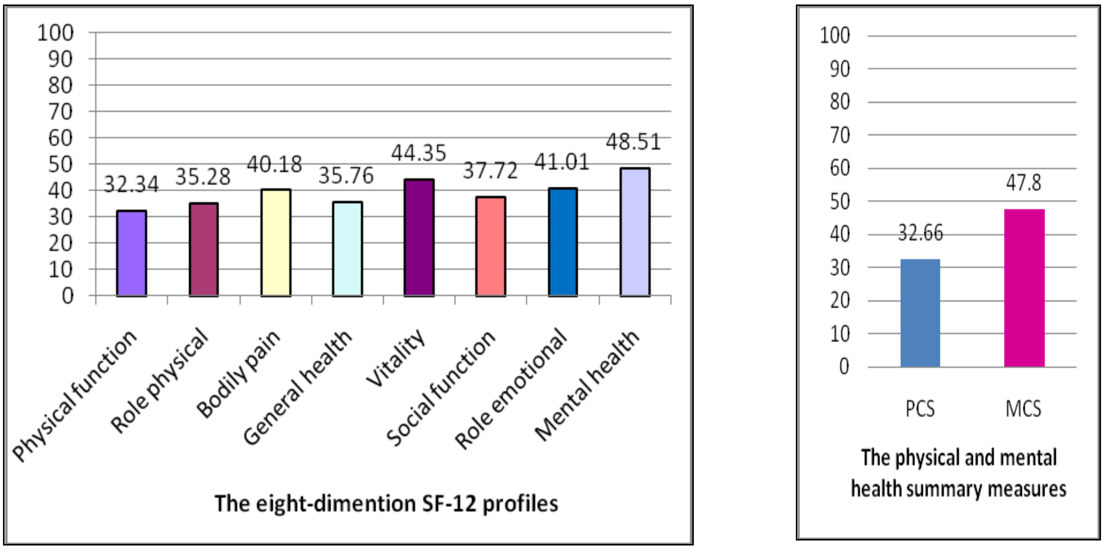


Figure 5.3. SF-12 Health Profile: Older Adults at High Risk of Hospital Readmission.

Table 5.8

Norm-Base Scoring of SF-12 Profile, Older Adults at High Risk of Hospital Readmission

Measure	Mean	Median	SD	Skewness	Kurtosis
Physical function	32.34	30.70	10.62	0.72	-0.40
Role physical	35.29	38.75	9.84	0.33	-0.29
Bodily pain	40.18	37.06	13.24	-0.12	-1.18
General health	35.76	40.43	10.66	0.20	-0.59
Vitality	44.35	47.75	10.84	0.18	-0.63
Social function	37.72	36.37	13.96	0.01	-1.21
Role emotional	41.01	44.90	12.77	-0.46	-0.68
Mental health	48.51	46.25	10.94	-0.44	-0.34
PCS	32.66	32.09	9.50	0.39	0.18
MCS	47.80	47.82	11.20	-0.19	-0.67

5.3.1.4 *Social Support - MOS Social Support Survey (MOS SSS).*

The MOS Social Support Survey was scored following the Social Support Survey Scoring Instructions (RAND Health). The survey consists of four separate support subscales and an overall functional social support index (Sherbourne & Stewart, 1991). The scores were transformed from 0 to 100, and the higher scores indicate better social support (Sherbourne & Stewart, 1991).

The median of the overall support index for the respondents was 72.21 (min 1.32, max 100). For the purpose of comparing the results with Sherbourne and Stewars' study (1991), the mean of the each sub-scale was presented in Figure 5.4. As Figure 5.4 illustrates, the respondents perceived the lowest support in the tangible support scale compared with other functional supports (Mean = 66.05, SD = 29.5). Conversely, the respondents appeared to receive greater affectionate support (Mean = 79.86, SD = 26.0). The averages of the four subscales are shown in Table 5.9.

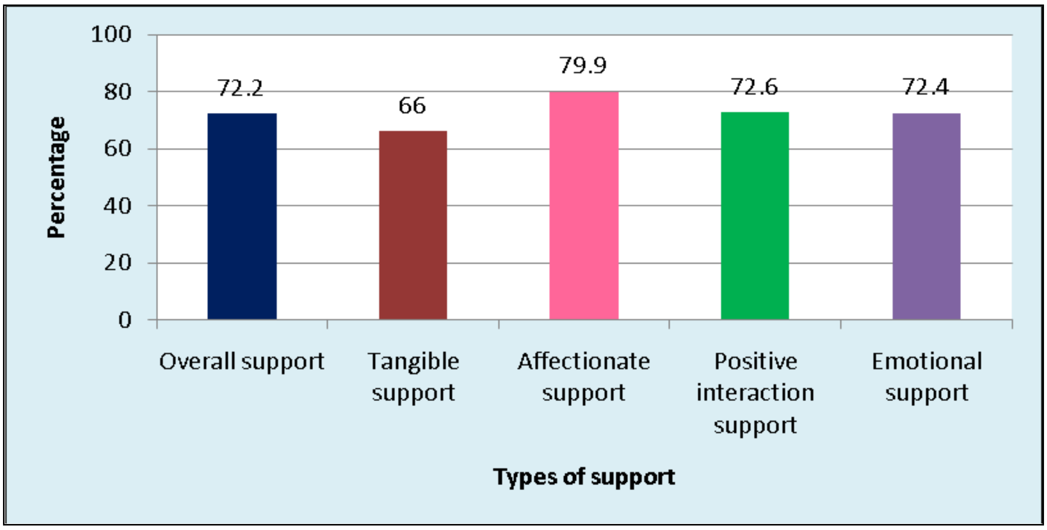


Figure 5.4. MOS SSS-Subscales and Overall Functional Social Support Index in Older Adults at High Risk of Hospital Readmission.

Table 5.9

Descriptive Statistics for Social Support Measures

Measure	Mean (SD)	Median	Percentiles		
			25	50	75
Overall support index	72.21 (25.0)	75.66	56.58	75.66	96.05
Tangible support	66.05 (29.5)	68.75	43.75	68.75	93.75
Affectionate support	79.86 (26.0)	91.67	66.67	91.67	100.0
Positive interaction support	72.58 (27.4)	75.00	50.00	75.00	100.0
Emotional/ info support	72.43 (26.8)	78.13	53.13	78.13	96.85

5.3.1.5 Chronic Disease Self-Efficacy Scale (CDSES).

The Chronic disease self-efficacy scales (CDSES) measured how participants perceived their level of self-efficacy to perform self-management behaviours. Scoring of the CDSES was guided by Lorig et al. (1996). There are ten subscales in CDSES, and the score for each subscale is the mean of the items. Higher scores indicate higher self-efficacy. The summary of these ten subscales is presented in Table 5.10.

The mean and standard deviation were presented as the total CDSES score, which showed roughly normal distribution. Most of the participants expressed a very high level of self-efficacy in the communication with the physician scale with the median score of 10, and the score of 8.0 and 10 being the first and third inter-quartile values. The total average score of CDSES was 6.90 (SD = 1.87), which also indicated that the participants had a high level of self-efficacy in managing their chronic conditions from these ten aspects. Among these ten subscales, however, the exercise regularly scale has the lowest score. Its mean score was 4.86 (SD = 2.71), which suggested the participants had a lower level of self-efficacy in relation to exercise on a regular basis compared to other component.

Table 5.10

Descriptive Statistics for Chronic Disease Self-Efficacy Measures

Scale	No. of items	Mean (SD)	Median
Exercise regularly	3	4.86 (2.71)	5.0
Get information on disease	1	6.95 (2.97)	8.0
Obtain help from community, family, friends	4	7.45 (2.15)	7.75
Communication with physician	3	8.76 (2.04)	10.0
Manage disease in general	5	7.57 (1.89)	7.8
Do chores	3	6.16 (2.83)	6.67
Do social/recreational activities	2	7.20 (2.74)	8.00
Manage symptoms	4	6.27 (2.47)	6.6
Manage shortness of breath	1	6.27 (2.97)	6.0
Control/manage depression	6	7.52 (2.21)	7.83
Total score	32	6.90 (1.87)	7.14

5.3.1.6 Short Portable Mental Status Questionnaire (SPMSQ).

Data on cognitive functioning were collected using ten-items SPMSQ (Pfeiffer, 1975). Four distinct levels of cognitive impairment are detected by the score range of 0 to 10. Normal mental functioning is defined as less than two errors, while moderate cognitive impairment is defined as five or more errors (Pfeiffer, 1975). Table 5.11 presents the percentages of subjects failing the items on the SPMSQ. As can be seen, the majority of the participants have less than two errors, indicating no cognitive impairment, and only one participant (0.6%) has mild cognitive impairment. There are no participants with 4 or greater than 4 errors. As a result, the average of the SPMSQ score is 0 (range 0-3). The results are expected, as cognitive impairment was one of the exclusion criteria for this study.

Table 5.11

Distribution of Sample by Number of Errors on SPMSQ

Number of errors	Mental function	Percentage	Subjects
0	Normal mental function	79.0%	124
1	Normal mental function	15.3%	24
2	Normal mental function	5.1%	8
3	Mild cognitive impairment	0.6%	1
4	Mild cognitive impairment	0	0
5-7	Moderate cognitive impairment	0	0
≥ 8	Severe cognitive impairment	0	0

Minimum = 0, Maximum = 3.

5.3.1.7 Geriatric Depression Scale (GDS)

Depressive symptoms are assessed using the 15-item Geriatric Depression Scale –Short Form (Sheikh & Yesavage, 1986). The range of scores on the GDS is from 0 to 15. A score of 0-4 is defined as no depression, 5-8 suggests mild depression, 9-11 is moderate depression, and a score of 12-15 is considered severe depression (The Stanford Aging Clinic Resource Centre (ACRC)).

The majority of the respondents had a GDS score of less than 4 (72.6%, n = 114), which indicated no depression. The prevalence of mild depressive symptoms was 21.7% (n = 34) and about 5.5% (n = 9) for moderate and severe depressive symptoms respectively. The average GDS score is 3.0 (Min 0, Max 14) and it is slightly positively skewed. The details of percentiles are presented in Table 5.12.

Table 5.12

Descriptive Statistics for GDS

Severity of depression	Percentage	Subjects (N = 157)	Mean (SD)
No depression	72.60%	114	3.44 (2.83)
Mild depression	21.70%	34	
Moderate depression	2.50%	4	
Severe depression	3.20%	5	

5.3.2 Results of exploring the bivariate analysis.

This section presents the results of the bivariate analysis. It examines the correlation coefficient based on the hypothesised self-efficacy model (see Figure 3.4) through Pearson's product-moment correlation coefficient (γ) or Spearman's Rho (γ_s). The relationship between demographic variables and outcome variables are also explored. The results of the bivariate analysis are addressed in a sequence corresponding to the order of the research questions in Study Two. Statistical significance will be reported at the conventional $p < 0.05$ level (two-tailed).

5.3.2.1 Research question 2-1.

Is there an association between perceived self-efficacy in managing chronic disease and participants' characteristics?

The Pearson product-moment correlation coefficient (γ) was used in exploring the relationship between perceived self-efficacy in managing chronic disease (as measured by the CDSES), and age, as both variables are continuous and normally distributed. The Spearman's Rho (γ_s) was performed in investigating the relationship between perceived self-efficacy in managing chronic disease and variables of the participants' characteristics, since some of the variables are ordinal or ranked data, and some variables are not normally distributed. These variables include: education, income, SPMSQ, GDS, the number of hospital readmission risk factors, and the number of co-morbidities. Additionally, preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity.

Table 5.13 shows there was a strong negative correlation between perceived self-efficacy in managing chronic disease and depressive symptoms (γ_s = -.68, N = 157, $p < .01$). The result reflected that the participants who had more confidence in managing their chronic condition were less likely to suffer from depression. The perceived self-efficacy in managing chronic conditions also showed a medium negative correlation with the number of hospital readmission risk factors (γ_s = -.45, N = 157, $p < .01$), a small negative correlation with the number of co-morbidities (γ_s = -.29, N = 157, $p < .01$), and a small positive correlation with educational attainment (γ_s = .28, N = 155, $p < .01$) and income (γ_s = .25, N = 157, $p < .01$). This indicated that the participants who had more risk factors of hospital re-admission and more co-morbidities tended to have lower confidence in managing their chronic conditions. Furthermore, the participants who had better social economic status, such as better income and education, were likely to have higher levels of self-efficacy in managing their chronic conditions.

Depressive symptoms were also associated with other variables, apart from being negatively associated with levels of perceived self-efficacy in managing chronic diseases. There was a medium positive correlation with depressive symptoms and the number of hospital readmission risk factors ($\gamma_s = .40$, $N = 157$, $p < .01$), a small positive correlation with the number of co-morbidities ($\gamma_s = .23$, $N = 157$, $p < .01$), and a small negative association with income ($\gamma_s = -.23$, $N = 157$, $p < .01$). The results suggested that the participants who had more depressive symptoms were associated with a higher number of hospital readmission risk factors, more co-morbidities, and had lower incomes.

Other demographic variables, such as age and income were also significantly associated with other variables. Age had a weak, positive association with the number of hospital re-admission risk factors ($\gamma_s = .27$, $N = 157$, $p < .01$); however, it was not significantly associated with the number of co-morbidities. This indicated that, as age increased, so did the risk factors of hospital readmission, while the number of co-morbidities might not increase. Income was significantly associated with education ($\gamma_s = .21$, $N = 157$, $p < .01$) and the number of hospital readmission risk factors ($\gamma_s = .22$, $N = 157$, $p < .01$). The participants with higher incomes tended to have higher educational attainment, while the participants with lower incomes were more likely to have more hospital readmission risk factors. There were no further correlations found between the SPMSQ and other variables.

Table 5.13

Relationships between Measures of Chronic Disease Self-Efficacy and Participants' Characteristics

Variables	1	2	3	4	5	6	7	8
1. CDSES	1							
2. Age	-.09	1						
3. Income	.25**	-.04	1					
4. Education	.28**	-.12	.21**	1				
5. SPMSQ	-.14	.06	-.12	-.08	1			
6. GDS	-.68**	-.05	-.23**	-.15	.50	1		
7. No. of risk factors	-.45**	.27**	-.22**	-.08	.10	.40**	1	
8. No. of co-morbidities	-.29**	-.03	-.11	-.02	.15	.23**	.30**	1

* $p < .05$, ** $p < .01$, CDSES: Chronic Disease Self-efficacy Scale; SPMSQ: Short Portable Mental Status Questionnaire; GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities.

5.3.2.2 Research question 2-2.

Is there an association between perceived self-efficacy in managing chronic disease and social support?

The relationship between perceived self-efficacy in managing chronic disease (as measured by the CDSES) and perceived social support (as measured by the MOS-SSS) was investigated using the Spearman's Rho (γ_s) because the assumption of normality was not met. There was a medium positive correlation between the two variables ($\gamma_s = .41$, N = 150, $p < .01$) with a high level of perceived self-efficacy in managing chronic disease associated with high levels of perceived social support. Among the four sub-scales of MOS-SSS, the positive interaction support scale had the strongest positive correlation with the chronic disease self-efficacy than other subscales (γ_s = .47, N = 155, p < .01). The participants perceived that higher confidence in managing their chronic disease was associated with higher levels of perceived positive interactional support from their family or friends (see Table 5.14).

Table 5.14

Spearman's rho Correlations between Measures of Chronic Disease Self-Efficacy and Social Support

Social support	Chronic disease self-efficacy
Overall support index	.41**
Tangible support	.34**
Affectionate support	.39**
Positive interaction support	.47**
Emotional/ info support	.41**

* p < .05, ** p < .01

5.3.2.3 Research question 2-3.

Is there an association between perceived self-efficacy in managing chronic disease and health outcomes (nutritional status, functional ability, and quality of life)?

To respond to research question 2-3, the results are presented in the following order: (1) to examine the relationship between perceived self-efficacy in managing chronic disease and nutritional status, (2) determine the relationship between perceived self-efficacy in managing chronic disease and functional ability, and (3) explore the relationship between perceived self-efficacy in managing chronic disease and quality of life.

Firstly, the relationship between perceived self-efficacy in managing chronic disease (as measured by the CDSES) and nutritional status (as measured by the MST, BMI and CAMA), the Spearman's rho was employed since the distribution of MST, BMI, CAMA were positively skewed. The raw data/scores were used as they were all continuous measurements. Among the measurement of nutritional status, only MST showed significantly negative correlations with perceived self-efficacy in managing chronic disease (γ_s = -.28, N = 157, p < .01). The participants with higher confidence in managing their chronic disease were likely not at risk of malnutrition as the lower scores of MST indicated not at malnutrition risk. The relationship among nutritional status and chronic disease self-efficacy are shown in Table 5.15.

Table 5.15

Spearman's rho Correlations between Measures of Chronic Disease Self-Efficacy and Nutritional Status

Nutritional measurement	Chronic disease self-efficacy
BMI	-.03
MST	-.28**
CAMA	-.05

* p < .05, ** p < .01

Secondly, the relationship between perceived self-efficacy in managing chronic disease (as measured by the CDSES) and functional ability (as measured by the WIQ, ADL, IADL) was examined through Spearman's rho as the assumption of normality was violated in WIQ, ADL and IADL. The perceived self-efficacy in managing chronic disease was moderately positively correlated with the three sub-scales of the Walking Impairment Questionnaire (WIQ) (see Table 5.16); especially, a stronger association was shown in the stair-climbing scale ($\gamma_s = .51$, $N = 127$, $p < .01$). The participants with higher confidence in managing their chronic disease tended to have less walking impairment, especially in stair-climbing, as the higher score of WIQ indicated less impairment.

The perceived self-efficacy in managing chronic disease was significantly negatively associated with ADL ($\gamma_s = -.38$, $N = 156$, $p < .01$) and IADL ($\gamma_s = -.48$, $N = 157$, $p < .01$). The participants with high levels of perceived self-efficacy in managing disease were associated with higher levels of independency in doing ADL and IADL, as lower scores for ADL and IADL indicated higher functional ability.

Table 5.16

Spearman's rho Correlations between Measures of Chronic Disease Self-Efficacy and Functional ability

Functional measurement	Chronic disease self-efficacy
WIQ- Distance scores	.47**
WIQ-Speed scores	.47**
WIQ- Stair-climbing scores	.51**
ADL	-.38**
IADL	-.48**

* $p < .05$, ** $p < .01$

Thirdly, the relationship between perceived self-efficacy in managing chronic disease (as measured by the CDSES) and quality of life (as measured by the SF-12) was explored through the Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. Perceived self-efficacy in managing chronic disease had a strong positive association with MCS ($\gamma = .57$, $N = 157$, $p < .01$) and a medium positive correlation with PCM ($\gamma = .349$, $N = 157$, $p < .01$). These results demonstrated that the participants who had higher confidence in managing their chronic disease tended to have a better quality of life, especially in relation to mental health summary measures.

5.3.2.4 Research question 2-4.

Is there an association between perceived social support and health outcomes (nutritional status, functional ability, and quality of life)?

The relationship between perceived social support and outcome variables was investigated using Spearman's Correlation Coefficient rho, as the assumption of normality was violated. Perceived social support was measured by the MOS-SSS and three health outcomes which included nutritional status (as measured by the MST, BMI, CAMA), functional ability (as measured by the WIQ, ADL, IADL), and quality of life (as measured by the SF-12).

As Table 5.17 illustrates, perceived social support was significantly associated with MST, ADL and MCS. Perceived social support had a low negative association with MST ($\gamma_s = -.16$, $N = 150$, $p < .05$), which signified that higher levels of perceived social support were associated with a lower risk of malnutrition, as the lower scores of MST (≤ 2) indicated not at risk of malnutrition. Additionally, perceived social support was weakly correlated with ADL ($\gamma_s = -.17$, $N = 149$, $p < .05$), indicating that the participants who perceived sufficient social support were likely to be able to perform ADL independently. Perceived social support was also weakly and positively associated with quality of life in mental health measures ($\gamma_s = .28$, $N = 150$, $p < .01$). The participants who perceived better social support were likely to have a perceived better quality of life from the point of view of mental health. Perceived social support did not demonstrate any association with physical function both in functional ability measurements and quality of life in the physical health measures apart from ADL.

Table 5.17

Spearman's rho Correlations between Measures of Social Support and Health Outcomes

Variables	Social support
Nutritional status	
MST	-.16*
BMI	-.04
CAMA	-.09
Functional ability	
WIQ-Distance scores	.12
WIQ-Speed scores	.08
WIQ-Stair-climbing scores	.09
ADL	-.17*
IADL	.01
Health-related quality of life	
PCS	.11
MCS	.28**

* p < .05, ** p < .01

5.3.2.5 Research question 2-5.

Is there an association between nutritional status, functional ability, and quality of life in older adults at high risk of hospital re-admission?

Spearmans' correlation coefficient rho was used to test the relationship between nutritional status, functional ability and quality of life as the majority of the variables were not normally distributed. The measurements of nutritional status, functional ability and quality of life were the same as the previous question. Table 5.18 presents the relationship among these three outcome variables, the results only highlight the correlation between three outcome variables. The correlation between the measurements of the individual outcome variables were confirmed but not highlighted, thus, they are not addressed.

Among the nutritional measurements, the MST was statistically significantly associated with functional ability in ADL ($\gamma_s = .17$, N = 156, $p < .05$), IADL ($\gamma_s = .22$, N = 157, $p < .01$), and quality of life in MCS ($\gamma_s = .37$, N = 157, $p < .01$) (Table 5.18). The above analyses show that the participants who were at malnutrition risk were more likely to have lower functional ability in terms of performing ADL and IADL. Moreover, the participants who were at risk of malnutrition were more likely to be associated with a lower quality of life in terms of mental health.

Other nutritional measurements showed statistically significant correlation with functional ability, but not in quality of life. BMI was significantly negatively associated with WIQ- distance scores ($\gamma_s = -.22$, N = 14, $p < .01$) and WIQ- speed scores ($\gamma_s = -.20$, N = 129, $p < .05$). This indicated that the participants with a higher BMI were associated with a greater impairment in walking certain distances and speeds. Similarly, the CAMA was also negatively associated with WIQ-speed scores ($\gamma_s = -.20$, N = 121, $p < .05$), which was not surprising as both the BMI and the CAMA measured the body composition.

The correlation of quality of life and functional ability was statistically significant. The PCS showed medium to strong positive correlation with all WIQ scales: WIQ-distance scores ($\gamma_s = .49$, N = 139, $p < .01$), WIQ-speed scores ($\gamma_s = .49$, N = 129, $p < .01$), and WIQ-stair climbing scores ($\gamma_s = .47$, N = 127, $p < .01$). It was negatively associated with ADL ($\gamma_s = -.26$, N = 156, $p < .01$) and IADL ($\gamma_s = -.41$, N

= 157, p < .01). These results all suggested that perceived better quality of life in physical health was associated with less impairment of functional status.

The MCS also demonstrated a significant correlation with WIQ- distance scores (γ_s = .25, N = 139, p < .01), WIQ- stair climbing scores (γ_s = .22, N = 127, p < .05), ADL (γ_s = -.23, N = 156, p < .01), and IADL (γ_s = -.28, N = 157, p < .01). Similar to the PCS results, the participants who had a perceived better quality of life on mental health measures were associated with better functional ability in terms of performing ADL and IADL independently, and better ability in walking and stair climbing

Table 5.18

Spearman's rho Correlations among Nutritional Status, Functional Status, and Health-Related Quality of Life

Measurement	1	2	3	4	5	6	7	8	9	10
Nutritional status										
MST	1									
BMI	-.40**	1								
CAMA	-.30**	.79**	1							
Functional status										
WIQ (1)	-.09	-.22**	-.16	1						
WIQ (2)	-.06	-.20**	-.20*	.76**	1					
WIQ (3)	-.16	-.12	-.09	.74**	.83**	1				
ADL	.17*	-.04	-.01	-.32**	-.33**	-.25**	1			
IADL	.22**	-.09	-.07	-.55**	.49**	-.51**	.51**	1		
Quality of life										
PCS	-.07	-.12	-.13	.49**	.49**	.47**	-.26**	-.41**	1	
MCS	-.31**	-.06	-.14	.25**	.11	.22**	-.23**	-.28**	-.07	1

* p < .05, ** p < .01, WIQ (1): WIQ-distance scores, WIQ (2): WIQ-Speed scores, WIQ (3): WIQ-Stair climbing scores.

5.3.2.6 Research question 2-6.

Is there an association between demographic characteristics and nutritional status, functional ability, and quality of life?

The relationship between demographic characteristics and three health outcomes were explored using Pearson's correlation coefficient and Spearmans' correlation coefficient rho. The variables of the demographic characteristics included: age, education, income, SPMSQ, GDS, the number of hospital readmission risk factors, and the number of co-morbidities. The three health outcomes were the same as the previous question. Pearson's correlation coefficient was applied to explore the relationship between quality of life (as measured by the PCS and MCS) and age in years, as these variables were normally distributed. The rest of variables were tested using Spearmans' correlation coefficient rho since income and educational levels were ordinal data and the other variables were not normally distributed. The results of the relationship between demographic characteristics and nutritional status are presented first, followed by the relationship between demographic characteristics and the functional ability. Finally, the results of the relationship between demographics characteristics and the quality of life are addressed.

When the relationship between demographic characteristics and the nutritional status were explored, there were several statistically significant findings. Age was found to be significantly associated with the BMI and CAMA. Age had a medium negative correlation with BMI ($\gamma_s = -.38$, $N = 157$, $p < .01$), and CAMA ($\gamma_s = -.29$, $N = 147$, $p < .01$). These results indicated that the participants who were older tended to have lower BMI and lower CAMA, which suggested that as age increases, the risk of malnutrition or malnutrition also increases. Additionally, the MST showed a small to medium positive association with the number of hospital readmission risk factors ($\gamma_s = .35$, $N = 157$, $p < .01$), the number of co-morbidities ($\gamma_s = .18$, $N = 157$, $p < .05$), and GDS ($\gamma_s = .24$, $N = 157$, $p < .01$). The participants with more risk factors for hospital re-admission, co-morbidities, and depressive symptoms were more likely to be associated with malnutrition risk.

Similarly, the number of co-morbidities was positively associated with CAMA ($\gamma_s = .22$, $N = 147$, $p < .01$), indicating that the participants who had higher CAMA were likely to have more co-morbidities. The finding was not surprising as the people who have higher CAMA typically have higher BMI, and higher BMI was associated with the number of chronic diseases. No statistical significant associations were found between income, education, the SPMSQ and the nutritional status.

In terms of examining the relationship between the demographics characteristics and functional ability, six demographic variables, except for education, showed significant association with functional ability. The ADL was positively associated with the GDS ($\gamma_s = .29$, N = 156, $p < .01$), indicating the participants who had more depressive symptoms were less likely to perform their ADL independently. IADL was associated with age ($\gamma_s = .22$, N = 157, $p < .01$), the GDS ($\gamma_s = .40$, N = 157, $p < .01$), the number of hospital re-admission risk factors ($\gamma_s = .40$, N = 157, $p < .01$), and the number of the co-morbidities ($\gamma_s = .28$, N = 157, $p < .01$). These suggested that participants who were older, with more depressive symptoms, and had more risk factors of hospital re-admission and co-morbidities would have less ability to perform IADL independently.

When examining the GDS and functional ability, the GDS was found to be associated with all functional measurements. GDS had a medium negative association with three WIQ scales: WIQ – Distance scores ($\gamma_s = -.46$, N = 139, $p < .01$), WIQ – Speed scores ($\gamma_s = -.41$, N = 129, $p < .01$), WIQ – Stair climbing ($\gamma_s = -.45$, N = 127, $p < .01$), medium positively associated with IADL ($\gamma_s = .40$, N = 157, $p < .01$) and weakly associated with ADL ($\gamma_s = .29$, N = 156, $p < .01$). The results suggested that the participants who had more depressive symptoms were more likely to have walking impairments when walking a certain distance, speed, and with stair climbing. Moreover, the participants with more depressive symptoms tended to be less able to perform their ADL and IADL independently.

Numbers of the demographic variables apart from the GDS also showed a significant association with WIQ scales, apart from the GDS. The WIQ – Distance scores was correlated with the number of hospital readmission risk factors ($\gamma_s = -.27$, N = 139, $p < .01$), and the number of co-morbidities ($\gamma_s = -.23$, N = 139, $p < .01$). The WIQ – Speed scores was positively associated with income ($\gamma_s = .29$, N = 129, $p < .01$), negatively associated with the SPMSQ ($\gamma_s = .23$, N = 129, $p < .01$), the number of hospital readmission risk factors (γ_s = -.30, N = 129, p < .01), and the number of co-morbidities (γ_s = -.17, N = 129, p < .05).

The WIQ-Stair climbing scores was also positively associated with income (γ_s = .24, N = 127, p < .01), while it was negatively associated with the SPMSQ (γ_s = -.21, N = 127, p < .05), the number of the hospital readmission risk factors, (γ_s = -.35, N = 127, p < .01) and the number of co-morbidities (γ_s = -.26, N= 127, p < .01). The results demonstrated that there was a greater likelihood that the participants who had better income and cognitive function would have better functional status in walking speed and stair climbing. Higher hospital readmission risk factors and co-morbidities were associated with greater walking impairments, especially in relation to walking distance and stair climbing.

In regard to the relationship between demographic characteristics and quality of life, GDS had moderate, negative association with both the PCS (γ_s = -.37, N = 157, p < .01) and the MCS (γ_s = -.54, N = 157, p < .01), indicating the participants who had less depressive symptoms were more likely to have a better perceived quality of life on physical and mental health measurements. Additionally, the number of hospital re-admission risk factors (γ_s = -.31, N = 157, p < .01) and the number of co-morbidities (γ_s = -.21, N = 157, p < .01) showed small to medium negative correlation with quality of life in physical measurements. This indicated that the participants with less risk factors for hospital re-admission and co-morbidities would perceive better quality of life related to physical health. The SPMSQ was weak but significantly associated with the MCS (γ_s = -.20, N = 157, p < .01), indicating the participants with no cognitive impairment tended to perceive better quality of life related to mental health. Table 5.19 shows the relationship between demographic characteristics and nutritional status, functional ability and quality of life.

Table 5.19

The Relationship between Demographics Characteristics and Nutritional status, Functional status, and Health-Related Quality of life

Variables	MST	BMI	CAMA	ADL	IADL	WIQ-Distance	WIQ-Speed	WIQ-Stair	PCS	MCS
Age in years	.11	-.38**	-.29**	.01	.22**	-.01	.06	.02	.06	.05
Education	-.11	.05	.08	.01	-.13	.15	.01	.11	.05	.13
Income	-.12	-.06	-.07	-.14	-.14	.12	.29**	.24**	.12	.14
SPMSQ	-.07	-.02	.06	-.01	.06	-.13	-.23**	-.21*	-.05	-.20**
GDS	.24**	.10	.14	.29**	.40**	-.46**	-.41**	-.45**	-.37**	-.54**
No. of risk factors	.35**	-.14	-.01	.13	.40**	-.27**	-.30**	-.35**	-.31**	-.37**
No. of co-morbidities	.18*	.13	.22**	.14	.28**	-.23**	-.17*	-.26**	-.21**	-.26**

* $p < .05$, ** $p < .01$, SPMSQ: Short Portable Mental Status Questionnaire, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital re-admission risk factors; No. of co-morbidities: Number of co-morbidities

5.3.2.7 Research question 2-7.

Is there an association between demographic characteristics and perceived social support?

This research question examined if there was a relationship between demographic characteristics and perceived social support in the study populations. The variables of the demographic characteristics were the same as the previous question, which included: age, education, income, SPMSQ, GDS, the number of hospital readmission risk factors, and the number of the co-morbidities. The perceived social support was measured by the MOS SSS. The Spearmans' correlation coefficient rho was employed to determine the relationship between demographic characteristics and perceived social support as the MOS SSS was not normally distributed.

The results revealed that three demographic characteristics were significantly associated with perceived social support (Table 5.20). Among these three variables, the number of hospital readmission risk factors had a medium, negative association with perceived social support ($\gamma_s = -.47$, $N = 150$, $p < .01$). Both the GDS ($\gamma_s = -.25$, $N = 150$, $p < .01$) and income ($\gamma_s = .19$, $N = 150$, $p < .05$) showed a small association with the perceived social support. The results indicated that the participants who had less risk factors of hospital re-admission, less depressive symptoms and better income, were likely to have better perceived social support. In other words, those participants who perceived that they received better social support had less risk factors for hospital re-admission, depressive symptoms, and they had better income.

Table 5.20
Spearman's rho Correlations between Measures of Demographic Characteristics and Social Support

Demographic characteristics	Social support
Age in years	.02
Education	.12
Income	.19*
SPMSQ	-.09
GDS	-.25**
No of risk factors	-.47**
No. of co-morbidities	-.16*

p < .05, ** p < .01 SPMSQ: Short Portable Mental Status Questionnaire; GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital re-admission risk factors; No. of co-morbidities: Number of co-morbidities.

In summary, this section has explored the associations between the variables of the hypothesized self-efficacy model in this study. The Pearson's product-moment correlation coefficient (γ) or Spearman's Rho (γ_s) were used to determine the relationship between variables. Statistically significant findings were addressed through each research question. The results highlighted that perceived self efficacy in managing chronic disease was associated with various hypothesised demographic variables which include depressive symptoms, the number of hospital readmission risk factors, the number of co-morbidities, income and educational attainment. Moreover, perceived self efficacy in managing chronic disease was significantly associated with perceived social support, functional status, and quality of life. However, perceived self efficacy in managing chronic disease showed a weak association with the risk of malnutrition or other measurements of nutritional status. Although the perceived social support was strongly associated with the self-efficacy in managing chronic disease, it was weakly associated with three health outcome variables.

To examine the relationship between the hypothesised demographic variables and health outcome variables, four hypothesised demographic variables were significantly and frequently associated with three health outcome measurements. Age was associated with three nutritional measures (SGA, BMI, CAMA), which indicated the risk of malnutrition increases as the age increased. The depressive symptoms, the number of hospital readmission risk factors, and the number of co-morbidities were all associated with some of the three health outcome measurements, especially with functional status and quality of life. This suggested that the people with less depressive symptoms, fewer hospital readmission risk factors and less co-morbidities were likely to have better functional ability and quality of life.

This section has explored the data using bivariate analysis; further statistical modelling would need to be adjusted for other possible predictors of perceived self-efficacy in managing chronic disease and health outcomes. Thus, the following section will undertake multivariable analysis, which is a more sophisticated approach to exploring the interrelationship among a set of variables in the hypothesised self-efficacy model.

5.3.3 Results of exploring the multivariate analyses.

This section presents the results of the multivariate analyses. The analyses examined the relationships among perceived self-efficacy in managing chronic disease, social support, and health outcomes while controlling for demographic, participants' characteristics, and socioeconomic status variables. Additionally, the analyses also examined how well the significant demographic variables, socioeconomic status, perceived self-efficacy in managing chronic disease and social support can predict health outcomes. These were examined through multiple linear regression and logistic regression. Model specifications and strategies for variables' inclusion in the model were based on the hypothesised self-efficacy model (see Figure 3.4), and the results of the bivariate analysis. The results of the multivariate analysis are addressed in a sequence corresponding to the order of the research questions in Study Two. Statistical significance will be reported at the conventional $p < .05$ level (two-tailed).

5.3.3.1 Research question 2-8.

How well do the demographic and socioeconomic statuses predict perceived self-efficacy in managing chronic disease? How well do the depressive symptoms and perceived social support predict perceived self-efficacy in managing chronic disease after controlling for significant socio-demographic variables in older adults at high risk of hospital readmission?

Hierarchical multiple regression analysis was used to assess the relationship among perceived chronic disease self-efficacy, participants' characteristics, depressive symptoms, and perceived social support. A three-stage process was used in which significant covariates were entered first and the independent variable of interest was entered second and third. According to the previous bivariate analysis, education, income, the number of co-morbidities, and the number of hospital re-admission risk factors were significantly related to perceived self-efficacy in managing chronic disease (see research question 2-1). Thus, these variables were used in the analysis as covariates and were entered at Step 1, explaining 34% ($R^2 = .34$) of the variance in perceived self-efficacy in managing chronic disease.

The Geriatric Depression Scale (GDS) was entered at Step 2, and accounted for an additional 23% of variance, after controlling for education, income, the number of co-morbidities, and the number of hospital readmission risk factors, R squared changed = .23, F change (1, 144) = 75.06, P < .001. The MOS SSS was entered at Step 3, and explained an additional 3% of variance, R squared changed = .03, F change (1, 143) = 10.72, P < .001. After entry of the MOS SSS at step 3 the total variance explained by the model as a whole was 59.7% ($R^2 = .60$), F (6, 143) = 35.32, P < .001. These results indicated that depressive symptoms were the strongest predictors of perceived self-efficacy in managing chronic disease.

Examining the standardized coefficients provided an opportunity to compare the relative strength of associations with the outcomes. In the final model, four variables were statistically significant (See Table 5.21). They were education, the number of hospital readmission risk factors, the GDS, and the MOS SSS, with the GDS recording the highest beta value ($\beta = -.52$, $p < .001$) followed by the MOS SSS ($\beta = .20$, $p = .001$). Neither income nor the number of co-morbidities made a unique contribution.

Table 5.21
Hierarchical Multiple Regression Analysis of Perceived Self-Efficacy in Managing Chronic Disease

Order of entry	*β*	*p*	Adjusted R^2	R^2 change	Model *F*	Model *P*
Step 1			.32		18.77	< .001**
Education	.19	.001**				
Income	.04	.54				
No. of risk factors	-.15	.03*				
No. of co-morbidities	-.03	.56				
Step 2			.55	.23	37.70	< .001**
GDS	-.52	.001**				
Step 3			.58	.03	35.32	< .001**
MOS SSS	.20	.001**				

p < .05, ** p < .01, No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; GDS: Geriatric Depression Scale; MOS SSS: MOS Social Support Survey.

Preliminary analyses were conducted to check the assumptions of normality, homoscedasticity, and multicollinearity. The assumptions of normality and homoscedasticity were checked by inspecting the Normal Probability Plot (P-P) of the regression standardised residual and the scatterplot. The residual were normally distributed with most of the points close to the line. In the scatterplot, the residuals were roughly rectangular distributed, with most of the scores concentrated in the centre (along the 0 point). The assumptions of normality and homoscedasticity, thus were met in this test.

The Variance inflation factor (VIF) was used to check for Multicollinearity. The VIF value was 1.52 which was well below the cut-off of 10; therefore, the multicollinearity assumption was not violated. This was also supported by the correlation between each of the independent variables, with the highest correlation between two independent variables being .47, which was less than .7; therefore no independent variable was omitted. Outliers and influential observations were checked by Cook's distance. The maximum value for Cook's distance was 0.10 which was well below 1, suggesting there was no cause of concern about outliners and influential observations, and no future investigations were required. The above results of preliminary analyses, thus, suggested that there were no violations of the assumptions of normality, homoscedasticity, and multicollinearity.

5.3.3.2 Research question 2-9.

Based on the study's hypothesized model, what are the significant predictors of nutritional status?

2-9-1: what are the significant predictors for malnutrition risk in older adults at high risk of hospital re-admission?

2-9-2: what are the significant predictors for malnutrition in older adults at high risk of hospital re-admission?

2-9-3: What are the significant predictors for body mass index in older adult at high risk of hospital re-admission?

Research question 2-9 focused on examining what variables influence malnutrition status which included malnutrition risk, malnutrition, and body mass index in older adults at high risk of hospital re-admission. Research question 2-9, thus is formed from the three specific sub-research questions which are presented above. The research question 2-9-1 is presented first followed by the research question 2-9-2 and 2-9-3 in this section.

Research question 2-9-1: Based on the study's hypothesized model, what are the significant predictors for malnutrition risk in older adults at high risk of hospital readmission?

A standard multiple regression was conducted to determine what predictors were significantly associated with malnutrition risk (as measured by the Malnutrition Screening Tool (MST)). Model specifications were based on the study hypothesised model (Figure 3.4) and the results of bivariate analysis in Section 5.3.2. The model contained five predictors, namely perceived social support, perceived self-efficacy in managing chronic disease, depressive symptoms, the number of hospital readmission risk factors, and the number of co-morbidities.

The results of a standard multiple regression analysis indicated that the model as a whole accounted for a significant amount of the malnutrition risk variability, R^2 =

.19, adjusted R^2 = .17, F (5, 144) = 6.95, p < .001. Among the five predictors, perceived self-efficacy in managing chronic disease (β = -.25, p = .03), and the number of hospital re-admission risk factors (β = .22, p = .02) made a statistically significant contribution to the prediction of malnutrition risk after adjusting for perceived social support, depressive symptoms, and the number of co-morbidities. This result also indicated that both perceived self-efficacy in managing chronic disease ($S\gamma_i^2$ = .03) and the number of hospital re-admission risk factors ($S\gamma_i^2$ = .03) had the same unique contribution to explain malnutrition risk, as they had the same semipartial correlation coefficients ($S\gamma_i^2$). Table 5.22 displays the unstandardised regression coefficients (B) and intercept, the standardized regression coefficient (β), the semipartial correlations ($S\gamma_i^2$), R^2, and adjusted R^2 of this model.

Table 5.22

Standard Multiple Regression of Five Predictors on Malnutrition Risk

Predictors	B	SE	β	Sig	$S\gamma_i^2$
MOS SSS	.00	0.01	-.01	.94	
CDSES	-.14	0.06	-.25	.03*	.03
GDS	.01	0.04	.03	.78	
No. of risk factors	.16	0.07	.22	.02*	.03
No. of co-morbidities	.03	0.06	.04	.62	
Intercept = 1.08				R^2 = .19	
				Adjusted R^2 = .17	
				F (5, 144) = 6.95	

*p < .05, SE: Standard Error; Sig: statistical significance; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale; GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities.

Preliminary results of evaluation of assumptions led to transformation of the MST, however, the results of residual plots showed very limited improvement in terms of the model fitting. Thus, the original raw data were used. The maximum value for Cook's distance was 0.14 which was below cut-off value 1, as a result, there is no source of concert in terms of outlier and influential observations. The VIF value was 2.25 which was well below the cut-off of 10; thus, the multicollinearity assumption was not violated. The Normal P-P plot showed that the residuals were not normal as there were some points that departed from the straight diagonal line. This result suggested that there are other potential predictors which were not included in the model. The issue, with regards to the potential predictors for the malnutrition risk will be discussed further in the discussion chapter. Although the scatterplot of the residuals does not look perfectly rectangular; there is no clear pattern. Thus, the assumption of homoscedasticity was not violated.

Research question 2-9-2. Based on the study hypothesised model, what are the significant predictors for malnutrition in older adults at high risk of hospital re-admission?

Multiple logistic regressions were applied to determine what predictors were associated with malnutrition (as measured by the SGA). Model specifications were based on the literature review and study's hypothesised model (Figure 3.4). Two models were tested. The first model was to explore the participants' characteristics and socio-economic status in predicting malnutrition. The second model was to examine what were the significant influence predictors among the four types of social support and ten specifics of chronic disease self-efficacy managements in predicting malnutrition.

In model one, seven predictors were included in the model (age, gender, income, education attainment, living alone, depressive symptoms, and the number of co-morbidities). The number of hospital readmission risk factors was excluded in the model to minimise the chance of multicollinearity, as it was moderately inter-correlated with two independent variables (living alone and depressive symptoms). For the purpose of analysis, SGA was reclassified as dichotomous variables (well nourished and malnourished), income was re-coded as dichotomous variables (< \$30K and >\$30K), and education levels were re-coded as trichotomous (completed primary schooling or less, completed 7-12 years or high school, completed post secondary vocational education or above). The Hosmer & Lemeshow's goodness of fit test was not significant with a small Chi-square, χ^2 (8, N = 155) = 7.25, p = .51, which indicated the model does not differ significantly from the observed data. In other words, the model was accepted as being an adequate fit. The Pseudo R Square statistic indicated that the model as a whole explained between 9% (Cox and Snell R Square = .09) and 14% (Nagelkerke R Square = .14) of the variance in malnutrition.

As showed in Table 5.23, two of the independent variables made a unique statistically significant contribution to the model. They were age and depressive symptoms. The strongest predictor of malnutrition was the depressive symptoms, recoding an odd ration of 1.17. This indicated that if this one score of the GDS increased, a person is more likely to increase the odds of suffering from malnutrition by 1.17 times (95% CI, 1.01, 1.36), when controlled for all other factors in the model. The odds ratio was 1.07 (95% CI, 1.01, 1.15) for age. This indicated that if age goes up by one, then the odds of malnutrition increased by 1.07, when controlled for other factors in the model.

Table 5.23

Logistic Regression Predicting Likelihood of Malnutrition – Model 1

Variable	B	S.E	df	OR	95% CI for OR	Sig
Age	0.07	0.04	1	1.07	1.01, 1.147	.04*
Gender						
Male	-0.22	0.60	1	0.80	0.25, 2.59	.71
Female				1	Referent	
Income						
< $ 30K	0.01	0.59	1	1.01	0.32, 3.18	.98
> $ 30K				1	Referent	
Education attainment						
≤ Primary schooling	0.77	0.67	1	2.15	0.55, 8.48	.27
≤ High schooling	1.10	0.63	1	2.99	0.88, 10.18	.80
≤ Tertiary				1	Referent	
Living alone						
No	-0.22	0.48	1	0.79	0.31, 2.05	.64
Yes				1	Referent	
GDS	0.16	0.07	1	1.17	1.01, 1.36	.03*
No. of co-morbidities	0.09	0.16	1	1.10	0.81, 1.49	.56

*p < .05, OR: Odds ratio of malnutrition; CI: confidence interval; Sig: statistical significance of the OR; GDS: Geriatric Depression Scale; No. of co-morbidities: Number of co-morbidities.

Cook’s distance was used to check for any influential observations. The plot revealed that there was one observation with a relatively large Cook’s distance (subject number 120). Further investigation was taken, and the original data was checked. It was noted that subject 120 had five co-morbidities with only one depressive symptom; however, all measurements were valid. Thus, subject 120 was included in the analyses.

The second model examined four types of social support and ten specifics of chronic disease self-efficacy managements in predicting malnutrition (Table 5.24). The Hosmer & Lemeshow’s goodness of fit test was not statistically significant, χ^2 (8, N = 150) = 4.25, p = .83, indicating that the model was accepted as being an adequate fit. The Pseudo R Square statistic indicated that the model as a whole explained between 8% (Cox and Snell R Square = .084) and 13% (Nagelkerke R Square = .132) of the variance in malnutrition.

Among the independent variables, only perceived tangible support made a unique statistically significant contribution to the model. The odds ration of 0.98 for perceived tangible support was less than 1, indicating that for every additional score of tangible support reported from the respondent, the respondents were 0.98 times less likely to suffer from malnutrition (95% CI, 0.95, 0.99), when controlled for all other factors in the model. None of the ten specifics of chronic disease self-efficacy managements showed statistical significance in predicting malnutrition.

Table 5.24

Logistic Regression Predicting Likelihood of Malnutrition – Model 2

Variable	B	S.E	df	OR	95% CI	Sig
MOS SSS						
Tangible support	-0.02	0.01	1	0.98	0.96, 0.99	.03*
Affectionate support	0.01	0.02	1	1.01	0.98, 1.04	.57
Positive interaction support	-0.01	0.02	1	0.99	0.96, 1.04	.95
Emotional/ info support	0.02	0.02	1	1.02	0.98, 1.06	.93
CDSES						
Exercise regularly	0.07	0.11	1	1.07	0.85, 1.34	.57
Get information on disease	-0.08	0.09	1	0.93	0.76, 1.10	.39
Obtain help from community	0.02	0.16	1	1.02	0.74, 1.41	.90
Communication with doctor	-0.01	0.15	1	0.99	0.75, 1.33	.97
Manage disease in general	0.03	0.21	1	1.03	0.69, 1.54	.89
Do chores	0.13	0.15	1	1.13	0.85, 1.52	.40
Do social/recreation activities	-0.26	0.15	1	0.78	0.58, 1.03	.08
Manage symptoms	0.01	0.17	1	1.01	0.73, 1.41	.95
Manage shortness of breath	-0.08	0.11	1	0.93	0.75, 1.14	.46
Control/mange depression	-0.06	0.15	1	0.94	0.71, 1.26	.69

*$p < .05$, OR: Odds ratio of malnutrition; CI: confidence interval; Sig: statistical significance of the OR; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

The outliner and influential observations were detected using Cook's distance. The Cook's distance indicated that the maximum value for Cook's distance was about 0.8 which was below the cut-off value 1. Although, there was no cause for concern of the outliner and influential observations, the raw data of the subjects 5 and 18 were checked and it was confirmed that all measurements were valid for these two subjects.

Research question 2-9-3: What are the significant predictors for body mass index in older adult at high risk of hospital readmission?

Age is strongly associated with body mass index, based on the previous results of the bivariate analysis and literature review. Therefore, the research question was specifically focused on "how well do the socio-economic status and participants' characteristics predict body mass index, and how well does age predict body mass index controlling for the socio-economic status and participants characteristics?" Hierarchical multiple regression analysis was employed to answer the research question. Model specifications were based on the study's hypothesised model (Figure 3.4) and the results of bivariate analysis (Section 5.3.2). Six independent variables were included in the model as predictors. They were age, incomes, educational attainment, depressive symptoms, the number of hospital re-admission risk factors, and the number of co-morbidities.

A two-stage process was used in which the variables of the socio-economic status and participants characteristics were entered first. Incomes, educational attainment, depressive symptoms, the number of hospital readmission risk factors, and the number of co-morbidities were entered at step 1, explaining 5.6% (R^2 = .056, Adjust R^2 = .025) of the variance in BMI. In the second step, age was entered into the model, and the total variance explained by the model as a whole was 15.9% (R^2 = .159), F (6, 150) = 4.72, p < .001. Age explained an additional 10.2% of the variance in BMI, after controlling for incomes, education attainment, depressive symptoms, the number of hospital re-admission risk factors, and the number of co-morbidities, R squared changed = .10, F change (1, 150) = 18.26, P < .001 (Table 5.25). In the final model, only age was statistically significant to predict BMI (β = -.34, p < .001), after controlling other variables in the model. This indicated that the BMI was dependent on age; as age increased by one year, the BMI was decreased by 0.34 kg/m^2 (95% CI: -0.49, -0.18).

Table 5.25

Hierarchical Multiple Regression Analysis of Participants' Characteristics and Socio-economic Status on Predicting Body Mass Index (BMI)

Order of entry	β	*p*	Adjusted R^2	R^2 change	Model *F*	Model *P*
Step 1			.03		1.81	.12
Education	0.05	.95				
Income	-0.05	.57				
GDS	0.05	.57				
No. of risk factors	-0.12	.19				
No. of co-morbidities	0.09	.28				
Step 2			.13	.10	4.72	< .001**
Age	-.34	.001**				

p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; GDS: Geriatric Depression Scale.

To check the assumptions for this test, the assumptions of normality and homoscedasticity were checked by inspecting the Normal Probability Plot (P-P) of the regression standardised residual and the scatterplot. The residual was roughly normally distributed with most of the points close to the line. In the scatterplot, the residuals were not perfectly rectangularly distributed; however, there was no clear pattern and as a result the assumptions of normality and homoscedasticity were not violated. When checking for multicollinearity, the Variance inflation factor (VIF) value was 1.4 which was well below the cut-off of 10, so there was no cause for concern regarding multicollinearity. Outliers and influential observations were checked by Cook's distance, and the maximum value for Cook's distance was 0.13 which was below 1, suggesting there was no issue of outliers and influential observations. Thus, the preliminary results suggested that there were no violation of the assumptions of normality, homoscedasticity, and multicollinearity.

5.3.3.4 Research question 2-10.

Based on the study's hypothesized model, what are the significant predictors for functional status in older adults at high risk of hospital readmission?

Four multiple standard regressions analyses were conducted to predict the functional status in the study respondents. The functional status was measured by using Instrumental Activities of Daily Living (IADL) and Walking Impairment Questionnaire (WIQ) which contains three measurements (walking distance, walking speed, and stair climbing). The Activities of Daily Living (ADL) was removed from the outcome measures as the majority of the respondents were still highly independent with their ADL (Median = 0, see Section 5.3.1.1). The same set of predictors was employed in all four standard regression analyses, which was suggested in the hypothesized model (Figure 3.4). There were eight predictors, namely age, educational attainment, income, depressive symptoms, the number of hospital re-admission risk factors, and the number of co-morbidities, perceived social support, and perceived self-efficacy in managing chronic disease.

The first multiple standard regression analysis was performed to predict IADL. The results of this standard multiple regression analysis indicated that the model as a whole accounted for a significant among of IADL variability, $R^2 = .44$, adjusted $R^2 = .41$, F (8, 141) = 13.97, $p < .001$. The R^2 value of .44 indicated that 44% of the variability in IADL was predicted by the independent variables in the model. As displayed in Table 5.26, among eight predictors, five of the predictors made a unique statistically significant contribution to the model. They were age ($\beta = .16$, $p = .02$), the number of hospital readmission risk factors ($\beta = .29$, $p = .001$), the number of co-morbidities ($\beta = .13$, $p < .05$), perceived self-efficacy in managing chronic disease ($\beta = -.41$, $p < .001$), and perceived social support ($\beta = .41$, $p < .001$).

These results indicated that both perceived self-efficacy in managing chronic disease and perceived social support made the strongest unique contribution to explaining the IADL, when controlling for all other variables in the model. The Beta value for age, the number of hospital readmission risk factors, and the number of co-morbidities were statistically significant but slightly lower, indicating that these three predictors made less of a contribution to explaining the IADL.

The semi-partial correlation coefficients ($S\gamma_i^2$) were calculated to assess the unique contribution of the significant predictors to R square in this set of predictors. The semi-partial correlation coefficients value was .07 for perceived self-efficacy in managing chronic disease and .12 for perceived social support. In other words, perceived social support alone uniquely explained 12% ($S\gamma_i^2$ = .12) of the variance in IADL, and perceived self-efficacy in managing chronic disease uniquely contributed 7% of variance ($S\gamma_i^2$ = .07). The number of hospital re-admission risk factors had a semi-partial correlation coefficient value of .05, indicating a unique contribution of 5% ($S\gamma_i^2$ = .05) to the explanation of variance. Age explained another unique 2% ($S\gamma_i^2$ = .02), and the number of co-morbidities contributed about 2% ($S\gamma_i^2$ = .02) of variance in IADL. These results indicated and supported that perceived social support was the strongest predictor for IADL, followed by the perceived self-efficacy in managing chronic disease, the number of risk of hospital re-admission risk factors, age, and the number of co-morbidities.

Table 5.26

Standard Multiple Regression of Eight Predictors on IADL

Predictors	B	SE	β	Sig	$S\gamma_i^2$
Age	0.03	0.02	.16	.02*	.02
Education attainment	0.03	0.07	.03	.72	
Income	-0.14	0.18	-.06	.43	
GDS	0.05	0.04	.09	.30	
No. of risk factors	0.27	0.08	.29	.01**	.05
No. of co-morbidities	0.13	0.07	.13	.05*	.02
MOS SSS	0.02	0.01	.41	.01**	.12
CDSES	-0.31	0.08	-.41	.01**	.07
Intercept = -2.01			R^2 = .44		
			Adjusted R^2 = .41		
			F (8, 141) = 13.97		

*p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

The assumptions for this test were assessed. There was no consistent pattern in the normal Probability Plot (P-P), indicating the residuals were normally distributed. Additionally, the scotterplot showed no clear and consistent pattern. Thus, the assumption of normality, linearity, and homoscedasticity were met. The VIF value was 2.48, which was well below the cut-off of 10, suggesting that the multicollinearity between independent variables was excluded. The maximum value for Cook's distance was 0.13 which was below 1, implying there was no cause for concern regarding to outliers and influential observations.

The second analysis was conducted to predict walking impairment in regard to walking distance ability. The results indicated that the model as a whole accounted for 29% of variances in walking distance, $R^2 = .29$, adjusted $R^2 = .25$, F (8, 124) = 6.46, $p < .001$. Among eight predictors, only perceived self-efficacy in managing chronic disease made a unique statistically significant contribution to the model ($\beta = .34$, $p = .05$), and explained unique 5% ($S\gamma_i^2 = .05$) of the variance in walking distance, when controlling for other independent variables in the model (Table 5.27).

Results of evaluation of assumptions confirmed that the assumption of normality, linearity, and homoscedasticity were met for this analysis. The P-P plot showed that the residuals were normally distributed, and there were no clear patterns of nonlinearity and heteroscedasticity in the scotterplot. There was no caused for concern in multicollinearity as the VIF value was 2.37, which was well below the cut-off of 10. The maximum value for Cook's distance was 0.08 which was well below 1, indicating there were no outliers and influential observations in this test.

Table 5.27

Standard Multiple Regression of Eight Predictors on Walking Impairment Questionnaire – Walking Distance

Predictors	B	SE	β	Sig	$S\gamma_i^2$
Age	-0.07	0.46	-.01	.87	
Education attainment	1.85	2.09	.07	.38	
Income	-3.66	5.43	-.05	.50	
GDS	-2.01	1.30	-.16	.13	
No. of risk factors	-2.58	2.41	-.11	.29	
No. of co-morbidities	-3.33	2.05	-.13	.11	
MOS SSS	-0.17	0.14	-.11	.22	
CDSES	6.72	2.33	.34	.05*	.05
			R^2 = .29		
			Adjusted R^2 = .25		
Intercept = 38.47			*F* (8, 124) = 6.46		

*p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

The third analysis was conducted to predict walking impairment in relation to walking speed. The results indicated that the model as a whole explained 31% of the variances in walking speed, R^2 = .31, adjusted R^2 = .26, *F* (8, 113) = 6.24, p < .001. Three predictors made a unique statistically significant contribution to the model (Table 5.28), with the perceived self-efficacy in managing chronic disease recording a highest beta value (β = .36, p < .01), followed by the number of hospital readmission risk factors (β = -.26, p = .01), and perceived social support (β = -.24, p = .01). When examining the semi-partial correlation coefficients ($S\gamma_i^2$), perceived self-efficacy in managing chronic disease uniquely explained 6% ($S\gamma_i^2$ = .06) of the variance in WIQ – walking speed. The number of hospital readmission risk factors accounted for unique 4% ($S\gamma_i^2$ = .04) of variances, and perceived social support ($S\gamma_i^2$ = .04). These results indicated that perceived self-efficacy in managing chronic disease was the strongest predictor for WIQ – Walking speed, when controlling for other independent variables in the model.

The assumptions of normality, linearity, and homoscedasticity were met for this analysis. The P-P plot showed that the residuals were normally distributed, and there were no clear patterns of nonlinearity and heteroscedasticity in the scotterplot. Additionally, when assessing the VIF for detecting multicollinearity, the VIF value was 2.30 which was well below the cut-off of 10. Hence, there was no caused for concern in multicollinearity. The maximum value for Cook's distance was 0.06 which was well below 1, indicating there were no outliers and influential observations in this test.

Table 5.28
Standard Multiple Regression of Eight Predictors on Walking Impairment Questionnaire – Walking Speed

Predictors	B	SE	β	Sig	$S\gamma_i^2$
Age	0.30	0.32	.08	.35	
Education attainment	-1.06	1.47	-.06	.47	
Income	-7.17	3.95	.16	.07	
GDS	-0.46	0.91	-.06	.61	
No. of risk factors	-4.33	1.71	-.26	.01**	.04
No. of co-morbidities	-0.06	1.43	-.01	.97	
MOS SSS	-0.24	0.10	-.24	.01**	.04
CDSES	4.93	1.65	.36	.01**	.06
			R^2 = .31		
Intercept = 5.67			Adjusted R^2 = .26		
			F (8, 113) = 6.24		

*p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital re-admission risk factors; No. of co-morbidities: Number of co-morbidities; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

The fourth analysis was conducted to predict walking impairment in relation to stair climbing. The model as a whole explained 33% of variances in WIQ-stairs climbing, R^2 = .33, adjusted R^2 = .28, *F* (8, 113) = 7.00, p < .001. Two predictors made a unique statistically significant contribution to the model (Table 5.29), with the perceived self-efficacy in managing chronic disease recoding the highest beta value (β = .48, p < .01) than the number of hospital readmission risk factor (β = -.25, p = .02). The results of the semi-partial correlation coefficients ($S\gamma_i^2$) indicated that perceived self-efficacy in managing chronic disease uniquely explained about 8.0% ($S\gamma_i^2$ = .08) of the variance in WIQ-stair climbing, and the number of hospital readmission risk factor accounted for another unique 3.6% ($S\gamma_i^2$ = .04) of variances in WIQ-stairs climbing. These results indicated that perceived self-efficacy in managing chronic disease was the strongest predictor for WIQ-stair climbing, when controlling for other independent variables in the model.

The preliminary analyses for the assumptions of normality, linearity, and homoscedasticity indicated that the assumption of normality and homoscedasticity might have been violated. The P-P plot illustrated that the residuals were not normally distributed, and there was a pattern that indicated mild heteroscedasticity in scatterplot. These results led to transformation of the variables; however, they showed a very limited improvement in residuals plots. Therefore, the raw data were used. Tabachnick & Fidell (2007) suggested that heteroscedasticity can result from a potential independent variable which has an interaction effect with other independent variables, which is not included in the regression equation.

In other words, there are other potential factors that may contribute in predicting WIQ-stair climbing, but were not included in the model. The potential factors will be addressed in more details in the discussion chapter (Chapter 6). When the VIF was assessed for detecting multicollinearity, the VIF value was 2.32 which was well below the cut-off of 10. Hence, there was no caused for concern about multicollinearity. The maximum value for Cook's distance was 0.19 which was well below 1, indicating that there were no outliers and influential observations in this test.

Table 5.29

Standard Multiple Regression of Eight Predictors on Walking Impairment Questionnaire – Stair Climbing

Predictors	B	SE	β	Sig	$S\gamma_i^2$
Age	0.20	0.39	.04	.61	
Education attainment	-0.17	1.77	-.08	.92	
Income	-3.63	4.49	-.07	.42	
GDS	-0.38	1.10	-.04	.73	
No. of risk factors	-5.03	2.03	-.25	.02*	.04
No. of co-morbidities	-2.44	1.70	-.12	.15	
MOS SSS	-0.20	0.11	-.16	.08	
CDSES	7.12	1.95	.43	.01**	.08
			R^2 = .33		
Intercept = 6.24			Adjusted R^2 = .28		
			F (8, 113) = 7.00		

*p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

5.3.3.5 Research question 2-11.

Based on the study's hypothesised model, what are the significant predictors for quality of life in older adults at high risk of hospital readmission?

Multiple standard regressions analyses were conducted to predict the quality of life in the study respondents. The quality of life was measured by using health-related quality of life SF-12 which consists of physical component score (PCS) and mental component score (MCS). The model specification was based on the hypothesized study model and results of bivariate analyses. Two standard regression analyses were performed. Both analyses included six predictors (age, depressive symptoms, the number of hospital readmission risk factors, the number of co-morbidities, perceived social support, and perceived self-efficacy in managing chronic disease).

A multiple standard regression was used to predict the PCS. The model as a whole accounted for 21% of variances in the PCS, R^2 = .21, adjusted R^2 = .17, *F* (6, 143) = 6.16, p < .001. As Table 5.30 illustrates, only the number of hospital readmission risk factors made a unique statistically significant contribution to the model (β = -.26, p = .01), when controlling for the other five independent variables in the model. Although perceived self-efficacy in managing chronic disease was not statistically significant, it had the second highest beta value (β = .21, p = .07). The results of the semi-partial correlation coefficients ($S\gamma_i^2$) indicated that the number of hospital re-admission risk factors uniquely explained about 4.0% ($S\gamma_i^2$ = .04) of the variance in PCS, and perceived self-efficacy in managing chronic disease accounted for another 2% ($S\gamma_i^2$ = .02) of variances in PCS. These results indicated that the PCS was dependent on the number of hospital re-admission risk factors, and likely influenced by perceived self-efficacy in managing chronic diseases.

The assumptions of normality, linearity, and homoscedasticity were met for this analysis. The P-P plot showed that the residuals were normally distributed, and there were no clear patterns of nonlinearity and heteroscedasticity in the scotterplot When the VIF was assessed for detecting multicollinearity, the VIF value was 2.26, which was well below the cut-off of 10. Hence, there was no cause for concern about multicollinearity. The maximum value for Cook's distance was 0.10 which was well below 1, and this eliminated the issues of outliers and influential observations for this test.

Table 5.30

Standard Multiple Regression of Six Predictors on Physical Component Score (PCS)

Predictors	B	SE	β	Sig	$S\gamma_i^2$
Age	0.14	0.12	.10	.23	
GDS	-0.41	0.35	-.12	.25	
No. of risk factors	-1.64	0.63	-.26	.01*	.04
No. of co-morbidities	-4.45	1.54	-.07	.41	
MOS SSS	-0.06	0.03	-.15	.11	
CDSES	1.06	0.57	.21	.06	.02
			R^2 = .21		
Intercept = 27.36			Adjusted R^2 = .17		
			F (6, 143) = 6.16		

*p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

A second multiple standard regression was performed to predict the MCS. The model as a whole accounted for 40% of the variances in the MCS, $R^2 = .40$, adjusted $R^2 = .38$, F (6, 143) = 16.17, $p < .001$ (Table 5.31). Two predictors made a unique statistically significant contribution to the model with perceived self-efficacy in managing chronic disease, recording the highest beta value ($\beta = .37$, $p < .01$) than depressive symptoms ($\beta = -.26$, $p = .05$), when controlling for the other independent variables in the model. The results of the semi-partial correlation coefficients ($S\gamma_i^2$) indicated that perceived self-efficacy in managing chronic disease uniquely explained about 6.0% ($S\gamma_i^2 = .06$) of the variance in MCS, and depressive symptoms explained another 3% ($S\gamma_i^2 = .06$) of variances in MCS. These results indicated that perceived self-efficacy in managing chronic disease was the strongest predictor for the MCS, followed by depressive symptoms.

The results of evaluation of assumptions confirmed that the assumption of normality, linearity, and homoscedasticity were met for this analysis. The P-P plot showed that the residuals were normally distributed, and there were no clear patterns of nonlinearity and heteroscedasticity in the scotterplot. When the VIF was assessed for detecting multicollinearity, the VIF value was 2.26 which was well below the cut-off of 10. Hence, there was no cause for concern about multicollinearity. The maximum value for Cook's distance was 0.06 which was well below 1, and this eliminated the issues of outliers and influential observations for this test.

Table 5.31

Standard Multiple Regression of Six Predictors on the Mental Component Score (MCS)

Predictors	B	SE	β	Sig	$S\gamma_i^2$
Age	0.11	0.12	.07	.35	
GDS	-1.03	0.36	-.26	.05*	.03
No. of risk factors	-0.58	0.65	-.08	.38	
No. of co-morbidities	-0.68	0.56	-.08	.23	
MOS SSS	-0.02	0.04	-.04	.63	
CDSES	2.23	0.59	.37	.01**	.06
			R^2 = .40		
Intercept = 32.86			Adjusted R^2 = .38		
			F (6, 143) = 16.17		

*p < .05, ** p < .01, GDS: Geriatric Depression Scale; No. of risk factors: Number of hospital readmission risk factors; No. of co-morbidities: Number of co-morbidities; MOS SSS: MOS Social Support Survey; CDSES: Chronic Disease Self-Efficacy Scale.

In summary, this section presented the results of relationships between the independent variables and outcome variables in the multivariate level. Three main statistical methods, which were hierarchical multiple regression, standard multiple regression, and logistic regression, were employed to determine the significant influential predictors for the outcome variables. Statistically significant findings were addressed through each research question. The results confirmed the bivariate correlation analyses in the early section, and adjusted for confounding to determine the ‘true’ relationships between independent variables and outcome variables.

An important finding was that perceived self-efficacy in managing chronic disease was more dependent on depressive symptoms (GDS) than perceived social support (MOS SSS), the number of hospital readmission risk factors, and education attainment. The results also underlined that both perceived self-efficacy in managing chronic disease and the number of hospital readmission risk factors were the most significant influential predictors across all outcome variables.

Perceived self-efficacy in managing chronic disease was a significant predictor for malnutrition risk (MST), malnutrition (SGA), Instrumental Activities of Daily Living (IADL), three aspects of walking impairment (WIQ), and health-related quality of life (PCS and MCS). The number of hospital readmission risk factors was a significant predictor for malnutrition risk (MST), Instrumental Activities of Daily Living (IADL), walking impairment – walking speed, walking impairment – stair climbing, and the physical component score (PCS). The results also indicated that other predictors such as age, depressive symptoms, and perceived social support played significant roles in predicting health outcomes. Table 5.32 summarised the results of statistically significant predictors for the outcome variable in Study Two.

Table 5.32

A summary of the Results for Statistically Significant Predictors of the Outcome Variables in Study Two.

Outcome variables	Significant predictors	Statistic methods
Self-efficacy in managing chronic disease		
CDSES	GDS; MOS SSS; Education attainment; No. of risk factors	Hierarchical multiple regression
Nutritional status		
MST	CDSES; GDS	Standard multiple regression
SGA	GDS; Age; MOS SSS – tangible support	Logistic regression
BMI	Age	Hierarchical multiple regression
Functional status		
IADL	MOS SSS; CDSES; No. of risk factors; Age; No. of co-morbidities	Standard multiple regression
WIQ – walking distance	CDSES	Standard multiple regression
WIQ – walking speed	CDSES; MOS SSS; No. of risk factors	Standard multiple regression
WIQ – stairs climbing	CDSES; No. of risk factors	Standard multiple regression
Health-related quality of life		
PCS	No. of risk factors	Standard multiple regression
MCS	CDSES; GDS	Standard multiple regression

GDS: Geriatric Depression Scale; MOS SSS: MOS Social Support Survey No. of risk factors: Number of hospital readmission risk factors; CDSES: Chronic Disease Self-Efficacy Scale; No. of co-morbidities: Number of co-morbidities.

Conclusion

This chapter has presented the results of Study One and Two. As the aims of Study One were to examine nutritional status and validate the MST, the results of Study One highlighted that the prevalence of malnutrition varies depending on the tools used. The results also indicated that the MST achieved high sensitivity and specificity when compared to the SGA. Study Two aimed to explore the relationships between self-efficacy in managing chronic disease, social support, and three health outcomes. Step by step statistical analysis approaches were undertaken, and results were presented in the following order: univariate analyses, bivariate analyses, and multivariate analyses. Table 5.32 summarized the significant influential factors for self-efficacy in managing chronic disease, nutritional status, functional status, and health-related quality of life. The results underscored that self-efficacy in managing chronic disease was a significant predictor for the three health outcomes, and self-efficacy beliefs were influenced by depression and social support.

This chapter explored the individual contribution of the independent variables on outcome variables. Further statistical modelling for testing theory is undertaken, which tests for the mediation effects, and the direct and indirect relationships between the constructs. The following chapter will present the results of testing the hypothesized theory using the Structural Equation Modelling approach.

Chapter 6: Results of Study Three

Introduction

This chapter presents the results of Study Three. Study Three aims to use a structural equation modelling (SEM) approach to test theoretical models of self-efficacy for self-managing chronic conditions in relation to health outcomes among older adults at high risk of readmission. It is hypothesised that perceived self-efficacy in managing chronic conditions and social support will be mediators of health characteristics (the number of hospital readmission risk factors, the number of co-morbidities and mental status) and three health outcomes (nutritional status, functional status, and health-related quality of life). To achieve the study aims, three research questions are addressed and five hypothesised models were proposed under the theoretical constructs of social cognitive theory to achieve the study aims.

The chapter begins by addressing issues that are related to the data, followed by the presentation and examination of the hypothesized self-efficacy for self-managing chronic disease models. The results of the testing of each model are presented in a sequence corresponding to the order of the research questions in Study Three.

6.1 Address the Data Issues

Preliminary data analyses were taken to address the issues related to data before the structural equation modelling analysis was undertaken. The issues included missing data, multivariate normality, multicollinearity and outliers. These issues were addressed in the following section.

6.1.1 Missing data.

There were 150 completed data (out of 157) in the data set, which was less than 10 percent of missing data. Cohen and Cohen (1983) stated that missing data of up to 10 percent was not considered large and was unlikely to cause problems in the interpretation of the results if the data is missing completely at random (MCAR). The expectation-maximisation (EM) algorithm analysis in SPSS generates Little's Missing

Completely At Random (Little's MCAR) Chi-Square statistic. If this statistic is not significant at an alpha level of .05, this missing data may be assumed to be missing at random (Tabachnick & Fidell, 2007). Table 6.1 summaries the Little's MCAR test for the variables that contained missing data in Study Three. None of the variables showed statistical significance, indicating the data is missing at completed random. Thus, the single imputation method, mean substitution, was able to be applied for the study as this method assumes that the data loss pattern is MCAR.

Table 6.1

Missing Data Analysis – Little's MCAR Test for the Variables of Study Three

Variables	Chi-Square	df	Sig
CDSES	139.14	126	.20
MOS SSS	47.92	87	1.00
SF-12	198.87	241	.98

CDSES: Chronic Disease Self-Efficacy Scale; MOS SSS: MOS Social Support Survey; Health-related quality of life SF-12.

6.1.2 Multivariate normality and measurement reliability.

Most of the SEM estimate statistics are based on the assumption of a normal multivariate distribution. The kurtosis index and skewness index were employed to assess the distribution of each observed variable for univariate normality to ensure that the assumption of the normal multivariate distribution are met (Kline, 2005). In this study, item parcelling techniques were applied to form the latent variables, which means that each item parcel represents one observed variable in the SEM model. In other words, each individual item parcel was examined for its normality as an observed variable. Thus, the following section firstly presents how the item parcels were formed and the results of their internal consistency reliability, and then the results of the kurtosis index and skewness index are discussed.

Table 6.2 presents the observed variables, items in the parcels, methods of constructing parcels and the results of internal consistency reliability, Cronbach's coefficient alpha (α). According to Kline (2005), reliability coefficient values of around .70 suggest "adequate", values around .80 are considered "very good", and values around .90 indicate “excellent”. For unidimensional scales, both the Geriatric Depression Scale (GDS) and Instrumental Activities of Daily Living (IADL) showed adequate internal reliability with a Cronbach’s alpha value of .79 and .74 respectively for the overall items. However, it is expected that the item parcels would have a lower Cronbach value in these two scales as Cronbach alpha values are quite sensitive to the number of items in the parcels. Thus, the mean inter-item correlation for the items was applied. The mean inter-item correlations for the item parcels were all within an optimal range of greater than .20 (Briggs & Cheek, 1986). This suggests a substantial relationship among the items.

For multidimensional item sets, three Chronic Disease Self-Efficacy Scales (CDSES) item parcels, and four MOS Social Support Survey (MOS SSS) item parcels had very good to excellent internal reliability (Cronbach’s $\alpha > .86$). The Cronbach’s α for health-related quality of life was .75 and .76 for the PCS item parcel and the MCS item parcel respectively, indicating adequate internal consistency reliability.

When examining univariate normality, the majority of the observed variables were within ± 3 of the kurtosis and skewness index as shown in Table 6.3. The Short Portable Mental Status Questionnaire (SPMSQ) was the only observed variable that had a kurtosis index of 4.59, which would not be cause for concern as it was less than the cut-off threshold, the kurtosis index of 10.0 as Kline (2005) suggested.

6.1.3 Multicollinearity and outliers.

Preliminary multiple regression analyses were performed to determine the muticolinearity using the Variance inflation factor (VIF), and using Cook’s distance to detect outliners. The results showed that all the VIF values were lower than 10 with the range from 1.03 to 2.27, indicating non-colinearity between independent variables. The value of Cook’s distance was from 0.0 - 0.22, which was well below the cut-off value 1.0, suggesting there were no potential outliers. The outliers would also be examined through the SEM analyses using the Mahalanobis distance if concerns arose.

Table 6.2

Item Parcelling and Measurement Reliabilities for Study Three

Measure	Item	Cronbach's α	Items in the parcel	Methods of constructing parcels
Multidimensional scales				
CDSES	33	.96		Domain-representative approach (Kishton & Widaman, 1994)
CDSES_1	11	.88	1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31	
CDSES_2	11	.88	2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32	
CDSES_3	11	.91	3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33	
MOS SSS	91	.97		Domain-representative approach (Kishton & Widaman, 1994)
Tangible support (SS_TAN)	4	.86	2, 5, 12, 15	
Emotional support (SS_EM)	8	.96	3, 4, 8, 9, 13, 16, 17, 19	
Affectionate support (SS_AF)	3	.88	6, 10, 20	
Positive interaction support (SS_POS)	4	.91	7, 11, 14, 18	
SF-12	12	.84		Domain-representative approach (Kishton & Widaman, 1994)
PCS	6	.75	1, 2, 3, 4, 5, 8	
MCS	6	.76	6, 7, 9, 10, 11, 12	
Unidimensional scales				
GDS	15	.79		Item-to Construct balance/ single factor method (Little. et al, 2002)
GDS 1	5	.56 (.22)[a]	1, 3, 6, 9, 15	
GDS 2	5	.53 (.22)[a]	4, 5, 7, 11, 13	
GDS 3	5	.58 (.21)[a]	2, 8, 10, 12, 14	
IADL	7	.74		Systematically group items (Bandalos & Finney, 2001)
IADL 1	3	.64 (0.25)[a]	1, 2, 3, 4	
IADL 2	4	.56 (0.35)[a]	5, 6, 7	

a = Mean inter-item correlation for the items.

Table 6.3

Results of kurtosis Index and Skewness Index for each Observed Variable (Indicator) to determine Univariate Normality in Study Three

	CDSE_1	CDES_2	CDSE_3	GDS_1	GDS_2	GDS_3	SPMSQ		No. of risk factors
Kurtosis	.51	.33	.30	1.57	2.69	.17	2.22		-.36
Skewness	-.70	-.62	-.74	1.35	1.45	.91	4.59		.50
(Continue)	SS_TAN	SS_EM	SS_AF	SS_POS	IADL_1	IADL_2	PCS	MCS	No. of co-morbidity
Skewness	-.73	-.35	.39	-.49	-.54	1.15	.11	-.55	.58
Kurtosis	-.58	-.77	-1.16	-.68	.94	.76	.40	-.19	.61

Chronic disease self-efficacy scale: Three 11-item parcels: item parcel 1(CDSE_1), item parcel 2 (CDSE_2), item parcel 3 (CDSE_3), Geriatric depression scale: Three 5-item parcels: item parcel 1 (GDS_1); item parcel 2 (GDS_2), item parcel 3 (GDS_3), MOS social support survey: Four facet-item parcels: Tangible support item parcel (SS_TAN), Emotional/info support item parcel (SS_EM), Affectionate support item parcel (SS_AF), Positive interaction support item parcel (SS_POS), Instrumental activity of daily living (IADL): Two 3 and 4-item parcels: item parcel 1 (IADL_1), item parcel 2 (IADL_2), Health- related quality of life SF-12 item parcels: Two facet-item parcels: Mental component score item parcel (MCS), Physical component score item parcel (PCS), SPMSQ: Short Portable Mental Status Questionnaire, No. of risk factors: Number of hospital readmission risk factors, No. of co-morbidities: number of co-morbidities.

6.2 Testing Theoretical Models for Chronic disease Self-Efficacy

The model specification was based on the hypothesized study model (Figure 3.4). Specifically, this study addressed the following research questions:

3-1. Does the level of chronic disease self-efficacy mediate the relationship between the health characteristics and health outcomes?

> H_1: Self-efficacy will have a mediation effect between health characteristics and health outcomes in older adults at high risk of hospital re-admission.

3-2. Does the perceived social support mediate the relationship between the characteristics and health outcomes?

> H_1: Perceived social support will have a mediation effect between the health characteristics and health outcomes.

3-3. Does social support mediate the relationship between health characteristics and chronic disease self-efficacy? Also, does chronic disease self-efficacy mediate the relationship between social support and health outcomes in older adults at high risk of hospital re-admission?

> H_1: Social support and self-efficacy in managing chronic disease will have mediation effects on the relationships above.

The following results of the model testing are addressed in a sequence corresponding to the order of the research questions in Study Three. A two-step SEM analysis approach was employed. The measurement models were examined using confirmatory factor analysis first, and then simultaneous estimation of the measurement and structural models were explored. Statistical significance will be reported at the conventional $p < .05$ level (two-tailed).

6.2.1 Model testing: The mediator effect of chronic disease self-efficacy.

Research question 3-1: Does the level of chronic disease self-efficacy mediate the relationship between the health characteristics and health outcomes?

H_1: Self-efficacy will have a mediation effect between health characteristics and health outcomes in older adults at high risk of hospital readmission.

The hypothesized conceptual model for research question 3-1 was presented in Figure 6.1. This model was developed to specifically test the mediated effect of self-efficacy in managing chronic conditions on three health outcomes. The model contained 6 latent variables: health characteristics, depression, self-efficacy in managing chronic conditions, nutritional status, functional status and health related quality of life. Health characteristics were operationalized as a latent construct consisting of three formative indicators measuring: (1) number of hospital re-admission risk factors, (2) the number of co-morbidities and (3) mental status (measuring by SPMSQ). The rest of the five latent variables were operationalized as reflective latent variables. Thus, these five latent variables were assessed as a five-factor measurement model, and then the validity of the formative constructs were examined for the formative latent variable (health characteristics). Finally, the full structural model was assessed.

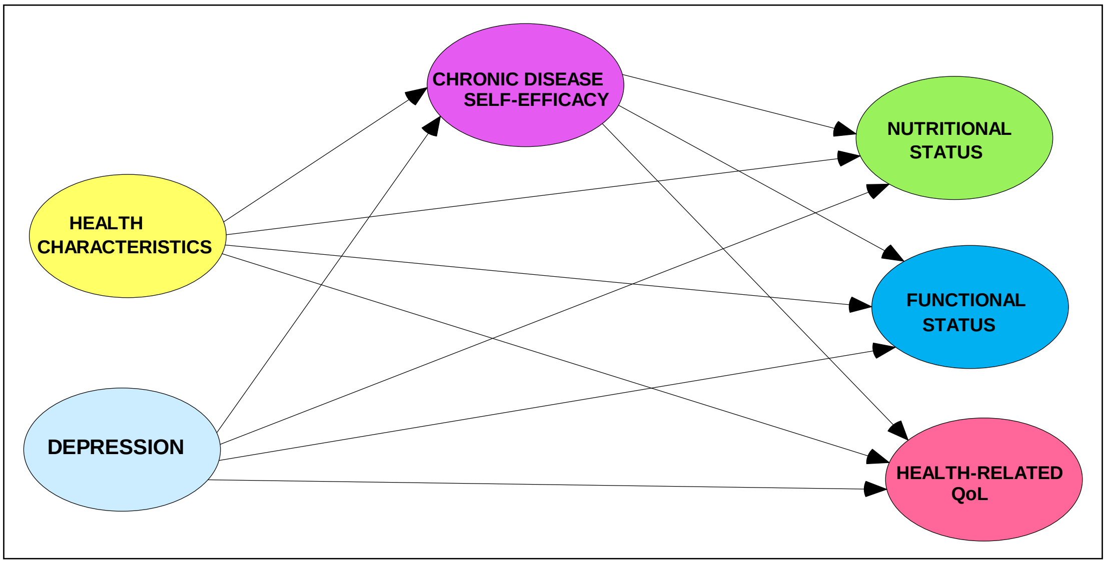


Figure 6.1. Diagram of the Proposed Conceptual Models of Chronic Disease Self-Efficacy Mediation on Three Health Outcomes.

6.2.1.1 *The measurement model of self-efficacy.*

A confirmatory factor analysis was conducted to estimate whether the hypothesized five-factor model fits the data. The results indicated that the data fitted the hypothesized five-factor model well, χ^2 (N = 157, df = 44) = 51.3, p = .209; χ^2/df ratio = 1.17; GFI = .95; AGFI = .91; CFI = .99; SRMR = .02; RMSEA =.03 with the 90% confidence interval (CI) .00 to .06. Figure 6.2 shows that all the factor loadings were significant at $p < .001$ and the standardized loadings ranged from a low of .71 to a high of .98. Figure 6.2 also shows that most of the factors were significantly inter-correlated with correlations ranging from .07 to .84, except for nutritional status which did not significantly correlate to depression, chronic disease self-efficacy and functional status. The results of the square multiple correlations (SMC) ranged from .50 to .97, indicating substantive item reliabilities (Table 6.4). As Cunningham (2008) suggested, item reliabilities exceeding .50 and corresponding to approximate factor loadings of .70 are desirable, although values of item reliabilities exceeding .30 seem acceptable.

Table 6.4 also shows the pattern and structure coefficients to determine whether constructs in measurement models are empirically distinguishable. Inspection of the structure coefficients for these five factors indicated a clear distinction between the items comprising the respective factors (see bolded figure in Table 6.3) and the remaining items. Additionally, the correlations between latent constructs were all less than .90 and satisfactorily suggested a five-factor discriminant validity (Cunningham, 2008). The results of Cronbach’s alpha, which are shown in Table 6.1 and the results presented above, indicate that this five-factor reflective measurer was reliable, convergent and discriminant. Finally, an examination of standardized residues suggested that none of the standardized residuals exceeded a magnitude of 2 and hence, there was no indication of misfit between the model and the data.

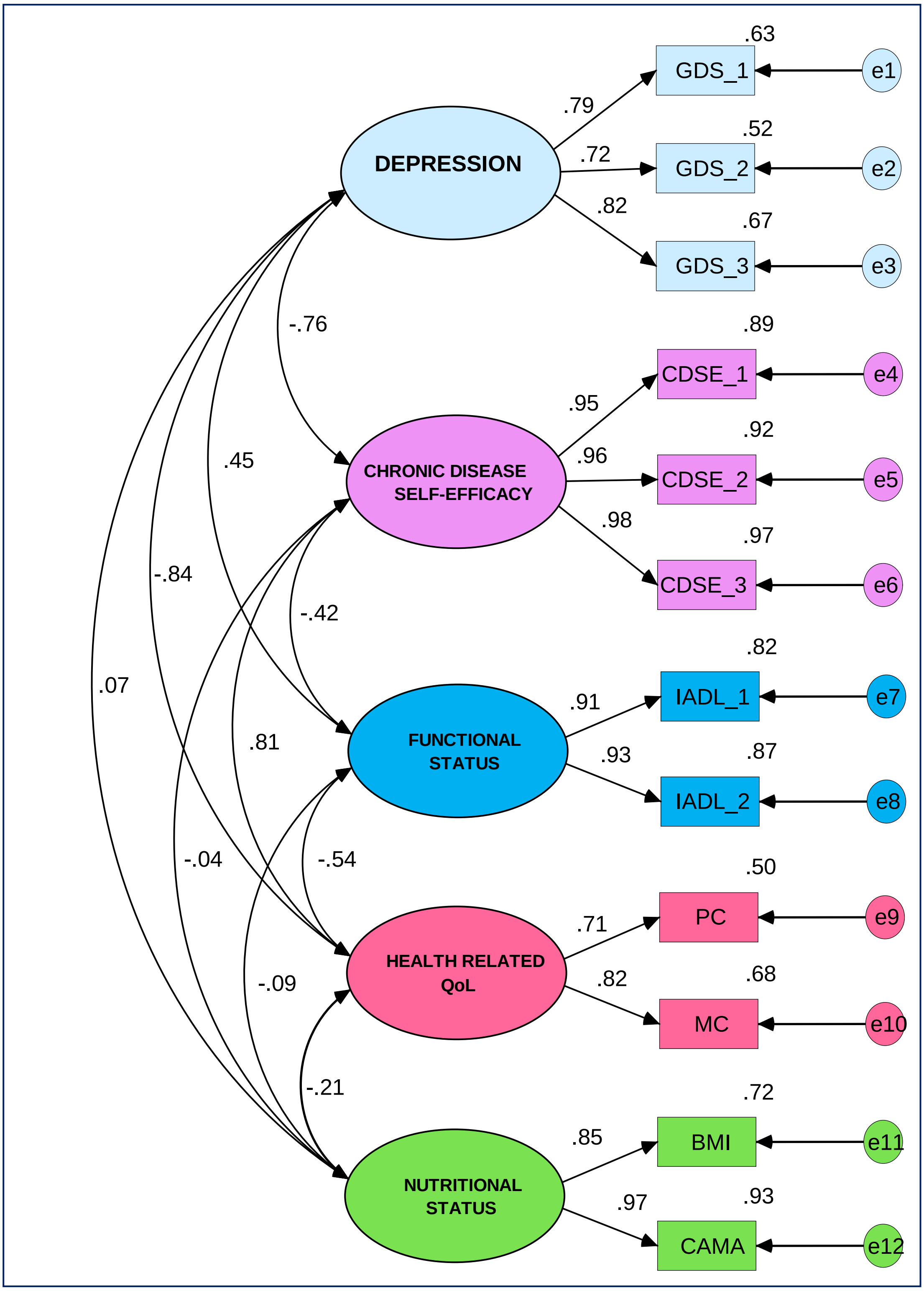


Figure 6.2. Standardized Parameter Estimates for a Five-Factor Self-Efficacy Mediation Model.

Table 6.4
Correlations, Factor Pattern and Construct Coefficients for Five Latent Variables and Item Reliabilities

	Nutritional status	Health related QoL	Functional status	Chronic disease self-efficacy	Depression	Squared Multiple Correlations (item reliabilities)
Health-related QoL	-.210					
Functional status	-.094	-.539				
Self-efficacy	-.045	.812	-.423			
Depression	.073	-.838	.449	-.764		
CAMA	**.966**	-.203	-.091	-.043	.071	.933
BMI	**.847**	-.178	-.080	-.038	.062	.718
MC	-.173	**.824**	-.444	.669	-.691	.679
PC	-.149	**.710**	-.383	.576	-.595	.504
IADL_1	-.085	-.489	**.908**	-.393	.418	.824
IADL_2	-.087	-.501	**.930**	-.384	.408	.865
CDSE_1	-.042	.768	-.400	**.946**	-.722	.894
CDSE_2	-.043	.777	-.405	**.957**	-.731	.917
CDSE_3	-.044	.799	-.416	**.983**	-.751	.967
GDS_1	.058	-.688	.356	-.606	**.793**	.629
GDS_2	.053	-.603	.323	-.549	**.719**	.517
GDS_3	.060	-.665	.369	-.627	**.821**	.674

Notes. Table values are standardized parameter estimates.

6.2.1.2 Validating the formative measurement model for self-efficacy.

The validity of a formative construct was assessed by including at least two unrelated latent constructs with reflective indicators (MacCallum & Browne, 1993; Roberts & Thatcher, 2009). Figure 6.3 depicts the hypothesized model. The structure of the health characteristics was modelled as a formative first-order construct with three freely correlated indicators: (1) the number of hospital readmission risk factors, (2) the number of co-morbidities and (3) mental status (measuring by SPMSQ). Self-efficacy in managing a chronic condition (chronic disease self-efficacy) and depression were each modelled as reflective first-order constructs. Two approaches were taken to obtain construct validity and nomological validity.

Firstly, to assess the construct validity of the formative construct, the parameters estimated for health characteristics' structure indicators were examined. Two indicators contributed significantly to the health characteristics' construct (Figure 6.3). These were the number of hospital readmission risk factors ($\beta = .47$, $p < .05$) and the number of co-morbidities ($\beta = .19$, $p < .05$). The mental status was retained to ensure sufficient width of coverage for capturing the content of the construct, although it was not statistically significant ($\beta = .01$, $p < .05$). Scholars strongly recommended that conceptual considerations must always be taken into account when eliminating indicators (Bollen & Lennox, 1991; Petter et al., 2007; Roberts & Thatcher, 2009).

It is also important to examine the error term (also referred to as the disturbance term) in formative constructs to gather insights into the measurement of the formative construct (Diamantopoulos, 2006; Petter et al., 2007; Roberts & Thatcher, 2009). Diamantopolous (2006) recommended the following guidelines for examining error term values based on Cohen's (1988) guidelines for multiple regression: f2 values of .02 ($R^2 = .0196$) refer to a small effect size, .15 ($R^2 = .13$) suggest moderate effect size, and .35 ($R^2 = .26$) indicate large effect size. The health characteristics' structure indicators explained 31% of the variance in the health characteristics' formative latent variable, which meets the criteria for a large effect size. In other words, the entire contents of the construct under study were appropriately captured.

A second approach to examine nomological validation involved linking the measure to the other two constructs with which it would be expected to be related (Roberts & Thatcher, 2009; Straub et al., 2004). Results in the form of standardized parameters are presented in Figure 6.3. The results showed that the health characteristics' structure had a significant relationship with chronic disease self-efficacy (β = -.90, p < .01) and depression (β = .85, p < .01). Health characteristics accounted for 80% of the variance in chronic disease self-efficacy (R^2 = .80) and 73% of variances in depression (R^2 = .73). The model provided an adequate fit to the observed data, χ^2 (N = 157, df = 22) = 15.76, p = .828; χ^2/df ratio = .72; GFI = .98; AGFI = .96; CFI = 1.0; SRMR = .02; RMSEA = .01 (90% CI: .00 to.04), and all of the standardized residual co-variances were less than two in magnitude. Hence, the validity of the health characteristics' formative model was obtained. The next section presents the full structural model for the self-efficacy mediating model.

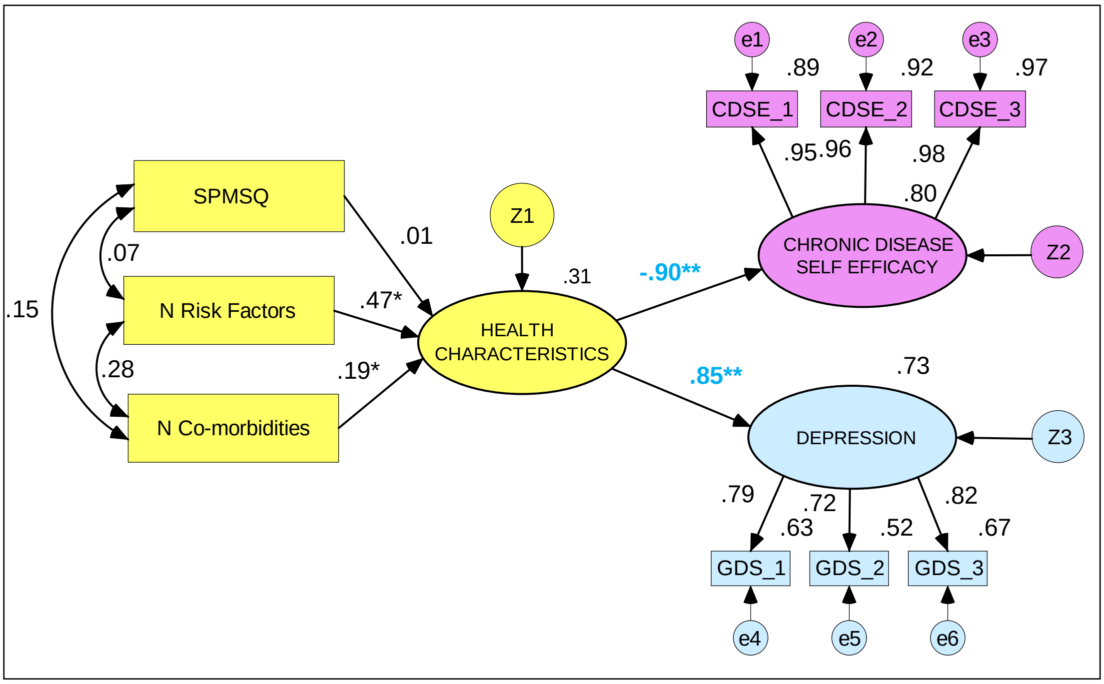


*Figure 6.3.*Standardized Parameter Estimates for the Formative Measurement Model.

Note: SPMSQ: Short Portable Mental Status Questionnaire, N Risk factor: Number of hospital readmission risk factors, N Co-morbidities: Number of co-morbidities.

6.2.1.3 *Full structural model of chronic disease self-efficacy.*

A full structural equation model reflecting the research question and hypothesis 3-1 consisted of four exogenous (number of hospital readmission risk factors, number of co-morbidities, mental status and depression) and five endogenous or dependent factors (health characteristics, chronic disease self-efficacy, nutritional status, functional status and health related quality of life). Thus a five-factor measurement model incorporating a formative construct was tested to explore relationships between the constructs and mediating effects.

To examine the mediating effect, a few criteria must be met for a variable to be designated as a mediator, as guided by Baron and Kenny (1986). Firstly, the predictors (in this study, the health characteristics and depression) must have a significant correlation with the dependent measures (nutritional status, functional status, and health related quality of life) and the mediator (self-efficacy in managing chronic disease). Secondly, the mediator also needs to be significantly related to the dependent measures. The final step is to examine for a full or partial mediation effect. For a full mediation, the direct path between the predictor and the dependent variable must become non-significant in the presence of the mediator.

In terms of partial mediation, the direct path between the predictor and the dependent variable remains significant, but is diminished in the presence of the mediator. Additionally, it is important to clarify a potentially confusing point about mediated effects and indirect effects. An important distinction is that the presence of mediation effects implies that the total effect between the predictor and the dependent variable was present initially, however, if the initial relationship between the predictor and the dependent variable was not significant, then this would be an indirect effect.

When conducting the initial hypothesized model (see Figure 6.4 - Model 3.1a), an error-message of negative variances for the e11 (nutritional status-BMI) was detected, making it impossible to estimate the model. Blunch (2008) stated that often the cause of negative variances is due to the problematic nature of existing correlations among the indicators for the same latent variable. The indicators should be sufficiently different, but nevertheless different enough, to measure the same concept (Blunch, 2008). In this case, both BMI and CAMA were measuring body composition, thus these two correlating indicators might be too similar. Blunch (2008) suggested that omitting one of the indicators may improve the estimation. However, one indicator for a construct is not recommended in SEM (Kline, 2005). Thus, the nutritional status construct was unable to be operationalized and hence, this construct was replaced by using one observed variable (BMI). The respecified, hypothesized model with the standardized solution for the test of the mediation model is presented in Figure 6.5 (Model 3.1b).

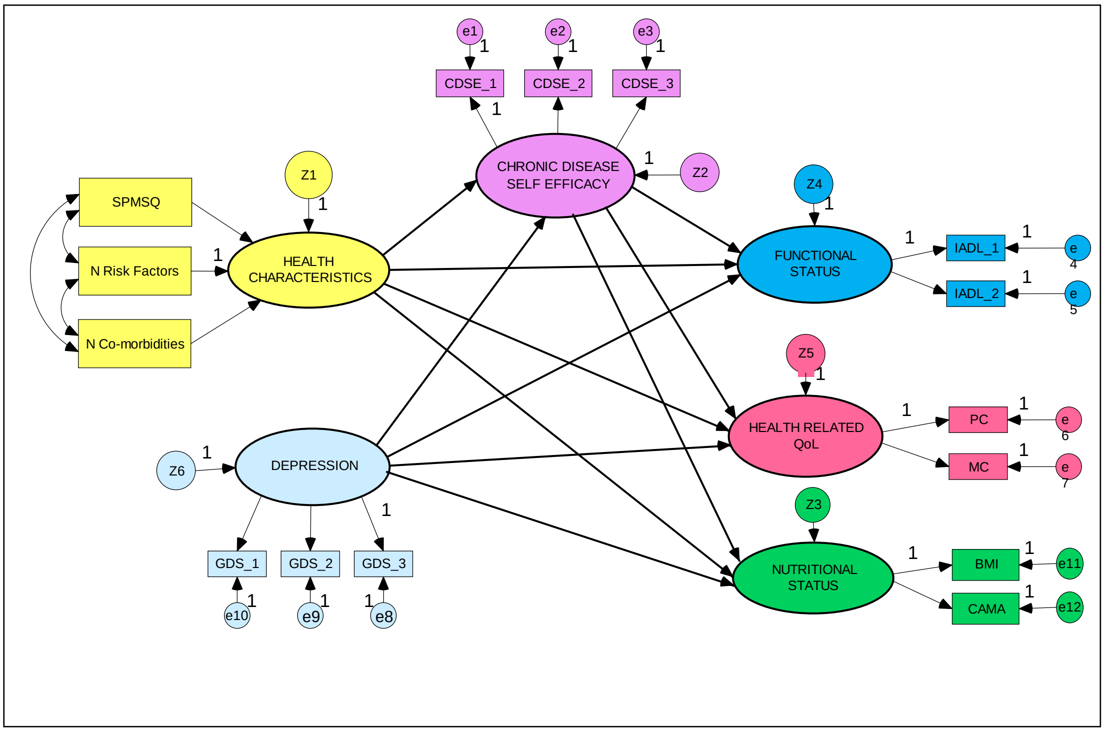


Figure 6.4. Hypothesized Chronic Disease Self-Efficacy Mediating Model (Model 3.1a).

The revised model (Figure 6.5) did not fit the data well χ^2 (N = 157, df = 64) = 106.6, p = .001; χ^2/df ratio = 1.67; GFI = .91; AGFI = .86; CFI = .97; SRMR = .107; RMSEA = .065 (90% CI: .04 to.09). An inspection of the standardized residual co-variances matrix showed that the standardized residual ranged from 2.11 to a high of 4.56 and this was detected for the following items: the number of co-morbidities, the number of hospital readmission risk factors and three depression items. The results of the regression weight modification indices also suggested that a path should be added between health characteristics and depression to improve the model's fit (Modification indices: health characteristics → depression = 24.10). In terms of theoretical considerations, the health status did influence and predict depression as suggested by the literature. Thus, a respecified model added a path between health characteristics and depression (Figure 6.6 – Model 3.1c).

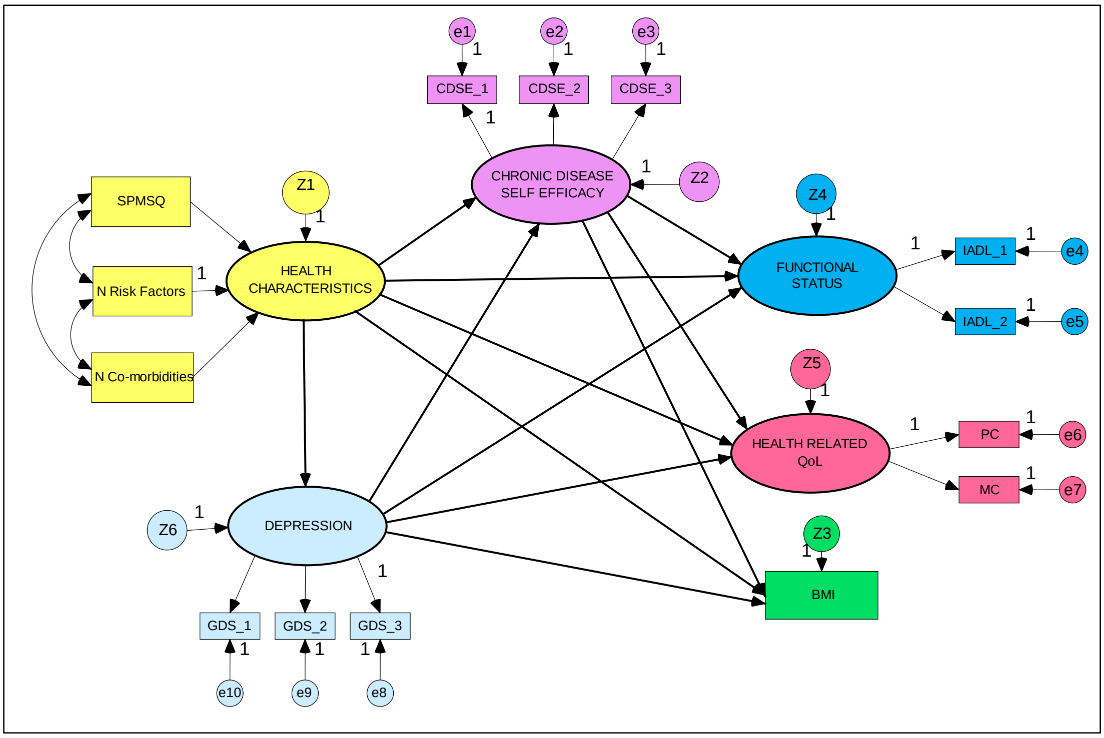


Figure 6.5. Hypothesized Chronic Disease Self-Efficacy Mediating Model (Model 3.1b).

A review of the respecified hypothesized model (Figure 6.6) showed that the model provided an adequate fit to the observed data, χ^2 (N = 157, df = 63) = 76.1, p = .124; χ^2/df ratio = 1.21; GFI = .93; AGFI = .89; CFI = .99; SRMR = .038; RMSEA = .037 (90% CI: .00 to.06). All of the standardized residual covariances were less than two in magnitude (from a low of .018 to a high of 1.67). The model respectively explained 32% of variance in functional status, 84% of variance in health related quality of life and only 4% of variance in BMI. The health characteristic predicted a 32% variance in depression. Initial testing of the respecified hypothesized model showed that the preconditions for mediation were met in two instances. These were that chronic disease self-efficacy potentially mediated both the relationship between health characteristics and health related quality of life, and the relationship between depression and health related quality of life when controlling for other factors in the model.

The health characteristics had significant direct effects on health related quality of life (β = -.32, p = .005) and chronic disease self-efficacy (β = -.25, p = .012). The chronic disease self-efficacy was significantly related to health related quality of life (β = -.27, p = .038). Thus, chronic disease self-efficacy served as a partial mediator of the relationship between health characteristics and health related quality of life. Depression contributed significantly to chronic disease self-efficacy (β = -.62, p < .001) and health related quality of life (β = -.46, p < .001). Chronic disease self-efficacy related significantly to health related quality of life (β = -.27, p = .038). Thus, chronic disease self-efficacy partially mediated the relationship between depression and health related quality of life. The chronic disease self-efficacy was not significantly related to either functional status (β = .03, p = .875) or BMI (β = -.08, p = .583), and as a result, chronic disease self-efficacy did not support the mediation between health characteristics, depression and these two health outcomes.

Table 6.5 shows the standardized total effects, direct effects and indirect effects of the final respecified model (Model 3.1c). The health characteristics had the strongest total effect on three health outcomes. The total effect of health characteristics on functional status was .58 and comprised a direct effect of .48 and an indirect effect via depression of .10. Health characteristics had the strongest total effect on health related quality of life of -.74 and comprised a direct effect of -.32 and an indirect effect through depression of -.42. Finally, health characteristics had a total effect of -.33 on BMI (direct -.24 and indirect via depression of .02). Additionally, the health characteristics had a total and direct effect of .57 on depression, and a total effect of .61 on chronic disease self-efficacy which comprised a direct effect of -.25 and an indirect effect via depression of -.36. For depression, the total and direct effect on chronic disease self-efficacy was -.61, and a weak total effect of .22 on functional status (direct .20 and indirect via chronic disease self-efficacy of .02). Depression also had a strong total effect of -.63 on health related quality of life and consisted of a direct effect of -.46 and an indirect effect via chronic disease self-efficacy of -.17. Finally, the total effect of depression on BMI was .21 (direct .16 and indirect via chronic disease self-efficacy of .05).

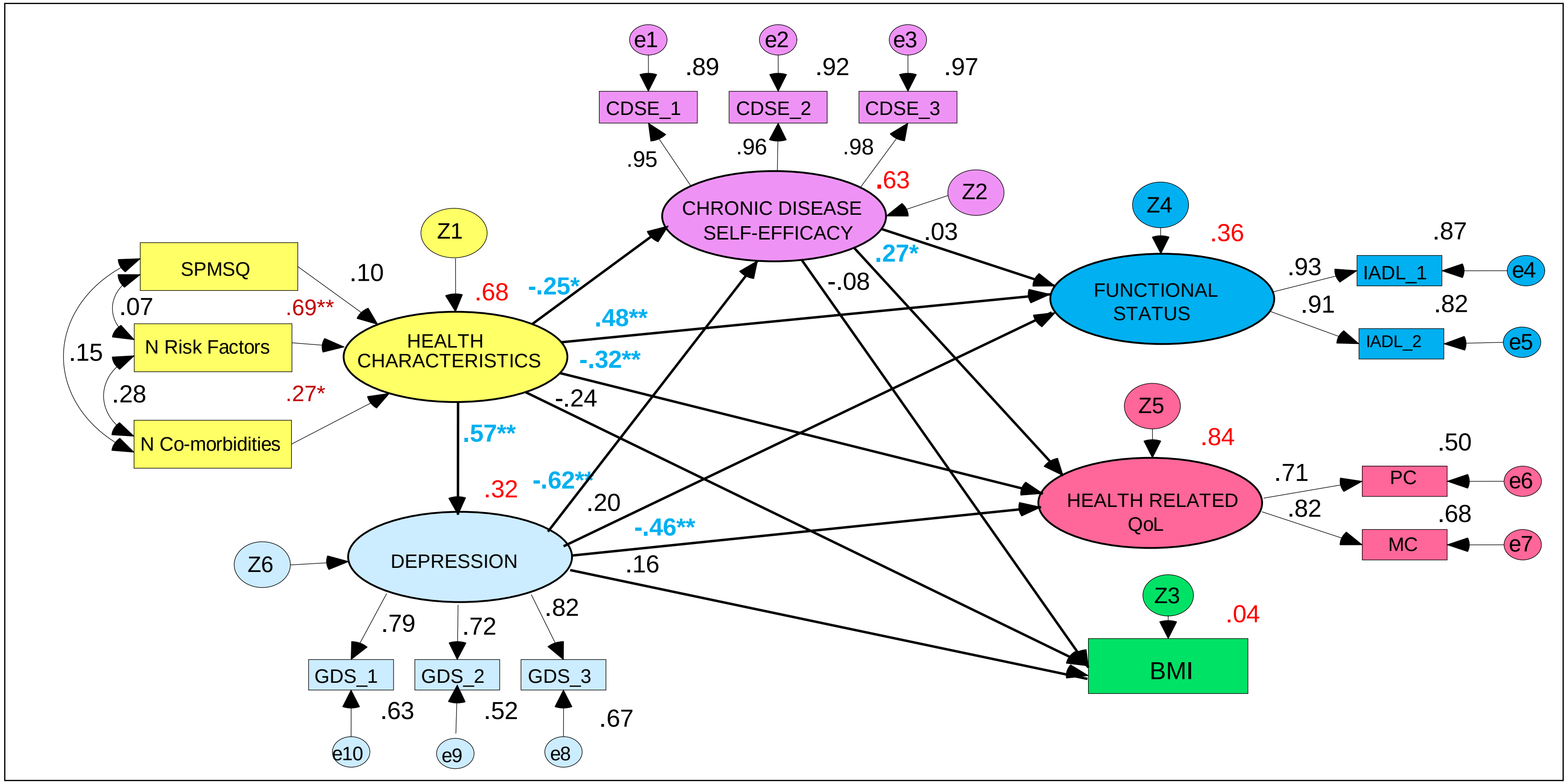


Figure 6.6. Hypothesized Chronic Disease Self-Efficacy Mediating Model (Model 3.1c).

"*" $p < .05$; "**" $p < .001$. Note that having better functional status is indicated by lower scores.

Table 6.5

Standardized Total Effects, Direct Effects and Indirect Effects of Self-Efficacy Mediating Model (Model 3-1c)

	Health characteristics	Depression	Chronic disease self-efficacy
Total effects			
Depression	.57	-	-
Chronic disease self-efficacy	-.61	-.62	-
Functional status	.58	-.22	.03
Health related quality of life	-.74	-.63	.27
BMI	-.33	.21	-.08
Direct effects			
Depression	.57	-	-
Chronic disease self-efficacy	-.25	-.62	-
Functional status	.48	.20	.03
Health related quality of life	-.32	-.46	.27
BMI	-.24	.16	-.08
Indirect effects			
Depression	-	-	-
Chronic disease self-efficacy	-.36	-	-
Functional status	.10	-.02	-
Health related quality of life	-.42	-.17	-
BMI	.09	.05	-

Note: “ –“ no pathway between the two variables.

6.2.2 Model testing: The mediator effect of social support.

Research question 3-2: Does the perceived social support mediate the relationship between the health characteristics and health outcomes?

> H_1: Perceived social support will have a mediation effect between the health characteristics and health outcomes.

The hypothesised conceptual model for research question 3-2 was presented in Figure 6.7. This model was developed to specifically test the mediated effect of perceived social support on three health outcomes. The model contained 6 latent variables: health characteristics, depression, social support, nutritional status, functional status and health related quality of life. Health characteristics were operationalized as a latent construct consisting of three formative indicators measuring: (1) number of hospital readmission risk factors, (2) number of co-morbidities and (3) cognitive status (measuring by SPMSQ). The rest of the five latent variables were operationalized as reflective latent variables. However, previous results (see section 6.2.1.3) suggested that BMI and CAMA were too similar to measure the same construct, thus the nutritional status construct was replaced by measuring an observed variable (BMI) for the rest of the analysis.

A four-factor model (depression, social support, functional status and health related quality of life) was assessed as a four-factor reflective measurement model first and then the formative measurement model (health characteristics) was examined for its validity. Finally, the full structural model was tested simultaneously.

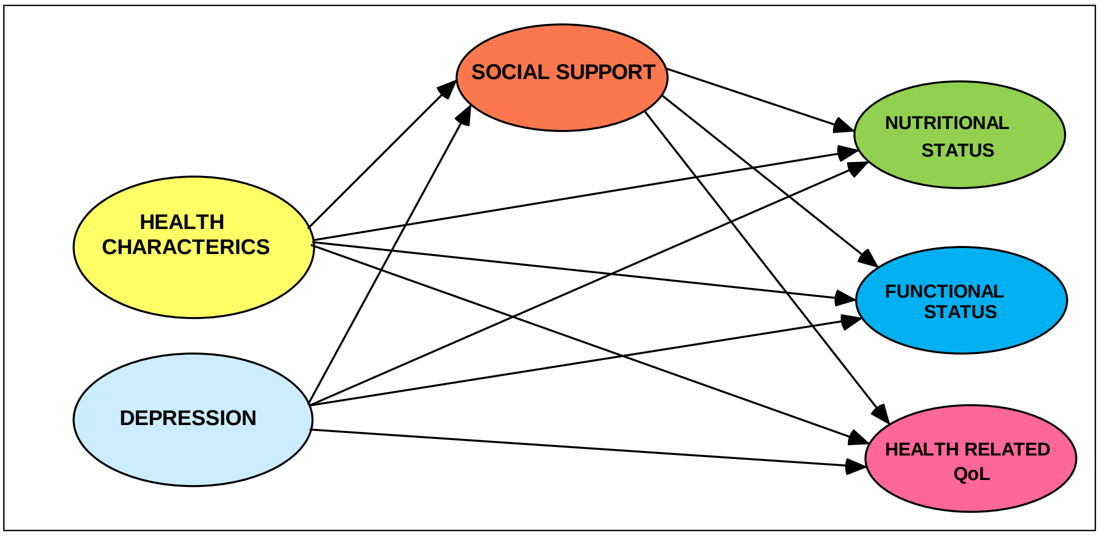


Figure 6.7. Diagram of the Proposed Perceived Social Support Mediated on Three Health Outcome Model.

6.2.2.1 Measurement model of social support.

A confirmatory factor analysis was performed to test the four factor model (Figure 6.8), an examination of the model fit statistics suggested that the model provided adequate fit to the data, , χ^2 (N = 157, df = 38) = 51.9, p = .07; χ^2/df ratio = 1.4; GFI = .95; AGFI = .91; CFI = .99; SRMR = .038; RMSEA =.048 (90% CI: .00 to.08). Investigation of the standardised residual covariances showed that all of the standardised residual was less than 2 magnitudes with the highest value of 1.44. All factor loadings were significant at $p < .001$ and within desirable ranges with the lowest standardized loadings of .71 to the highest of .95. Similarly, Table 6.5 shows that all of the square multiple correlations exceeded 0.50 (.51 to .90), providing strong evidence of item reliabilities.

With regard to the discriminant validity, an examination of the structure coefficients in Table 6.5 shows a clear distinction between the items comprising the respective factors and remaining items, indicating discriminant validity. The factors were all significantly inter-correlated with correlations ranging from .33 to -.84, except for functional status which was not significantly correlated with perceived social support (γ = .03, p = .70) (Figure 6.8). The results of construct correlation also supported the discriminant validity, as none of the correlations were greater than .90.

Thus, the analysis provided evidence that the four-factor reflective measures were reliable as well as convergent and discriminant.

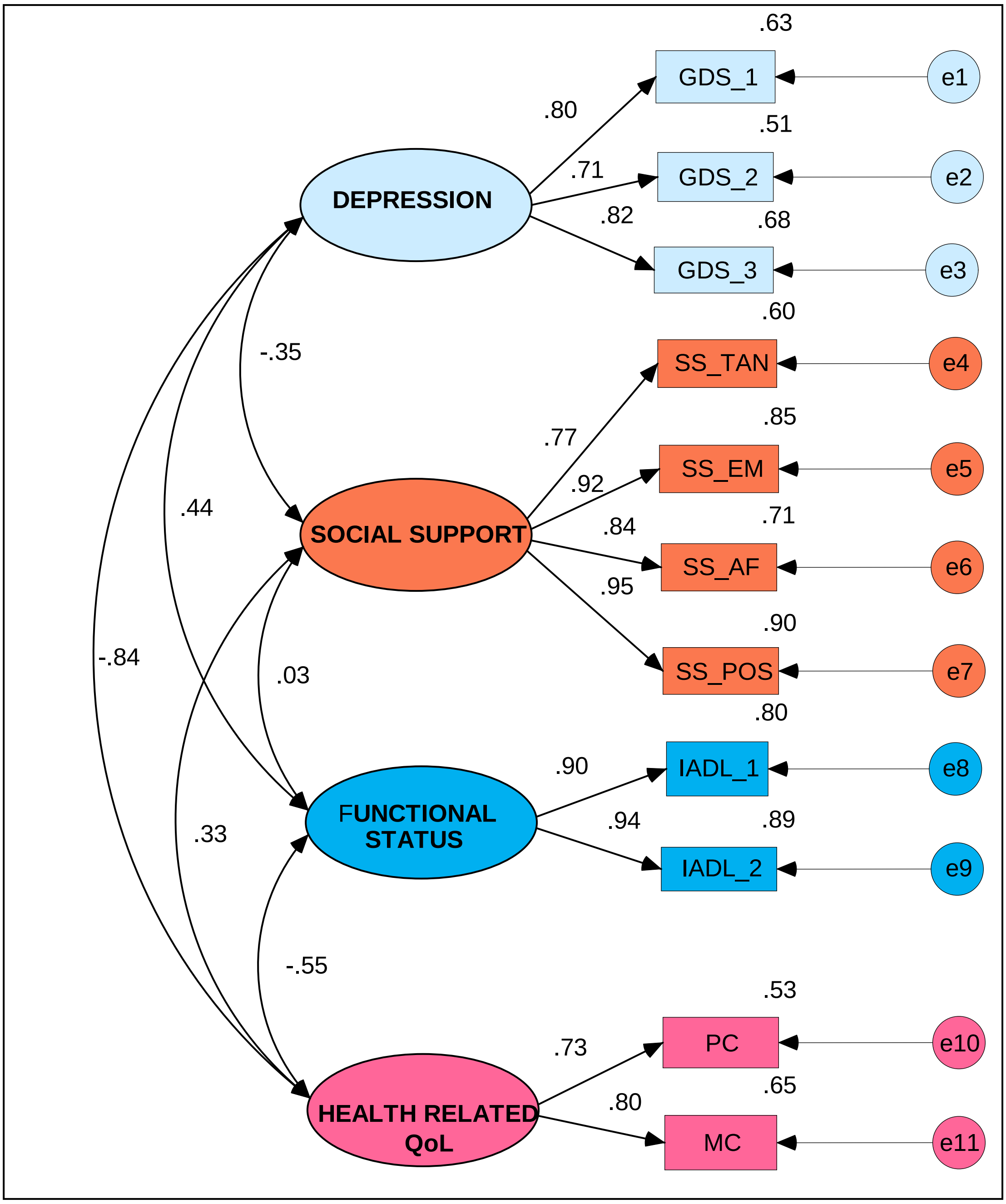


Figure 6.8. Standardized Parameter Estimates for a Four-Factor of Perceived Social Support Mediating Measurement Model.

Table 6.6

Correlation, Factor Pattern and Construct Coefficients for Four Latent Variables and Item Reliabilities

	Health-related QoL	Functional status	Social support	Depression	Item reliability (SMC)
Functional status	-.55				
Social support	.33	.03			
Depression	-.84	.44	-.35		
MC	**.80**	-.44	.27	-.68	.65
PC	**.73**	-.40	.24	-.61	.53
IADL_1	-.52	**.94**	.03	.40	.80
IADL_2	-.49	**.90**	.03	.42	.89
SS_POS	.31	.03	**.95**	-.33	.90
SS_AF	.28	.03	**.84**	-.29	.71
SS_EM	.30	.03	**.92**	-.32	.85
SS_TAN	.25	.03	**.77**	-.27	.60
GDS_1	-.67	.35	-.28	**.80**	.63
GDS_2	-.60	.32	-.25	**.71**	.51
GDS_3	-.69	.36	-.25	**.82**	.68

Notes: Table values are standardized parameter estimates.

6.2.2.2 Validating the formative measurement model for social support.

The SEM approach was undertaken to test and validate the hypothesized formative measure (Figure 6.9). The construct validity and the nomological validity were examined for the construct of the health characteristics which was a formative first-order construct with three freely correlated indicators (the number of hospital readmission risk factors, the number of co-morbidities, and mental status (measuring by SPMSQ). Assessing the construct validity, involves measuring the contribution of each formative indicator to the variance of the construct and the indicator weights are the evidence of construct validity (Petter et al., 2007; Roberts & Thatcher, 2009). For inspecting the nomological validity, it is necessary to assess the relationship between the measure to other constructs which would be expected to be related (Roberts & Thatcher, 2009; Straub et al., 2004).

In order to assess nomological validity, the following criteria are required. Firstly, the formative construct must emit two paths to at least two unrelated latent constructs with reflective indicators. This approach also is part of an identification of formative indicator construct (MacCallum & Browne, 1993; Roberts & Thatcher, 2009). In this case, depression and social support were each modelled as reflective constructs. Secondly, a theoretical relationship is posited to exist between the constructs in the model (Roberts & Thatcher, 2009; Straub et al., 2004). The hypothesized model as shown in Figure 6.9 fulfilled these requirements. The model was reasonably well fit to the data, χ^2 (N = 157, df = 30) = 35.4, p = .23; χ^2/df ratio = 1.18; GFI = .96; AGFI = .92; CFI = .99; SRMR = .037; RMSEA = .034 (90% CI: .00 to.07). The standardized residual co-variances ranged in magnitude from a low of .001 to a high of 1.52.

As Figure 6.9 shows, the parameters estimated for health characteristics structure indicators, among these three indicators only the number of hospital readmission risk factors made a strong, significant contribution to the health characteristic construct (β = .73, p < .05). These three indicators together explained 63% of the variance in the health characteristics formative latent variable, which meets the criteria for a large effect size, which indicated that the entire content of the construct under study was appropriately captured. Thus, the other two indicators (the number of co-morbidities β = .18, p > .05; the mental status β = .001, p > .05) were retained in the model as this is important on a conceptual level, although they were not statistically significant. Having indicators eliminated could result in a measure that captured only part of the construct, and hence the nature of the construct would have been altered (Bollen & Lennox, 1991; Little et al., 1999; Roberts & Thatcher, 2009).

For nomological validation, the results showed that the health characteristics structure was significantly related to perceived social support (β = -.58, p < .01) and depression (β = .59, p < .01). The health characteristics explained 34% of variances in perceived social support (R^2 = .34) and 35% of variances in depression (R^2 = .35). In summary, an inspecting of the analysis provided the evidence of the construct and nomological validity for this formative measure.

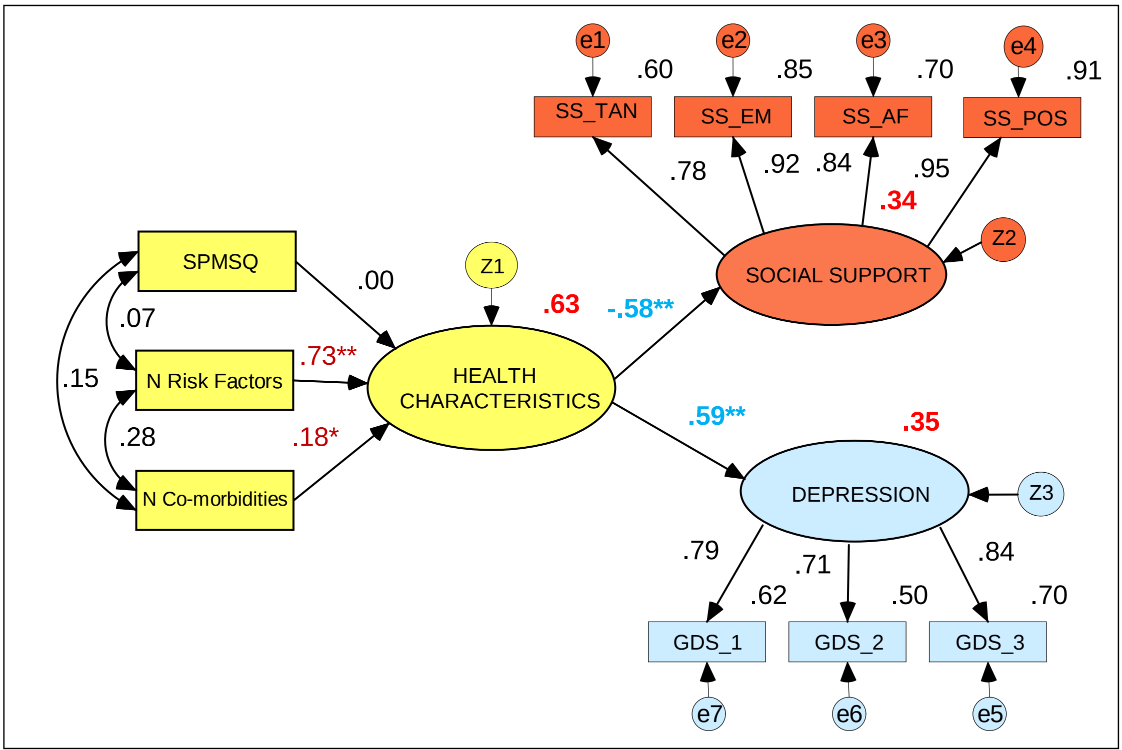


Figure 6.9. Standardized Parameter Estimate for the Formative Measurement Model (The Health Characteristics).

Note: "*" p < .05; "**" p < .001.

6.2.2.3 Full structural model of social support.

A full structural equation model addressing the research question and hypothesis 3-2 was comprised of three exogenous (the number of hospital readmission risk factors, the number of co-morbidities, mental status) and six endogenous (the health characteristics, depression, social support, functional status, health related quality of life, and BMI). The full model was examined through a four-factor measurement model (social support, depression, functional status, and health related quality of life) incorporating a formative construct (health characteristics) and an observed variable (BMI) (Figure 6.10).

In examining the model, there was a reasonably good fit of the hypothesized model to the data, χ^2 (N = 157, df = 76) = 95.8, p = .06; χ^2/df ratio = 1.26; GFI = .93; AGFI = .89; CFI = .98; SRMR = .046; RMSEA = .041 (90% CI: .00 to.06). All of the standardized residual covariances were less than two in magnitude (from a low of .012 to a high of 1.71). The model respectively accounted for 5% of variance in BMI, 48% of variance in functional status, and 83% of variance in health related quality of life. The health characteristics explained 29% of variance in depression. The health characteristics and depression combined explained 29% of social support.

For assessing the mediation effects, the preconditions for mediation were met in one instance. Social support mediated the relationship between the health characteristics and functional status. The health characteristics had significant direct effects on functional status (β = .64, $p < .01$) and social support (β = -.48, $p < .01$). Social support was significantly related to functional status (β = .46, $p < .01$). As a result, social support partially mediated the relationship between the health characteristics and functional status. Social support was not significantly related to BMI (β = -.06, p = .59) and health related quality of life (β = -.12, p = .19) and hence the mediation precondition was not met. The hypothesis was thus rejected in this regard.

With regard to the total effects, direct effects and indirect effects, the standardized form of these three effects are displayed in Table 6.7. The health characteristics had moderate to strong total effects on three health outcomes. The health characteristics had the strongest influence on functional status with a total effect of .86 which was comprised of a direct effect of .64 and mediated effect via social support of .22. The total effect of the health characteristics on health related quality of life was -.78 with a direct effect of -.41 and an indirect effect via depression of -.37. There was a moderate total effect of .38 of the health characteristics on BMI with a direct effect of -.26 and an indirect effect, due to depression of .12. The health characteristics had a direct and total effect of .54 on depression, and total effect of -.53 on social support which comprised a direct effect of -.48 and an indirect effect via depression of -.05.

Depression had a weaker total effect on the three health outcomes compared to the health characteristics. The total effect of depression on functional status was .31 which consisted of a direct effect of .27 and an indirect effect of .04 through social support. Similarly, depression had a weak total effect and a direct effect of .22 on BMI. However, depression had a stronger total and direct effect of -.68 on health related quality of life. Finally, no statistically significant direct effects were found between depression and social support (direct effect of .09).

In short, perceived social support partially mediated the relationship between the health characteristics and functional status, however, social support did not have a mediated or indirect effect on health related quality of life and BMI. In regard to direct effects, the health characteristics had the strongest direct effect on functional status and BMI. Depression had the strongest direct effect on health related quality of life. The results of total effect indicated that the health characteristics had the strongest total effects on both functional status and health related quality of life.

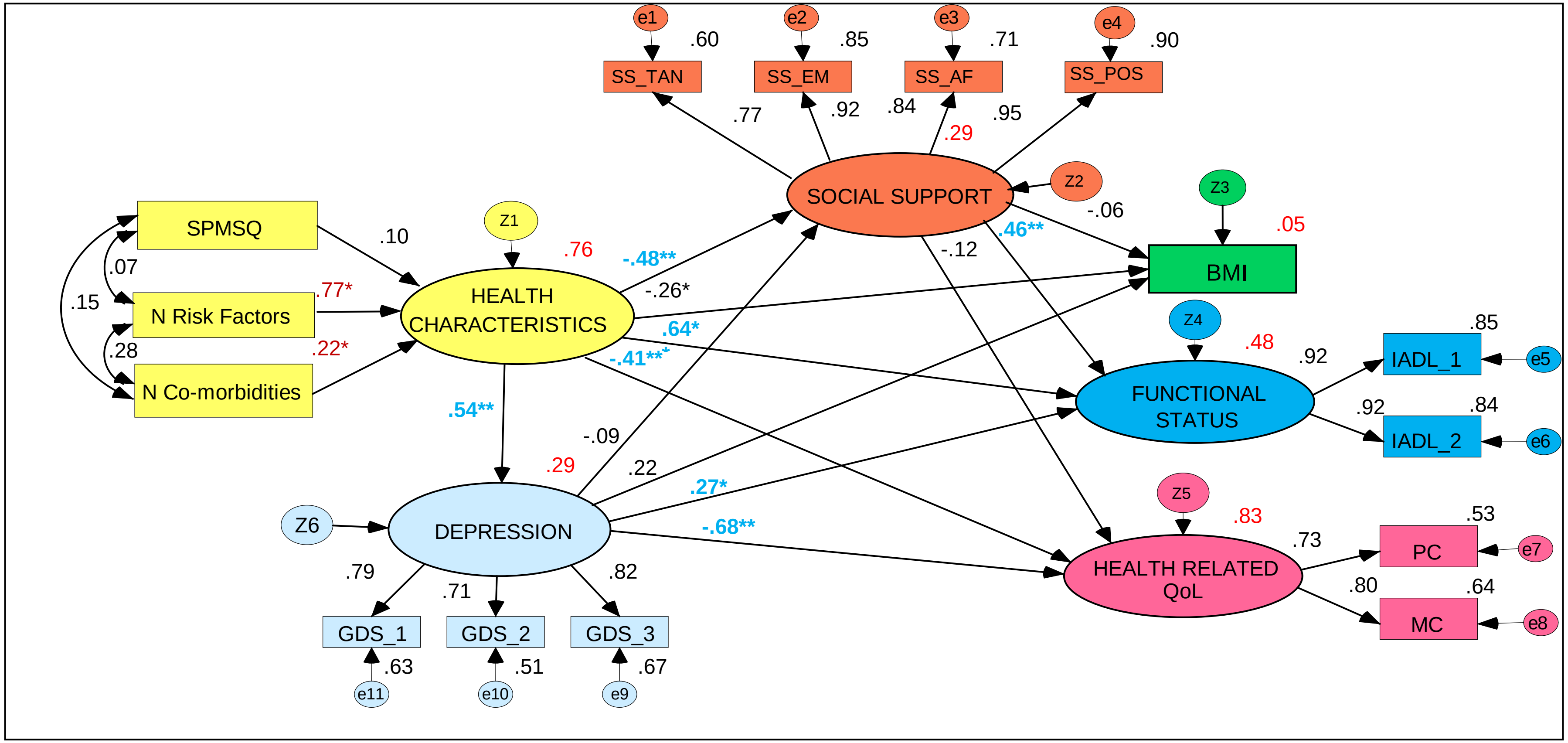


Figure 6.10. Hypothesized Social Support Mediating Model (Model 3.2a).

“*” p < .05; “**” p < .001. Note that having better functional status is indicated by lower scores.

Table 6.7

Standardized Total Effects, Direct Effects and Indirect Effects of Social Support Mediating Model (Model 3-2a)

	Health characteristics	Depression	Social support
Total effects			
Depression	.54	-	-
Social support	-.53	-.09	-
Functional status	.86	-.31	.46
Health related quality of life	-.78	-.68	-.12
BMI	-.38	.22	-.06
Direct effects			
Depression	.54	-	-
Social support	-.48	-.09	-
Functional status	.64	.27	.46
Health related quality of life	-.41	-.68	-.12
BMI	-.26	.22	-.06
Indirect effects			
Depression	-	-	-
Social support	-.05	-	-
Functional status	.22	-.04	-
Health related quality of life	-.37	-.01	-
BMI	.12	.01	-

Note: "-"no pathway between the two variables.

6.2.3 Model testing: Social support and self-efficacy as mediators.

Research question 3-3: Does social support mediate the relationship between health characteristics and chronic disease self-efficacy? Also, does chronic disease self-efficacy mediate the relationship between social support and health outcomes in older adults at high risk of hospital readmission?

H1: Social support and self-efficacy in managing chronic disease will have mediation effects on the relationships above.

To address research question 3-3, three hypothesized conceptual models were proposed, these corresponded to the three health outcomes. The first hypothesized model postulated that perceived social support would mediate the health characteristics/ depression on self-efficacy managing chronic disease. Furthermore, self-efficacy managing chronic disease would mediate the perceived social support and nutritional status (Figure 6.11).

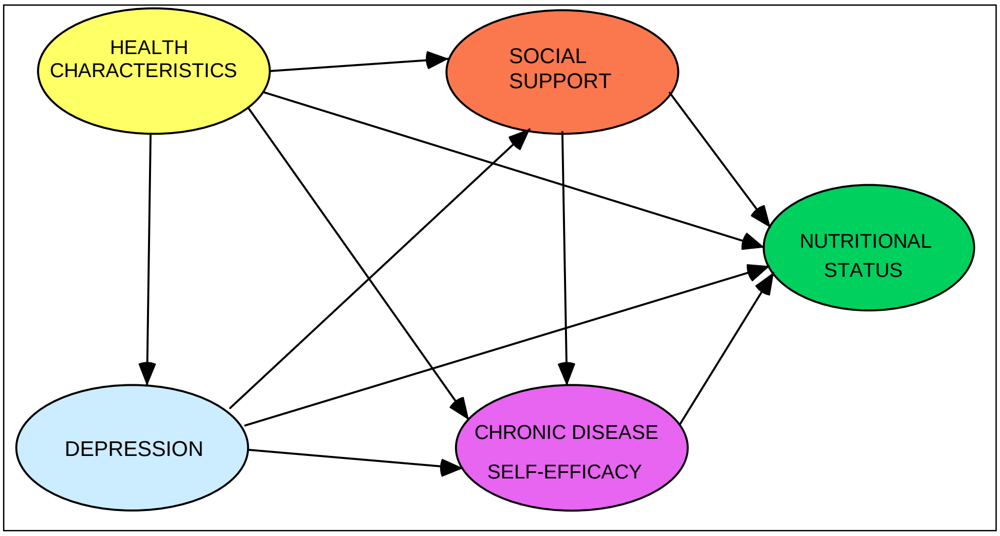


Figure 6.11. Diagram of Social Support and Self-Efficacy Mediate on Nutritional Status Model and Hypothesized Relational Statements (Model 3-3a).

The second hypothesized model is presented in Figure 6.12. It was postulated that perceived social support would be a mediator of health characteristics and depression on self-efficacy managing chronic disease; and chronic disease self-efficacy would mediate the relationship between perceived social support and nutritional status.

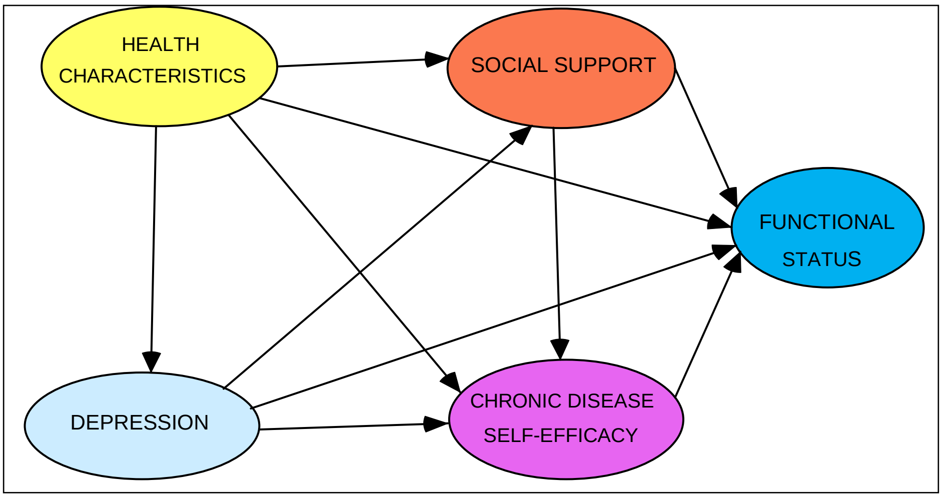


Figure 6.12. Diagram of Social Support and Chronic Disease Self-Efficacy Mediate on Nutritional Status Model and Hypothesized Relational Statements (Model 3-3b).

The third hypothesized model postulated that perceived social support would be a mediator of health characteristics and depression on self-efficacy managing chronic disease; and chronic disease self-efficacy would mediate the relationship between perceived social support and health related quality of life.

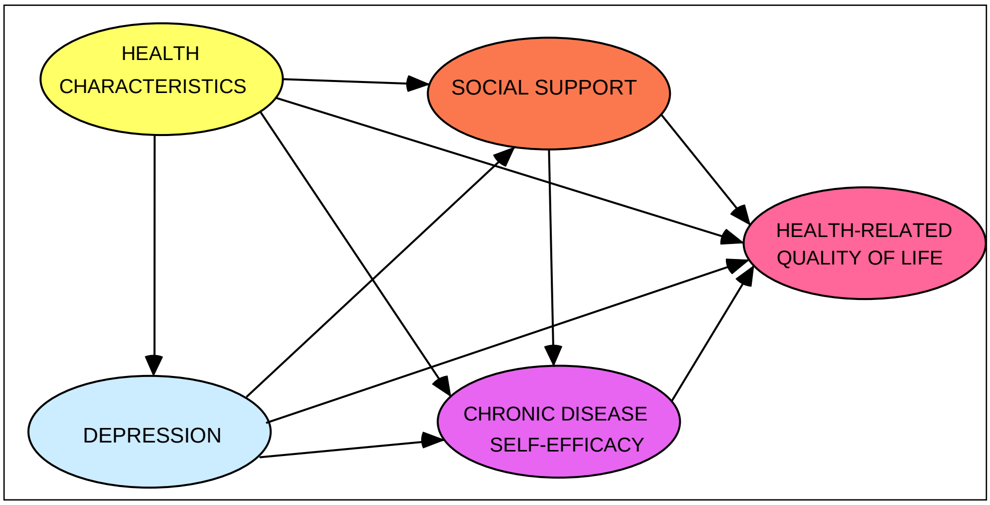


Figure 6.13. Diagram of Social Support and Chronic Disease Self-Efficacy Mediate on Health-Related Quality of Life Model and Hypothesized Relational Statements (Model 3.3c).

6.2.3.1 Nutritional status model.

For the first hypothesized model (Model 3-3a), the mode consisted of one formative construct (the health characteristics with three indicators: the number of hospital readmission risk factors, the number of co-morbidities and mental status), three reflective constructs (depression, social support and chronic disease self-efficacy) and one observed variable (BMI). It was hypothesized that social support would mediate the effects of the health characteristics on chronic disease self-efficacy which in turn mediates the effect of the social support factor on the BMI. It was also hypothesized that social support would mediate the effects of depression on chronic disease self-efficacy. The model testing again used a two-step SEM analysis approach. A three-factor measurement model (depression, social support and chronic disease self-efficacy) was assessed first. The formative construct measurement model (the health characteristics) has been tested previously and found to be a valid measure (see section 6.2.1.2 and 6.2.2.2). Finally, the full structural model was examined.

The results of a cluster three-factor measurement model showed that the model fits the data well, χ^2 (N = 157, df = 32) = 32.1, p = .46; χ^2/df ratio = 1.0; GFI = .96; AGFI = .94; CFI = 1.0 SRMR = .03; RMSEA = .01 (90% CI: .00 to.06). All the standardised residual co-variances were less than 2 with the highest value being 1.43. The factor coefficients were all significant ($< .001$) and ranged from a low of .72 to a high of .99 (Figure 6.14). The results of squared multiple correlations indicated good item reliabilities with all items exceeding .50. The factors were all significantly inter-correlated with correlations ranging from -.35 to -.76 ($p < .001$). Finally, the structural coefficients shown in Table 6.8 reveals that the three constructs of chronic disease self-efficacy, social support and depression display discriminant validity. The full structural model for Model 3-3a will now be examined.

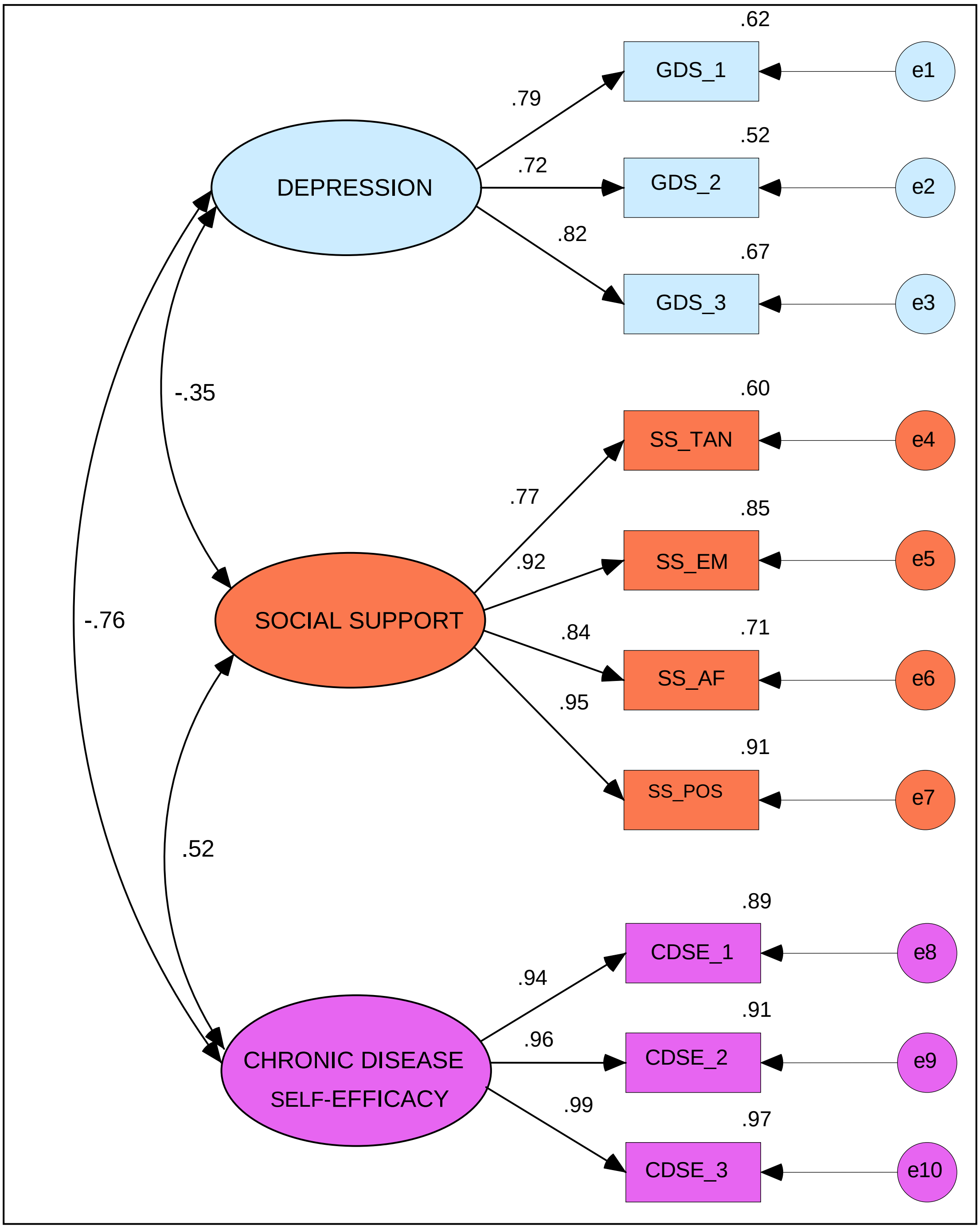


Figure 6.14. Standardized Parameter Estimates for the Three-Factor Validation Model.

Table 6.8

Correlation, Factor Pattern and Construct Coefficient and Item Reliabilities of the Three-Factor Measurement Model

	Chronic disease self-efficacy	Social support	Depression	Item reliability
Social support	.52			
Depression	-.76	-.35		
CDSE 1	**.95**	.49	-.72	.89
CDSE 2	**.96**	.50	-.73	.91
CDSE 3	**.99**	.51	-.75	.97
SS POS	.50	**.95**	-.33	.91
SS AF	.44	**.83**	-.29	.71
SS EM	.48	**.92**	-.32	.85
SS TAN	.40	**.77**	-.27	.60
GDS 1	.60	-.28	**.79**	.62
GDS 2	.55	-.25	**.72**	.52
GDS 3	.63	-.27	**.82**	.67

Note: Table values are standardized parameter estimates.

Figure 6.15 shows the full structural model for social support and self-efficacy mediated on BMI. In the initial test, the model was not identified, and a message from the AMOS output stated that “the model is probably unidentified. In order to achieve identifiability, it will probably be necessary to impose one additional constraint”. Blunch (2008) stated that a model can be identified by increasing the number of observed variables for the construct or by reducing the number of parameters to be estimated. In this case, the first solution was not an option, and hence reduction in the number of parameters to be estimated was applied. This solution was done by fixing one parameter at 1.00 (Blunch, 2008). The disturbance term for the BMI was fixed at 1.00 as the BMI is an observed variable rather than a latent variable. The model was then reassessed.

In reviewing the model, the model provided a good fit to the data, χ^2 (N = 157, df = 66) = 63.77, p = .56; χ^2/df ratio = .97; GFI = .95; AGFI = .92; CFI = 1.0 SRMR

= .04; RMSEA = .01 (90% CI: .00 to .04), and all the standardised residual co-variances were less than 2 with the highest value being 1.78. The three formative indicators explained 72% of the variance in health characteristics, and health characteristics explained 30% of the variance in depression. Health characteristics and depression combined explained 31% of social support. Health characteristics, depression and social support explained 66% of chronic disease self-efficacy. Together the variables in the model explained 6% of BMI in the study respondents.

In responding to the research question 3-3, two mediation effects were inspected. The preconditions for mediation were met in one instance. Social support fully mediated the relationship between the health characteristics ($\beta = -.52$, $p <. 01$) and chronic disease self-efficacy ($\beta = .24$, $p < .01$) as the path for health characteristics and chronic disease self-efficacy were not significant after the introduction of the mediator, social support, into the model ($\beta = -.06$, $p < .01$) (Figure, 6.15). It should be noted that for estimating the preconditions for a mediation effect for social support, a model (Figure 6.16) was tested prior to testing the model 3-3a. Figure 6.15 shows that health characteristics ($\beta = -.22$, $p = .01$) and depression ($\beta = -.64$, $p < .01$) as predictors were significantly influenced by the dependent variable, chronic disease self-efficacy, and the model fitted well with the data χ^2 (N = 157, df = 22) = 15.76, p = .83; χ^2/df ratio = .72; GFI = .98; AGFI = .96; CFI = 1.0 SRMR = .02; RMSEA = .01 (90% CI: .00 to .04). Thus, the full mediation effect of social support on the health characteristics and chronic disease self-efficacy was confirmed. On the other hand, social support did not mediate depression and chronic disease self-efficacy as depression was not significantly related to social support ($\beta = -.06$, $p = .57$).

When examining the second mediation effect, chronic disease self-efficacy was not found to be significantly related to the BMI ($\beta = -.11$, $p =.47$). Social support was not significantly related to the BMI ($\beta = -.07$, $p = .53$). As a result the preconditions of the mediation effect of chronic disease self-efficacy on social support and BMI were not met. In terms of the direct effect on BMI, only the health characteristics variable was statistically significant ($\beta = -.33$, $p = .03$).

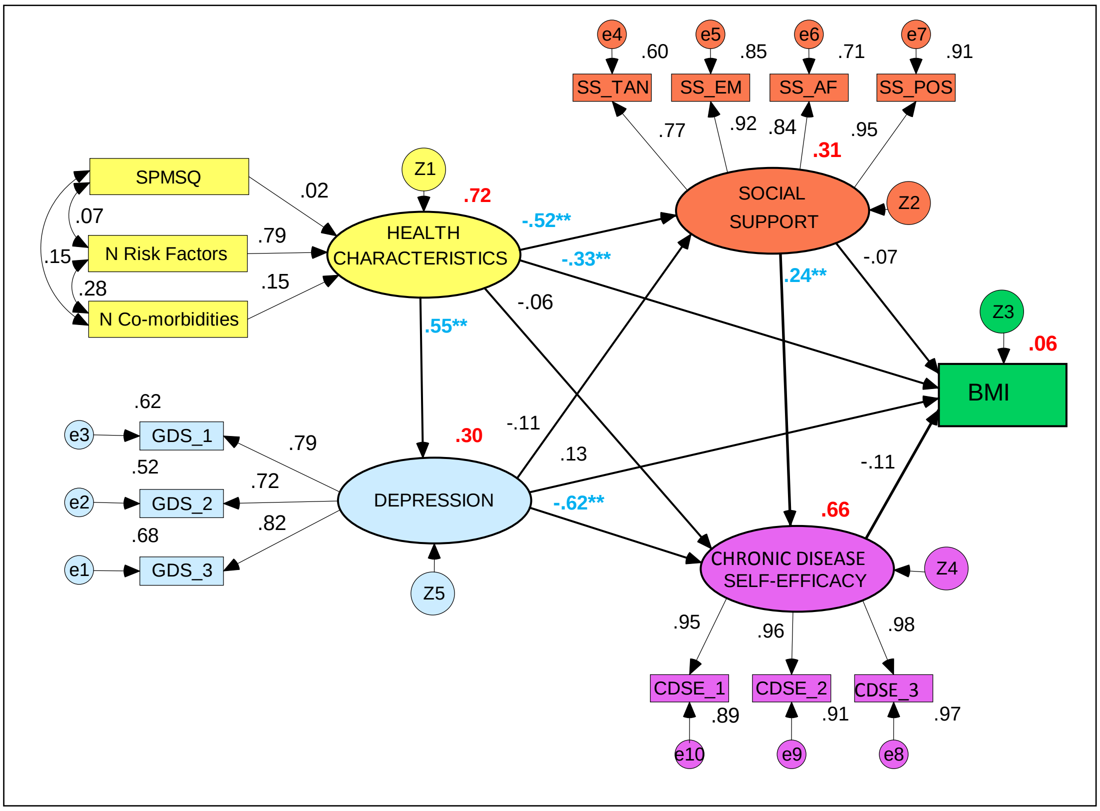


Figure 6.15. Hypothesized Model for Social Support and Self-Efficacy Mediating on BMI (Model 3-3a).

Note: “*” p < .05; “**” p < .001.

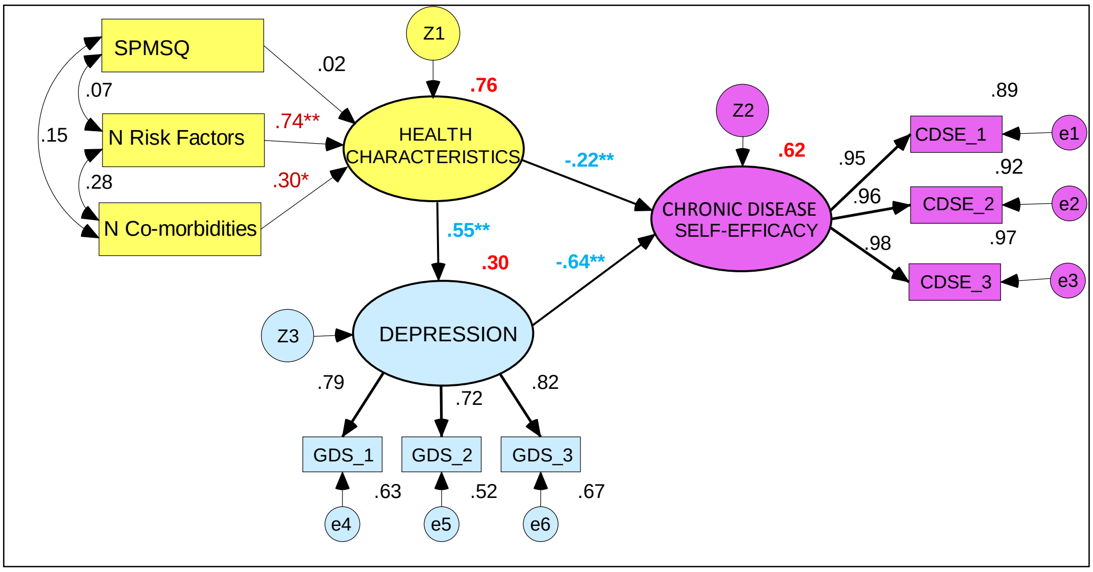


Figure 6.16. Model Testing for Preconditions of Meditation Effects

. Note: “*” p < .05; “**” p < .001.

6.2.3.2 *Functional status model.*

For the second hypothesized model (Model 3-3b), the model consisted of five constructs: one formative construct (the health characteristics with three indicators) and four reflective constructs (depression, social support, chronic disease self-efficacy and functional status). Again, social support was specified to mediate the effects of health characteristics and depression on chronic disease self-efficacy which in turn mediated the effect of social support on functional status. Prior to analysis of the structural model, a four-factor measurement model was evaluated and the results are presented as below.

The four-factor measurement model was found to fit the data well, χ^2 (N = 157, df = 48) = 55.58, p = .21; χ^2/df ratio = 1.16; GFI = .95; AGFI = .92; CFI = 1.0 SRMR = .03; RMSEA = .03 (90% CI: .00 to .06), and all the standardized residual co-variances were less than 2 with a highest value of 1.06. All factor coefficients were significant ($p < .001$) and ranged from .73 to .98 (Figure 6.17). The results of squared multiple correlations suggested good item reliabilities with all items exceeding the value of .53 (Table 6.9). Most factors were significantly inter-correlated with correlations ranging from -.34 to -.77 ($p < .001$), except for social support and functional status (α = .03, p = .70) (Figure 6.17). Evidence for four factors of discriminant validity is presented in Table 6.9. These four factors indicated a clear distinction between the items comprising the respective factors and remaining items. The full structural equation model for Model 3-3b will be assessed in the next section.

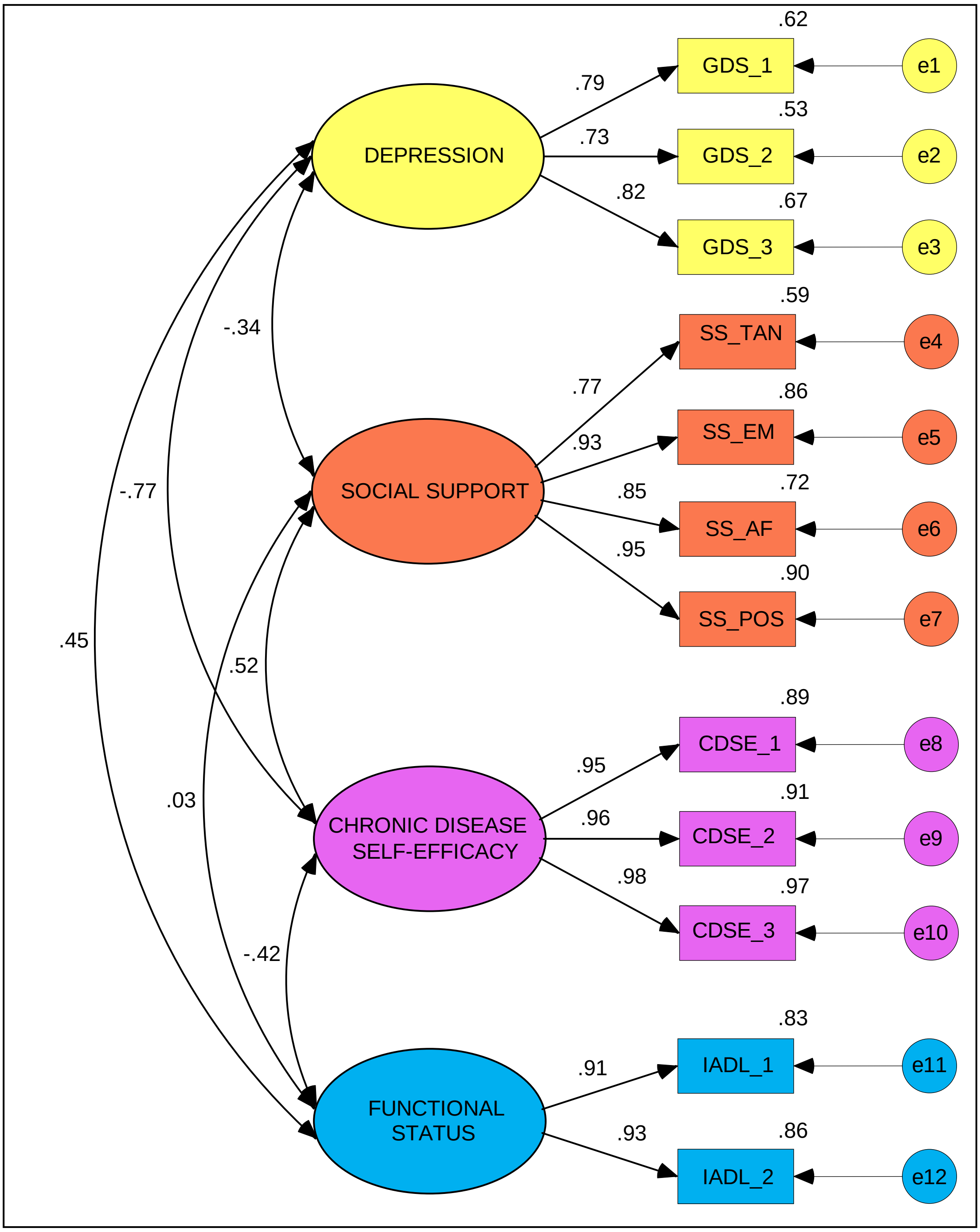


Figure 6.17. Standardized Parameter Estimates for a Four-Factor Measurement Model for Model 3-3b.

Table 6.9

Correlation, Factor Pattern and Construct Coefficient and Item Reliabilities of the Four-Factor Measurement Model for Model 3-3b

	Functional status	Chronic disease self-efficacy	Social support	Depression	Item reliability
Self-efficacy	-.42				
Social support	.03	.52			
Depression	.45	-.34	-.34		
IADL 1	**.91**	-.39	.03	.42	.83
IADL 2	**.93**	-.39	.03	.41	.86
CDSE 1	-.40	**.95**	.45	-.72	.89
CDSE 2	-.42	**.96**	.50	-.73	.92
CDSE 3	-.42	**.98**	.51	-.75	.97
SS POS	.03	.49	**.95**	-.33	.90
SS AF	.03	.44	**.85**	-.29	.72
SS EM	.03	.48	**.93**	-.32	.86
SS TAN	.03	.40	**.77**	-.26	.59
GDS 1	.36	-.60	-.27	**.82**	.62
GDS 2	.33	-.56	-.25	**.73**	.53
GDS 3	.37	-.63	-.28	**.79**	.67

Note: Table values are standardized parameter estimates.

The structural model evaluating the mediation of social support and chronic disease self-efficacy on functional status (Figure 6.18), yielded good fit to the data, χ^2 (N = 157, df = 78) = 75.01, p = .57; χ^2/df ratio = 0.96; GFI = .94; AGFI = .91; CFI = 1.0 SRMR = .03; RMSEA = .01 (90% CI: .00 to .04). All the standardized residual co-variances were less than 2 with the highest value being 1.71. The three formative indicators explained 74% of the variance in the health characteristics which in turn explained 30% of variance in depression. Health characteristics and depression combined explained 29% of social support. Health characteristics, depression and social support explained 66% of chronic disease self-efficacy. Together the variables in the model explained 50% of functional status in older adults at high risk of hospital readmission.

With regard to the mediation effects, two mediation effects were evaluated according to the research question 3-3. Firstly, the mediation effect was assessed to determine whether social support mediated the relationship between health characteristics and depression on chronic disease self-efficacy. In order to determine the mediation effect for social support, a model for estimating the preconditions for a mediation effect for social support was conducted and the results were the same as previously shown in Figure 6.16. As a result, social support fully mediated the relationship between the health characteristics ($\beta = -.49$, $p < .01$) and chronic disease self-efficacy ($\beta = .25$, $p < .01$).

Initially the path between the health characteristics and chronic disease was statistically significant ($\beta = -.22$, $p < .01$) as shown in Figure 6.16. This path, however was not statistically significant after the inclusion of social support in the model ($\beta = -.11$, $p = .25$) (Figure 6.18). Thus, the full mediation effect of social support on health characteristics and chronic disease self-efficacy was ensured. However, the mediation effect of social support did not exist between depression and the chronic disease, as depression was not statistically significantly related to social support ($\beta = -.07$, $p = .51$).

Secondly, the mediation effect was assessed to determine whether chronic disease self-efficacy mediated the relationship between social support and functional status. Social support was significantly related to functional status ($\beta = .53$, $p < .001$), and chronic disease self-efficacy ($\beta = .25$, $p < .001$). Additionally, the chronic disease self-efficacy was significantly related to functional status ($\beta = -.27$, $p < .05$). Thus, the preconditions for a mediation effect were met and the results suggested that chronic disease self-efficacy partially mediated the relationship between social support and functional status (Figure 6. 18).

It is also noted that health characteristics had the strongest direct effect on functional status ($\beta = .61$, $p < .001$), indicating that respondents with poor health characteristics tended to have impaired functional status.

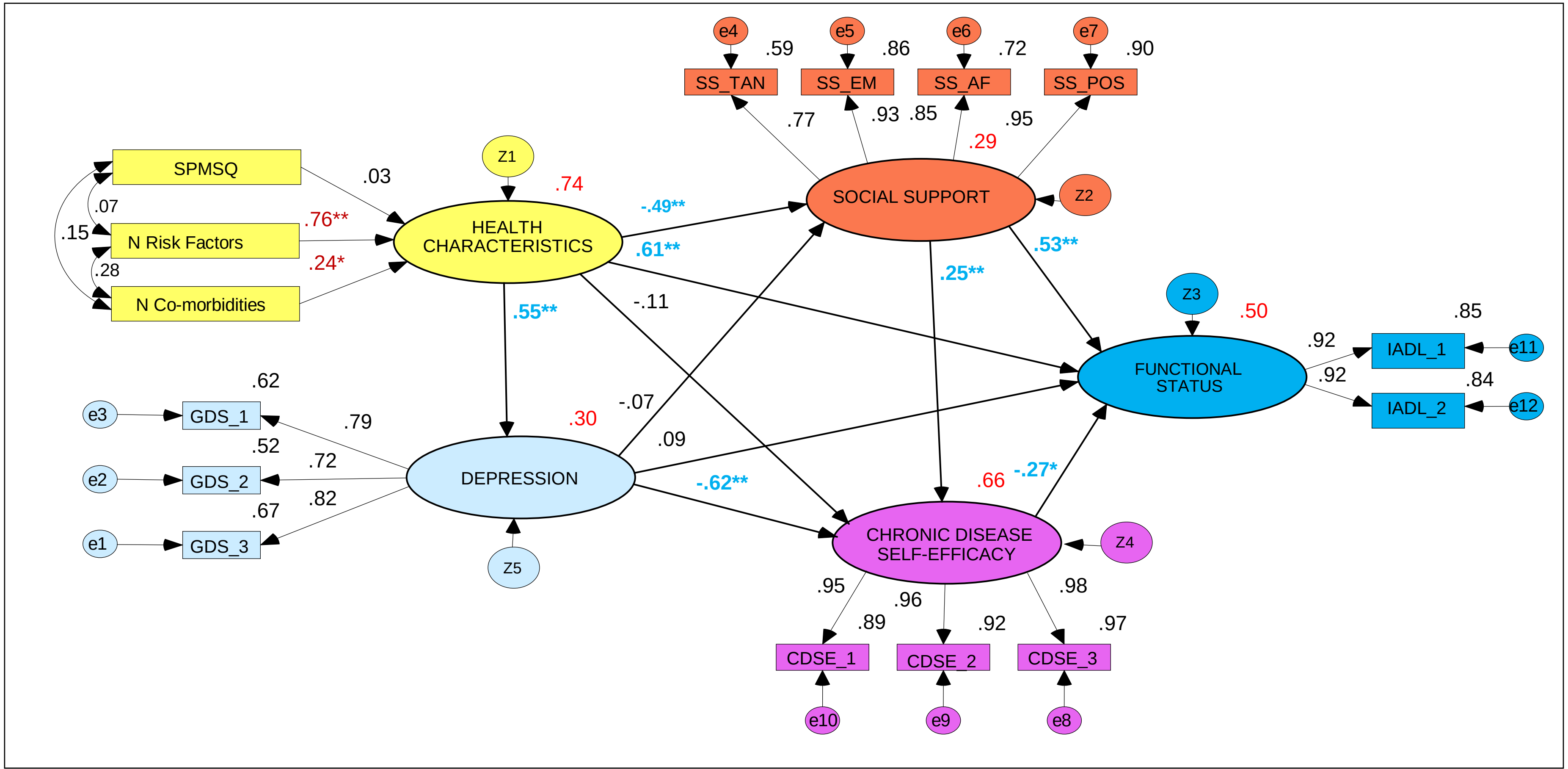


Figure 6.18. Hypothesized Model for Social Support and Self-Efficacy Mediating on Functional Status (Model 3-3b).

Note: “*” p < .05; “**” p < .001. Note that having better functional status is indicated by lower scores.

6.2.3.3 *Health-related quality of life model.*

For the third hypothesized model (Model 3-3c), the model consisted of five constructs which included: one formative construct (the health characteristics with three indicators) and four reflective constructs (depression, social support, chronic disease self-efficacy and health related quality of life). Social support was specified as mediating the effects of the health characteristics and depression on the chronic disease self-efficacy which in turn mediated the effect of social support on the health related quality of life. The following section presents the results of a four-factor measurement model followed by the full structural model of 3-3c.

The four-factor measurement model provided an adequate fit to the data, χ^2 (N = 157, df = 48) = 62.49, p = .08; χ^2/df ratio = 1.30; GFI = .94; AGFI = .90; CFI = .99; SRMR = .03; RMSEA = .04 (90% CI: .00 to .07). All the standardized residual co-variances were less than 2 with the highest value being 1.43, indicating that the model was not misfit between the model and data. All factor coefficients were significant with factor loadings of .69 to .98 ($p < .001$). The results of the squared multiple correlations (MSC) suggested reasonable item reliabilities with the majority of items exceeding .50. Only one item "PC" had an MSC value of .48, which still exceeded a cut-off value of .03, and hence was not a cause for concern. All factors were significantly inter-correlated with correlations ranging from -.35 to -.83 ($p < .01$) and less than .90, indicating discriminant validity (Figure 6.19). Furthermore, the factor pattern and construct coefficient presented a clear four factor (depression, social support, chronic disease self-efficacy and health related quality of life) discriminant validity as shown in Table 6.10. The full structural equation model for Model 3-3c would be evaluated in the next section.

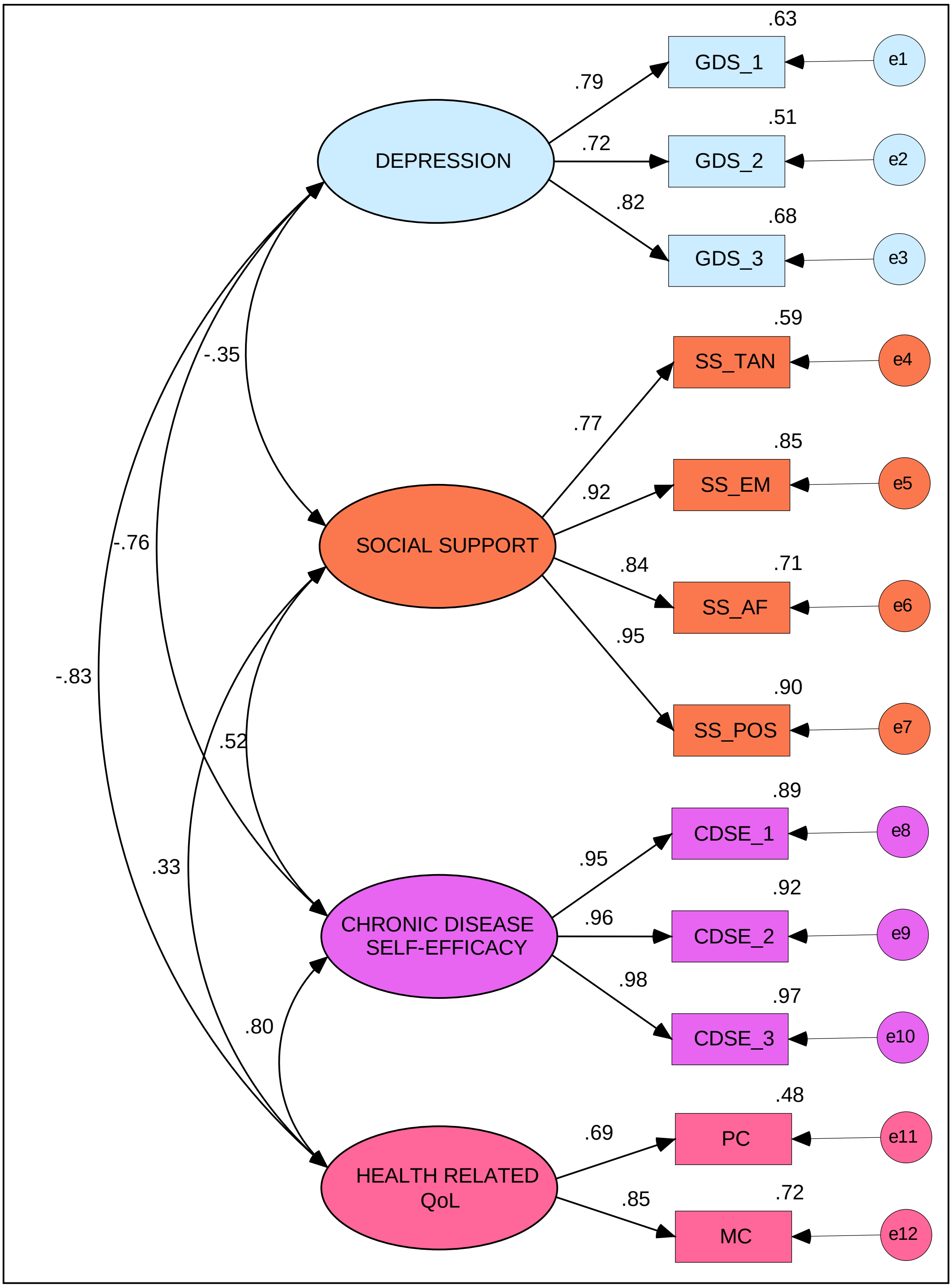


Figure 6.19. Standardized Parameter Estimates for a Four-Factor Measurement Model for Model 3-3c.

Table 6.10

Correlation, Factor Pattern and Construct Coefficient and Item Reliabilities of the Four-Factor Measurement Model for Model 3-3c

	Health-related QoL	Chronic disease self-efficacy	Social support	Depression	Item reliability
Self-efficacy	.80				
Social support	.33	.52			
Depression	-.83	-.76	-.35		
MC	**.85**	.68	.28	-.70	.48
PC	**.69**	.56	.23	-.57	.72
CDSE 1	.76	**.95**	.49	-.72	.89
CDSE 2	.77	**.96**	.50	-.73	.92
CDSE 3	.79	**.98**	.51	-.75	.97
SS POS	.31	.49	**.95**	-.33	.90
SS AF	.28	.44	**.84**	-.29	.71
SS EM	.30	.48	**.92**	-.32	.85
SS TAN	.25	.40	**.77**	-.27	.59
GDS 1	-.66	-.61	-.27	**.79**	.63
GDS 2	-.59	-.55	-.25	**.72**	.51
GDS 3	-.68	-.63	-.28	**.82**	.68

Note: Table values are standardized parameter estimates.

The structural model evaluated the mediation of social support and chronic disease self-efficacy on health related quality of life (Figure 6.20), indicated good fit to the data, χ^2 (N = 157, df = 78) = 87.54, p = .22; χ^2/df ratio = 1.12; GFI = .93; AGFI = .90; CFI = .99 SRMR = .04; RMSEA = .03 (90% CI: .00 to .06). All the standardized residual co-variances were less than 2 with the highest value being 1.69, indicating that the model was not misfit between the model and data. The three formative indicators explained 75% of the variance in health characteristics which in turn explained 29% of the variance in depression. Health characteristics and depression combined explained 28% of social support. The health characteristics, depression and social support explained 66% of chronic disease self-efficacy.

Together the variables in the model explained 86% of health related quality of life in older adults at high risk of hospital readmission.

With regard to the mediation effects, two mediation effects were evaluated according to the research question 3-3. Firstly, the mediation effect was assessed for whether social support mediated the relationship between the health characteristics and depression on chronic disease self-efficacy. The results were almost identical to the previous results of model 3-3b, where social support fully mediated the relationship between the health characteristics ($\beta = -.48$, $p < .01$) and chronic disease self-efficacy ($\beta = .24$, $p < .01$). Initially the path between the health characteristics and chronic disease was statistically significant ($\beta = -.22$, $p < .01$) as shown in Figure 6.16, however this path was not statistically significant after including social support in the model ($\beta = -.11$, $p = .21$) (Figure 6.20). This presented evidence of a full mediation effect of social support between the health characteristics and chronic disease self-efficacy. However, the mediation effect of social support was not found between depression and the chronic disease, as depression was not statistically significantly related to social support ($\beta = -.09$, $p = .40$).

Secondly, the mediation effect was assessed for whether the chronic disease self-efficacy mediated the relationship between social support and health related quality of life. Social support was significantly related to health related quality of life ($\beta = -.22$, $p < .01$), and chronic disease self-efficacy ($\beta = .24$, $p < .001$). Additionally, chronic disease self-efficacy was significantly related to health related quality of life ($\beta = .39$, $p < .001$). As a result, the preconditions for mediation effect were met in this instance. Chronic disease self-efficacy partially mediated the relationship between social support and health related quality of life (Figure 6. 20).

With regard to the direct effect on the quality of life, both the health characteristics ($\beta = -.39$, $p < .001$) and depression ($\beta = .40$, $p < .001$) had a similar moderate direct effect on health related quality of life, indicating that the respondents with greater health characteristics (fewer hospital readmission risk factors, less co-morbidity and better mental status) and less depressive symptoms were likely to have better quality of life.

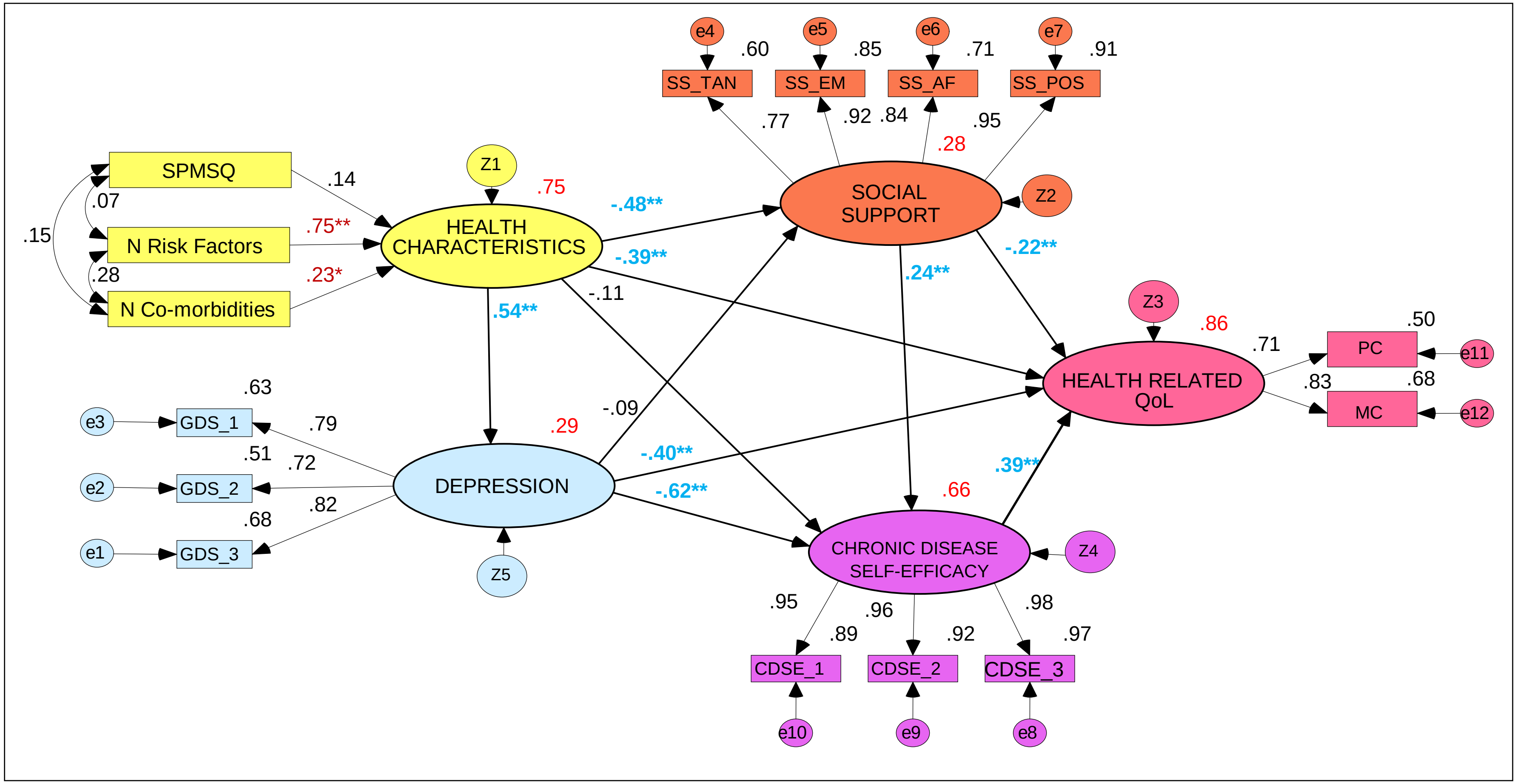


Figure 6.20. Hypothesized Model for Social Support and Self-Efficacy Mediating on Health-Related Quality of Life (Model 3-3c).

Note: "*" p < .05; "**" p < .001.

Conclusion

In summary, this chapter presented the results of the testing of theoretical models involving self-efficacy for self-managing chronic diseases and three health outcomes. Two-step structural equation modelling approaches were employed where the measurement models (formative or reflective) were evaluated to confirm the factor structure of the latent variables first, and then the full structural models were assessed. Statistically significant findings were addressed through each research question.

A number of important findings were established through the analyses. Firstly, self-efficacy for self-managing chronic diseases (SE) mediated the health characteristics (HC) and depression (DP) on health-related quality of life (HC-SE-QoL, DP-SE-QoL). Secondly, perceived social support (SS) was a mediator between the relationship of the health characteristics and functional status (FS), and the relationship between the health characteristics and self-efficacy in managing chronic disease (HC-SS-FS, HC-SS-SE). Finally, self-efficacy in managing chronic disease was a mediator for the relationship between social support and functional status (SS-SE-FS), and the relationship between social support and health related quality of life (SS-SE-QoL). However, neither self-efficacy in managing chronic disease nor social support were supported as mediators on BMI.

Additionally, some significant direct effects and total effects were also identified. Health characteristics were found to have a strong significant direct effect on depression, social support and functional status. Depression had a strong significant direct effect on self-efficacy in managing chronic disease and health related quality of life. In terms of the total effects, the health characteristics appeared to have the strongest total effect on the BMI, functional status and health related quality of life.

This chapter tested five hypothesized models based on social cognitive theory, and the results indicated that the sample data support the hypothesized models, and hence these five hypothesized models provided empirical evidence for understanding the complex relationships among the hypothesized constructs. Significant findings and interpretations of the complex relationship among the constructs in the hypothesized model will be discussed in the next chapter.

Chapter 7: Discussion

Introduction

This chapter discusses the key results related to the objectives of the three studies and examines the key findings in the light of existing literature. The goal of the first study was to determine the nutritional status and prevalence of malnutrition in the study population as well as validating a nutrition screening tool, the Malnutrition Screening Tool (MST). The findings related to Study One are discussed first, following by the key findings of the Study Two, which aimed to determine the relationship between demographic characteristics, self-efficacy in managing chronic disease, social support and three health outcomes, including nutritional status, functional status and health-related quality of life. Finally, the discussion focuses on the results of Study Three, where a structural equation modelling approach was used to test theoretical models of self-efficacy for self-managing chronic disease in relation to the three health outcomes mentioned above.

7.1 Study One Discussion

7.1.1 Nutritional status and prevalence of malnutrition.

Study One examined the nutritional status and prevalence of malnutrition among the older hospitalized patients who were at higher risk of hospital readmission. The prevalence of malnutrition risk ranged from 10.9% to 27.4% depending on the tools used. This result however was lower than other rates reported in the literature. A much higher rate of malnutrition was reported in an American study that used the Subjective Global Assessment (SGA) to determine a malnutrition rate of 40% in 369 patients over 70 years of age (mean 81 years), who were admitted to the general medical units (Covinsky et al., 1999). Similarly, a higher prevalence was reported in Australian studies, with prevalence of malnutrition ranging from 30-42% in acute hospital care settings, when the SGA was applied (Banks et al., 2007; Lazarus & Hamlyn, 2005; Middleton et al., 2001).

Other studies which used Body Mass Index (BMI) as a measurement also reported higher rates of malnutrition, when compared to the present study. Brantervik et al. (2005) found 43.3% of subjects had a BMI below 22 kg/m^2 in 244 elderly patients (82.7 years ± 8) admitted for rehabilitation after acute hospital care in Sweden. Similarly, Visvanathan et al., (2004) found 34.8% of subjects who were ≥ 65 years screened positive as they had a BMI < 22 kg/m^2 in 65 patients of a rehabilitation centre. Neumann et al. (2005) conducted a study using BMI and Correct Arm Muscle Area (CAMA) in 133 older adults (≥ 65 years) admitted to a rehabilitation unit in Australia hospital. They found that 17% and 20% of subjects were malnourished according to the BMI with a cut-off value of < 22 kg/m^2 and CAMA with a cut-off value of < 21.4 cm^2 (males) and < 21.6 cm^2 (females) respectively. The lower malnutrition prevalence of the present study may reflect that the target population were different from that of previous studies as the present study's participants were identified as at risk of readmission yet relatively healthy with reasonable functional ability and potentially able to live independently.

Among the nutrition tools, the MST detected a greater prevalence of malnutrition risk compared to SGA, BMI and CAMA, while the CAMA assessment identified the lowest frequency of malnutrition risk or malnutrition. This result was expected as the MST is a nutrition screening tool which is designed to be sensitive to detect malnutrition risk. The anthropometric measures such as BMI and CAMA have been widely used as indicators of malnutrition but controversy remains as the best lower cut-off values for older adults are yet to be confirmed (Kubrak & Jensen, 2007; Visvanathan et al., 2004). A study conducted by Bannerman et al. (1997) found that anthropometric measures may be inappropriate for nutritional screening of elderly people. They measured BMI, mid-upper arm circumference, and triceps skinfold thickness in 200 independently living elderly (≥ 75 years) in Britain and highlighted that there were significant differences in several important anthropometric indices of nutritional status between three different geographic groups of elderly people. Comparing the results of the current study and the literature suggested that the BMI and CAMA may not be suitable for identifying malnutrition risk in older adults; however, it may be useful for detecting established malnutrition.

Furthermore, Kubrak and Jensen (2007) pointed out that skin fold measures varied between assessors and population groups, such as the elderly. This may reflect the result of CAMA in the current study as the mid-upper arm circumference and triceps skin fold thickness were performed by two assessors for older hospitalized adults. On the other hand, the SGA has been rigorously tested for validity and reliability in the literature (Kubrak & Jensen, 2007), and it continues to demonstrate its stability when compared to other measures in the present study. The malnutrition prevalence was 20.6% according to the SGA in the present study, indicating one in five older hospitalized patients suffered from malnutrition. The following section presents the validity of the MST compared to the SGA.

7.1.2 Validation of the Malnutrition Screening Tool (MST).

The second purpose of Study One was to validate the MST in this target population. The present study demonstrated the validity of MST compared with a full nutrition assessment by the SGA in older adults at high risk of hospital readmission. The MST was shown to be effective in identifying patients at risk of malnutrition when compared to the SGA, with high sensitivity (94%), specificity (89%), positive predictive value (70%) and negative predictive value (98%). Additionally, the Kappa statistic shows a substantial agreement (kappa = .74, $p < .001$; 95% CI .62-.86) between these two methods.

These results are similar to previous MST validation studies conducted with acute and oncology outpatients (Ferguson et al., 1999; Isenring et al., 2006). The present study's findings particularly supported the original development of the MST in 408 hospital inpatients with an average age of 57.7 ± 16.5 (19-94) (sensitivity = 93%, specificity = 93%, positive predictive value = .98 and negative predictive value = .73), compared with a full nutrition assessment by the SGA (Ferguson et al., 1999). Jones (2004) suggested that assessment of a tool's validity is an ongoing process, and use of the tool in a different population required new validity.

There was a concern whether the MST would be appropriate for older adults at high risk of readmission as it was originally developed in a younger population (57.7 ± 16.5 years). However, the current study found that it was also valid in an older frail population at risk of readmission. A recent study, which compared the MST with

SGA in 285 residents of aged care, also found the MST to be highly sensitive (84%) but have a lower specificity (66%) (positive predictive value = .65 and negative predictive value = .84), compared to the present study (Isenring et al., 2009). With the strong predictive values, the current study provides clear evidence that the MST performs well in older adults in an acute setting.

Other studies have used similar methods to validate other nutrition screening tools compared to the SGA (Kyle, Kossovsky, Karsegard, & Pichard, 2006; Pablo, Izaga, & Alday, 2003). The current study results, however demonstrates higher sensitivity and specificity compared to those studies. A study comparing three nutritional screening tools (nutritional risk indicator, Malnutrition Universal Screening Tool and Nutrition Risk Screening) with the SGA in 995 hospital inpatients with medical or surgical conditions attending a Swiss hospital, found that the sensitivity was in the range of 43-62% and specificity was in the range of 76-93% (Kyle, Kossovsky, Karsegard, & Pichard, 2006).

These results showed higher specificity than sensitivity, which indicates that these screening tools performed better in correctly identifying patients who were non-malnourished than those at risk of malnutrition (Kyle et al., 2006). Although a 100% sensitivity and specificity would be ideal for a screening tool, in reality this is generally not achievable and hence the need to correctly classify all malnourished patients (sensitivity) takes priority over misclassifying patients who are well-nourished (specificity) (Capra, 2007; Ferguson et al., 1999).

The purpose of nutrition screening is to identify those patients who are at nutrition risk (American Dietetic Association, 1994). Early detection of malnutrition risk allows for appropriate intervention, however it relies on validated nutrition screening tools (Isenring et al., 2009). Although many nutrition screening tools have been developed, few have been solidly validated (Jones, 2004). Examples of validated and commonly used nutrition screening tools in the Australian older adult population include the Mini Nutritional Assessment-Short Form (MNA-SF) (Rubenstein et al., 2001), the Malnutrition Universal Screening Tool (MUST) (Stratton et al., 2004) and the Malnutrition Screening Tool (MST) (Ferguson et al., 1999).

It has been suggested that simple, accurate and highly sensitive and specific screening tools are best in clinical practice (Ferguson et al., 1999). The simplicity and accuracy of the MST suggests it is easier to use than the other two methods as it does not require calculations such as body mass index. Additionally, a quick and easy to use tool is an important consideration for nursing staff, given the time constraints and work related-pressures they face. Furthermore, using the same nutrition screening approach such as MST for all patients admitted to the hospital may shed light on improving identification of malnutrition, as the nursing staff would be familiar with the method regardless of different settings. The MST is widely used in Australian teaching hospitals and has been consistently investigated and validated in more diverse samples of patients and hence there is the further advantage of using the MST over other screening tools. Finally, the present study group would particularly benefit from primary and secondary prevention in terms of early detection and effective interventions for malnutrition, which in turn may prevent any nutrition-related clinical complications.

In summary, the prevalence of malnutrition risk in the current study varies from 10.9% to 27.4% depending on the tools used. Among the measurements, the MST detected a greater prevalence of malnutrition risk compared to other tools used in the study, suggesting its useful function as a nutrition screening tool. The MST demonstrated substantial sensitivity, specificity and agreement with the SGA, indicating it is a valid malnutrition screening tool for older adults who are at risk of hospital readmission.

7.2 Study Two Discussion

This study explored the relationship between self-efficacy in managing chronic disease and three health outcomes among older adults who were at risk of hospital readmission. The following section starts by discussing the factors that are associated with self-efficacy for chronic disease, followed by discussing the factors that significantly predicted nutritional status. Next, the significant influential factors on functional status are addressed, and finally, the relationship between self-efficacy and health-related quality of life is discussed.

7.2.1 Factors predicting self-efficacy for managing chronic disease.

Significant relations were identified among socio-demographic, social support, and depressive symptoms in the study participants. The major predictors of self-efficacy for managing chronic disease were depressive symptoms followed by perceived social support. Other significant predictors included education attainment and numbers of hospital readmission risk factors. These findings are consistent with those of previous studies and Bandura's social cognitive theory. As self-efficacy refers to individuals' perceptions or assessments of their capability to perform a designated task successfully (Bandura, 1986), people with more depressive symptoms tend to perceive self-inefficacy (Bandura, 1997).

The subjects who experienced more depression symptoms were likely to present with depressed mood, loss of interest or pleasure, feelings of low self-worth and energy, poor motivation and concentration (World Health Organization), which may impair their ability to assess their capability to perform a designated task successfully. These symptoms can lead to substantial impairments in an individual's ability to take care of their everyday responsibilities (World Health Organization). Similar to the present study, studies have shown that depressive symptoms are associated with lower self-efficacy for managing chronic health conditions such as epilepsy and chronic pain (Robinson et al., 2008; Turner, Ersek, & Kemp, 2005). Two studies of randomized controlled trials (RCTs) suggested that depressive symptoms modified and moderated the effect of self-efficacy enhancing interventions on post-stroke patients and patients with chronic conditions (Jerant, Kravitz et al., 2008; Salbach et al., 2005).

Perceived social support is also demonstrated as a strong predictor for self-efficacy in managing chronic disease in the current study and this finding supported those of the previous studies (Anderson et al., 2010; Coffman, 2008). Bandura (1997) claimed that a strong sense of social efficacy assists in development of social support, which results in enhanced perceived efficacy. The relationship between social support and self-efficacy in chronic condition management is further supported by the beneficial mechanisms of social support, including (1) increasing feelings of self-esteem; (2) increasing control over one's environment; (3) providing information; (4)

exerting social norms that encourage adaptive behaviours; and (5) providing tangible aid and resources (Marino, Sirey, Raue, & Alexopoulos, 2008 ; Wills, 1985).

Social support may be viewed as a source of self-efficacy (i.e. verbal persuasion and vicarious experience) which is applied extensively in designing interventions for enhancing self-efficacy, or which acts as a facilitator to impact on health behaviour (Anderson et al., 2010). Although it was unable to determine which roles perceived social support played in the current study, the finding confirmed that perceived social support is positively associated with beliefs of personal efficacy.

Consistent with the literature, educational attainment was positively related with self-efficacy in managing chronic disease, while the numbers of hospital readmission risk factors were negatively associated with perceived self-efficacy in managing chronic disease. Clark (1996) reported that the factors that affect exercise beliefs of personal efficacy include older age, low socioeconomic status such as low income and education, as these factors reduce access to material and non-material resources, which in turn constrain the development of a strong sense of control. On the other hand, Callaghan (2005) revealed that individuals who reported an adequate income and higher education attainment also reported higher scores on healthy behaviours, self-efficacy and self-care in 235 community-dwelling older adults.

However, age and income did not significantly influence self-efficacy in the present study. This finding may indicate that although the majority of the participants were pensioners (79%) with incomes less than $ 30,000 per annum, their incomes were still enough to support their needs. With regard to age, Bandura (1977) stated that self-efficacy problems in older adults are related to misappraisal of capability which can improve regardless of age. Furthermore, an individual's belief in self-efficacy may vary across context and behaviour (Bandura, 1977, 1986). Thus, the findings about the relations with age are still controversial and may vary with the tasks assessed, such as self-efficacy for physical activities versus managing chronic disease. Additionally, there are limited studies that have explored and reported the influential factors of socio-demographic and health or illness characteristics on self-efficacy in older adults.

Finally, the participants who were identified as having more risk factors of hospital readmission were significantly perceived to have lower self-efficacy in managing chronic disease. This result was expected as these eight risk factors namely, multiple co-morbidities, impaired functionality, advanced age, recent multiple admissions, poor social support, live alone, poor self-rating of health, and history of depression may interact and be inter-related with each other in a variety of ways creating a spiralling relationship, which led to a low sense of control and de-motivation, resulting in inefficacy. For example, individuals with a history of depression were likely to be associated with chronic health problems (co-morbidities), live alone, have a lower income and education level, and experience poor social support and functional impairment (Fiske, Wetherell, & Gatz, 2009; Swenson, Baxter, Shetterly, Scarbro, & Hamman, 2000).

Moreover, it is well supported in the literature that advanced age runs in parallel with impaired functionality, and co-morbidities (Bruckenthal, Reid, & Reisner, 2009; Freedman, Schoeni, Martin, & Cornman, 2007), which are independent predictors of late-life depression (Blazer & Hybels, 2010; Karp et al., 2009; Lyness, 2008). Apart from the parent study, this is the first study that has explored the relationship between the number of hospital readmission risk factors and perceived self-efficacy in managing chronic disease in older adults. Although there are no other studies available to confirm this finding, the information drawn from relevant studies suggested that the number of hospital readmission risk factors affect exercise efficacy.

7.2.2 Factors predicting nutritional status.

The present study examined the factors associated with malnutrition risk and malnutrition in older adults who are at risk of hospital readmission. Past studies consistently indicate that older adults are at increasing risk of malnutrition due to various factors such as physical, psychosocial and medical factors (Adams, Bowie, Simmance, Murray, & Crowe, 2008; Heersink et al., 2010). In the current study, the results of the bivariate correlation analysis indicated that depressive symptoms, the number of hospital readmission risk factors, the number of co-morbidities, and self-efficacy in managing chronic disease are correlated with malnutrition risk. However, only the number of hospital readmission risk factors and self-efficacy in managing chronic disease are significantly associated with malnutrition risk in the multivariate regression model. Discrepancies between these two analyses suggested that depressive symptoms and the number of co-morbidities are two confounders, and indicated that these two variables are correlated to the number of hospital readmission risk factors.

It is well supported in the literature that self-efficacy is a significant predictor of disease management behaviours and health outcomes (Anderson et al., 2007; Clark & Dodge, 1999; Grembowski et al., 1993). In the current study, the participants who perceived low self-efficacy in managing chronic disease and had more risk factors of hospital readmission were more likely to be at risk of malnutrition. This finding is consistent with that of previous studies. Gallagher and colleagues (2008) conducted a prospective study of self-management in 300 patients (age > 55 years) with chronic illness, and found that low self-efficacy was related to poor self-management. Poor self-management results in increasing risk of malnutrition. Similarly, the participants who had more risk factors for hospital readmission increased their risk of being malnourished as these factors are related with the factors that cause malnutrition. For example, the factors that cause malnutrition include physical factors, psychosocial factors and medical factors, which may refer to functional impairment, poor social support and living alone, and co-morbidities in the current study. These factors are well supported in the literature that is related to malnutrition risk (Johansson, Bachrach-Lindström, Carstensen, & Ek, 2009; Kubrak & Jensen, 2007; Lee & Berthelot, 2010).

It should be noted that although self-efficacy in managing chronic disease and the number of hospital readmission risks are identified as significant predictors for malnutrition risk, the assumptions of normality were violated in the multivariate regression model (Research question 2-9-1). This suggested that there are other potential predictors which were not included in the model. These potential predictors may include: severity of the disease, medical treatment, sensory loss (taste and smell), and recent stressful life events such as loss of partner, hospitalization, and a new diagnosis of chronic disease (Brantervik et al., 2005; Kubrak & Jensen, 2007; Martin, Kayser-Jones, Stotts, Porter, & Froelicher, 2005). However, other unmeasured variables may be important predictors, but the need to minimise responder burden made more comprehensive assessment inappropriate. Future research focusing on the factors contributing to malnutrition risk are suggested to include broader studies and extensive factors in the model to validate this model.

With regard to malnutrition, age and depressive symptoms were two strong predictors. This finding was consistent with previous studies in elderly populations. A recent study which investigated malnutrition in 579 home-living older adults (age ≥ 75years) in Sweden, found that advanced age, depressive symptoms, and low self-perceived health were stronger predictors of malnutrition (Johansson et al., 2009). These results are also supported by a study conducted in 195 hospitalized medical patients (age ≥ 65 years), which showed that malnutrition was significantly associated with depression, and those who were depressed had more eating and digestive problems (German et al., 2008). The mechanism of association between malnutrition and depression is still unknown (German et al., 2008). The possible explanation is that the symptoms of depression may led to impaired appetite and weight loss, and as a consequence cause malnutrition (Johansson et al., 2009). Additionally, Watterson (2009) stated that malnutrition is a problem that increases with age. A study revealed that patients over 80 years old have a higher odds risk of being malnourished compared to those between 61 and 80 years old (Banks et al., 2007). The present study confirmed that as age increased the odds of malnutrition increased as well.

When examining the association between perceived social support, self-efficacy in managing chronic disease, and malnutrition, only tangible support was significantly associated with malnutrition. This finding is partially consistent with those of previous studies and contrasts with other studies, which showed self-efficacy is associated with health behaviours and health outcomes (Anderson et al., 2007; Lorig, Ritter, & Gonzalez, 2003). This finding was not surprising as Bandura (1986) argued that although self-efficacy beliefs may be generalized to some extent both within and across domains of behaviour, efficacy can vary significantly for different behaviours. Hence, the prediction of specific behaviours is best achieved by using measures of self-efficacy beliefs specific to that behaviour (Bandura, 1997; Seeman, Unger, Mcavay, & Mendes de Leon, 1999; van der Bijl & Shortridge-Baggett, 2001).

The present study, however, evaluated the extent to which more general measures of self-efficacy beliefs, regarding ten facets of behaviour, influence the management of chronic disease, including: 1) exercise regularly, 2) get information on disease, 3) obtain help from community, family and friends, 4) communication with physician, 5) manage disease in general, 6) do chores, 7) do social/recreational activities, 8) manage symptoms, 9) manage shortness of breath, 10) control/ manage depression). Among these ten facets of self-efficacy measurement, none have specifically measured nutritional self-efficacy, which may have led to the inability to capture the association between self-efficacy in managing chronic disease and malnutrition. This may also highlight the importance of including nutritional behaviour as part of chronic disease management in future studies.

Consistent with the literature, tangible support was an independent predictor of health status (Coffman, 2008; Raggi, Leonardi, Mantegazza, Casale, & Fioravanti, 2010). The participants who perceived better tangible support were less likely to suffer from malnutrition. Although, emotional/informational, tangible, affectionate, and positive social interaction support are well documented as important to mental and physical health outcomes (Fischer Aggarwal, Liao, & Mosca, 2008; Reblin & Uchino, 2008; Uchino, 2009), tangible support may be particularly important in relation to nutritional status, as this kind of support is related to assistance with meal preparation if the participants were unable to do it themselves. In the current study, almost half of the participants lived alone, and they may rely on their family, friends, or community services to prepare their meals for them if they are unable to do it after discharge from the hospital. This finding may shed light on preventing malnutrition through tangible support for older adults, particularly those who live alone and are at risk of hospital readmission.

Finally, advancing age is associated with lower BMI, which suggests that as age increases, the risk of malnutrition also increases. This finding is supported by the previous findings of Grylls and colleagues (2003) who investigated 150 older patients (≤ 65 years) with diabetes and found an inverse association of BMI with advancing age, in which BMI decreased 5% with each 10-year increase in age. This finding has brought to light the importance of understanding the factors that contribute to underweight BMI in advancing age and for the development of appropriate prevention and intervention for underweight BMI in advancing age older adults, as underweight BMI is reported to be associated with mortality and morbidity (Berraho et al., 2010;

Gadalla, 2010; Kulminski et al., 2008; Locher et al., 2007). Further studies in these areas are warranted.

7.2.3 Factors predicting functional status.

The salient findings of this study are the five statistically significant contributions influencing instrumental activities of daily living (IADLs), and two major factors that are associated with walking impairment in older adults who are at risk of hospital readmission. Perceived social support was the strongest predictor for IADL, followed by perceived self-efficacy in managing chronic disease, the number of hospital readmission risk factors, age, and the number of co-morbidities.

These findings are consistent with those in the literature. Green and colleagues (2008) reported that more emotional support was associated with better functional status (IADL) in a longitudinal community-based elderly cohort over a 10.9 year study. A recent study, Gadalla and colleagues (2010) examined the socio-demographic, health and economic determinants of limitations in performing IADLs in 21,255 Canadian elderly ($\geq$ 65 years). They found that the participants who lived alone, with advancing age and weaker physical health had increased odds of limitations in performing IADLs. In addition, older adults with two or more co-morbidities are assumed to be more certain to develop a functional disability than those without chronic conditions (Peek & Coward, 2000). The finding that perceiving high self-efficacy in managing chronic disease would be associated with better performance in IADLs was expected, as the participants who were confident in managing their chronic conditions, may also be confident to perform IADLs. This finding also supported Bandura's SCT theory.

It is noteworthy that social support was the strongest predictor for IADL in this current study. This suggests that social support plays a vital role for older adults who are at risk of hospital readmission, as the majority of older adults live alone and maintaining independence in late life is one of the major goals of healthy ageing (Judge, Schechtman, & Cress, 1996). Evidence indicates that social support promotes more adaptive cognitions including increased optimism, reduced loneliness, and increased self-efficacy in the face of stress (Sacco & Yanover, 2006; Southwick, Vythilingam, & Charney, 2005). Additionally, the tangible support may be particularly practical as the study participants reported low levels of independence on travelling, shopping, and preparing meals. Also, the majority of participants had difficulty doing house work, especially heavy jobs. This finding provides the evidence to which future interventions may be tailored. As a whole, social support may shed light on preventing functional decline in terms of performing IADLs, and hence the elderly can continue to live independently without diminishing their quality of life.

The factors that influence walking impairment varied. However, two major factors were identified, including self-efficacy in managing chronic disease and the number of hospital readmission risk factors. Perceived higher self-efficacy in managing chronic disease was associated with better performance in walking distance, speed and stair climbing. There was an inverse association of the number of hospital readmission risk factors with walking impairments, in which the more risk factors for hospital readmission, the lower performance in walking speed and stair climbing. It is difficult to compare this relationship with previous research as little research has examined perceived self-efficacy in managing chronic disease and the number of hospital readmission risk factors in relation to walking impairment in this population.

In related literature, one study found that self-efficacy in managing chronic disease was significantly associated with walking ability, which was measured by treadmill walking distance and the 6-minute walking test in 145 individuals (mean age 66.5 ± 10.1 years) with diabetes mellitus and peripheral arterial disease (PAD) (Collins et al., 2010). Other studies have measured various self-efficacies on physical activities in community-dwelling older adults, including performing self-efficacy, barriers to self-efficacy (Rejeski, Tian, Liao, & McDermott, 2008), the exercise self-efficacy and self-efficacy for walking (McAuley et al., 2006); however these studies shared the consistent patterns that self-efficacy beliefs determine and influence physical activity behaviours (McAuley & Blissmer, 2000; McAuley et al., 2006; Rejeski, Tian et al., 2008). In this regard, the current study supports these studies, although the study population and measurements are different (i.e. community-dwelling volunteer older adults versus high risk of hospital readmission older adults).

The finding of an inverse association of the number of hospital readmission risk factors with walking ability was expected, as these eight risk factors have potential negative impacts on individuals' physical, psychosocial and medical well-being, including functional status, such as walking impairment. In related literature, older age, physical impairment, self-reported poor health, and chronic health conditions are consistent with reports in the geriatrics literature on functional limitation risk factors (Dunlop et al., 2005; Enright et al., 2003; McCurry et al., 2002; Seeman & Chen, 2002).

Other factors such as perceived social support and depressive symptoms are also reported to be associated with functional decline (Hays, Saunders, Flint, Kaplan, & Blazer, 1997; McCurry et al., 2002). The current study found that the depressive symptoms were associated with walking impairment in bivariate correlation analyses. However, they were not an independent predictor for walking impairment after controlling for other socio-demographic variables in the model of multivariate analysis. This suggested that depressive symptoms may be a confounder. This contradicts previous studies, which show depressive symptoms as an independent predictor on functional decline.

A possible explanation is that the majority of participants were mildly depressed, among those who were detected as depressed, and hence their depressive symptoms might not affect their walking ability. Similarly, Hybels and colleagues (2009) found that the relationship between depressive symptoms and functional status may vary by the tasks that are under assessment. It is also noted that the assumptions of standard multiple regression analysis in the model of walking impairment – stair climbing was violated, suggesting there are other potential factors that may contribute in predicting WIQ-stair climbing. These potential factors may include disease severity and disease-specific areas such as arthritis and cardiac related-conditions tending to limit older adults' walking ability, especially for stair climbing (Guccione et al., 1994; Izquierdo-Porrera et al., 2005; Maly, Costigan, & Olney, 2007). Further longitudinal studies are required to investigate whether the depressive symptoms will cause walking impairment in regard to walking-distance, walking-speed, and stair-climbing over a period of time, and including the factors suggested above.

7.2.4 Factors predicting health-related quality of life.

The current study findings suggested that the physical component summary (PCS) was adversely affected by the number of hospital readmission risk factors, and the mental component summary (MCS) was adversely affected by depressive symptoms, but positively associated with self-efficacy in managing chronic disease, after controlling for confounding variables such as age, perceived social support and the number of co-morbidities. In the initial bivariate correlation analysis, both PCS and MCS were adversely correlated with depressive symptoms, the number of co-morbidities, and the number of hospital readmission risk factors, but positively associated with self-efficacy in managing chronic disease. These results of bivariate analyses confirm the existence of an inverse relationship between the number of chronic diseases, depression and health-related quality of life (Fortin et al., 2006; Keles, Ekici, Ekici, Bulcun, & Altinkaya, 2007), and a positive correlation between self-efficacy beliefs and health-related quality of life (Amir et al., 1999; Elise et al., 2001; Kim, 2008).

In multivariate analyses, however, risk factors of hospital readmission were found to independently predict physical related quality of life; and, depressive symptoms and self-efficacy in managing chronic disease were found to affect mental health-related quality of life. Consistent with the literature, among the eight risk factors examined, recent multiple hospital readmissions (Bookckvar et al., 2003), some functional impairment (Dominick, Ahern, Gold, & Heller, 2004; Izquierdo-Porrera et al., 2005), and multiple co-morbidities (Fortin et al., 2006) were shown to directly influence physical health-related quality of life. In addition, it is well documented in the literature that psychosocial factors such as social support also contributed to physical health-related quality of life (Bennett et al., 2001; Sibbritt, Byles, & Regan, 2007).

This finding is particularly striking in the case of depressive symptoms, where the number of hospital readmission risk factors remained a significant predictor even though the depressive symptoms were powerful enough to overwhelm the usual robust association of physical health-related quality of life. This may indicate that the lower physical health-related quality of life previously reported by other studies with depressive symptoms is due to having more risk factors for hospital readmission in this population, rather than to depressive symptoms per se. Thus, this finding highlights an important consideration for the need to identify older adults who are at risk of hospital readmission in clinical settings, so that the individualized nursing care plans or interventions may be tailored for this population to ensure their physical health-related quality of life will not be diminished.

For mental health-related quality of life, the present findings concur with previous studies showing that the participants who were more depressed reported a significantly lower mental health-related quality of life, while the participants who perceived higher levels of self-efficacy in managing chronic disease reported a significantly better mental health-related quality of life. This finding supports a recent study conducted by McLaughlin and colleagues (2010). They found that more depressive symptoms were a significant predictor of impaired health-related quality of life in community-dwelling older adults with epilepsy. Additionally, Gallegos-Carrillo et al. (2009) found that the poorest mental and physical health-related quality of life was for older adults who suffered from both depressive symptoms and two or more chronic diseases.

In relation to self-efficacy beliefs, Fry (2001) reported that weaker levels of perceived self-efficacy in various domains such as interpersonal, instrumental, emotional, social support, physical health, nutritional and spiritual health were associated with lowered perceptions of health-related quality of life in 211 community dwelling older widows and widowers (age 65-85 years). Although a number of earlier studies have reported adverse relationships between the number of co-morbidities and health-related quality of life (Gallegos-Carrillo et al., 2009; Keles et al., 2007), results from the current study demonstrated no association between the number of co-morbidities and health-related quality of life. It is the higher levels of perceiving self-efficacy in managing chronic disease that are associated with better health-related quality of life.

It would appear, therefore, that the level of self-efficacy in managing chronic disease is an important aspect of clinical management in older adults who are at risk of hospital readmission. In addition, while more co-morbidities may impair quality of life for older adults, it would appear that enhanced self-efficacy in managing chronic disease should have a positive effect on health-related quality of life. Thus, this finding provides evidence for the development of intervention programmes to enhance self-efficacy in managing chronic disease aimed at improving health-related quality of life in older adults at high risk of hospital readmission.

Study Two has highlighted the significant predictors that influence participants' self-efficacy in managing chronic disease, nutritional status, functional status, and health-related quality of life. In general, the findings are consistent with the hypothesized self-efficacy model (Figure 3.4) and existing literature. The findings particularly underscore the importance of identifying risk factors of hospital readmission and self-efficacy for managing chronic disease in the context of improving nutritional status, functional status, and health-related quality of life in older adults who are at risk of hospital readmission.

7.3 Study Three Discussion

Study Three tested the impact of mediating components from social cognitive theory perspectives that explain three health outcomes, including nutritional status, functional status and health-related quality of life. The discussions are addressed in a sequence corresponding to the order of the research questions in Study Three, which refers to: 1) mediation effects of self-efficacy in managing chronic disease on three health outcomes, 2) mediation effects of social support on three health outcomes, and 3) mediation effects of both social support and self-efficacy in managing chronic disease on three health outcomes.

7.3.1 Mediation effects of self-efficacy in managing chronic disease on three health outcomes.

Two hypotheses were proposed in regard to the mediation effects of self-efficacy in managing chronic disease. They were: firstly, that self-efficacy would mediate between health characteristics and three health outcomes (nutritional status, functional status and health-related quality of life); and secondly, that self-efficacy beliefs would mediate between depressive symptoms and the three health outcomes above. The findings suggest that self-efficacy in managing chronic disease partially mediates the relationship between the health characteristics and health-related quality of life, and the relationship between depressive symptoms and health-related quality of life. However, the hypotheses that self-efficacy beliefs would mediate the relationships between two latent factors (the health characteristics and depressive symptoms) and two dependent factors (functional status and nutritional status) were not supported.

It is worth noting the latent factor structure which underlies the health characteristics before discussing the findings further, as this is the first study that has constructed health characteristics as a formative construct to examine the relationship between self-efficacy beliefs and health outcomes in older adults. The construct of health characteristics was represented by cognitive status, the number of hospital readmission hospital risk factors, and the number of co-morbidities, and was measured as a formative construct. The rationale behind creating this formative construct was based on statistical and theoretical considerations. In the formative construct, the indicators could be viewed as causing, rather than being caused by, the latent variable measured by the indicators (MacCallum & Browne, 1993). In other words, it is changes in the indicators that determine changes in the value of the latent construct rather than the other way around (Diamantopoulos & Siguaw, 2006; Jarvis et al., 2003).

In light of this principle, the above three indicators were chosen based on theoretical considerations regarding the relationship between the indicators and the latent construct under examination in the current study. For example older adults are more likely to present with more chronic conditions (Wolff, Starfield, & Anderson, 2002), and to be at risk of hospital readmission due to the following factors: advanced age (≥ 75 years), multiple admissions in the previous 6 months, multiple co-morbidities, living alone, lacking social support, having poor self-rated health, moderate functional impairment, a history of depression (Courtney et al., 2009), and cognitive decline (Myers, 2008). These three indicators explained 68% of the total variance in this construct, and the results of validity of this formative construct showed that the model fitted the data well. Thus, the current study provides evidence that the structure of the health characteristics is conceptually and statistically supported.

In terms of the mediation effects of self-efficacy beliefs, the current study provides evidence to support self-efficacy in managing chronic disease as a mediator in two instances. First, self-efficacy in managing chronic disease served to partially mediate the effects of the health characteristics on health-related quality of life. Second, self-efficacy in managing chronic disease partially mediated the relationship between depressive symptoms and health-related quality of life. The finding is similar to those of previous studies, in which higher levels of self-efficacy beliefs were found to mediate the relationship between the health conditions and health-related quality of life (Abbott et al., 2010; Amir et al., 1999; Grembowski et al., 1993).

In the same way, the participants who had fewer depressive symptoms tended to have higher levels of self-efficacy in managing chronic disease, and hence may perform better for managing their chronic conditions, which in turn would enhance perceptions of better health-related quality of life. Scant research regarding the examination of the mediation effects of self-efficacy in managing chronic disease between depressive symptoms and health-related quality of life in older populations is available. In related studies, a recent study suggested depressive symptoms moderated the effect of self-efficacy in managing chronic disease (Jerant, Kravitz et al., 2008) in 415 patients ($\geq$ 40 years) with chronic conditions.

Another study found that enhancing participants' self-efficacy in managing chronic disease through the Chronic Disease Self-Management Program (CDSMP) had a positive effect on quality of life for the elderly with low back pain (Haas et al., 2005); however, the mediation effects were not assessed. Further support for a mediating role for self-efficacy is provided by Kuijer and de Ridder (2003) who found that self-efficacy in achieving desired health outcomes mediated the association between discrepancy in illness related goals and the quality of life and well-being; nevertheless, the relationship between depressive symptoms, self-efficacy beliefs and quality of life was not examined. Clearly, the mediation effects of self-efficacy between depressive symptoms and health-related quality of life is a topic that warrants further consideration in future research.

Contrary to the current study hypotheses, the instances of self-efficacy in managing chronic disease as a mediator were not evident across both functional status and BMI; instead, the finding showed that the health characteristics had the strongest direct effects on both functional status and BMI. The participants who had poor health characteristics such as more co-morbidities and had more risk factors of hospital readmission were reported to have more functional disability and lower BMI. These findings are consistent with previous reports in the literature (Forman-Hoffman et al., 2008; Gadalla, 2010; Kubrak & Jensen, 2007; Steffens, Hays, & Krishnan, 1999; Weiner, Rudy, Kim, & Golla, 2004).

Although, health characteristics and depressive symptoms significantly influence self-efficacy beliefs, which has been confirmed in previous studies (Fiske et al., 2009; Jerant, Kravitz et al., 2008; Robinson et al., 2008), self-efficacy in managing chronic disease was not significantly related to functional status in terms of performing instrumental activities of daily living and BMI. These findings provide the evidence that the health characteristics had more influential effects on functional status and BMI. However, the findings may be affected by the general measures of self-efficacy in managing chronic disease rather than domain-specific measures. It has been suggested that domain-specific aspects of self-efficacy become more important with age, particularly in the elderly (Bandura, 1997; Fiori, McIlvane, Brown, & Antonucci, 2006). In this instance, future study may include nutrition elements in measuring the chronic disease self-efficacy among older adults.

7.3.2 Mediation effects of social support on three health outcomes.

The principle goal of this model test was to investigate two proposed hypotheses. The first hypothesis was that social support would mediate between health characteristics and three health outcomes (nutritional status, functional status and health-related quality of life). The second hypothesis was that social support would mediate between depressive symptoms and the three health outcomes above. The findings revealed that only perceived social support partially mediate the relationship between the health characteristics and functional status. The participants who had fewer co-morbidities, less cognitive impairment, and fewer risk factors of hospital readmission reported perceived better social support, and perceived higher levels of social support were related to more instrumental activities of daily living limitations.

This finding confirmed previous multivariate analysis, which indicated that social support was the strongest predictor of instrumental activities of daily living. This is consistent with previous studies which suggested that as increasing disability occurs, individuals are forced to rely on family and relatives or friends more heavily to care for themselves and accomplish daily tasks (Dean, Kolody, & Wood, 1990; Newsom & Schulz, 1996). Among the types of social support, tangible support was found as most useful support for elderly people with chronic conditions (Coffman, 2008; Newsom & Schulz, 1996; Raggi et al., 2010). This finding is also reflected in the current study population, as the participants reported having more limitation on travelling, shopping, preparing meals and doing house work independently. It may require the family, relatives or friends to assist in these activities. Additionally, more than half of the participants lived alone, a sense of security associated with knowing that material assistance is available may also play a critical effect on psychological support, which in turn may ensure that the individuals' living status in the community can be maintained (Newsom & Schulz, 1996).

The findings of the current study are inconsistent with the literature in a few aspects with regard to the mediation effects of social support for health-related quality of life and nutrition indicators (BMI). For instance, Newsom and Schulz (1996) found that social support was a mediator between physical disability and quality of life in a national sample of 4,734 older adults (≥ 65 years). In related studies, Sherman et al. (2006) conducted a study that measured the health-related quality of life in 364 older adults with osteoarthritis and reported that social support was an important predictor of long-term psychosocial outcomes. This finding was further supported by a study conducted by Fortin et al. (2006). They found that social support was related to mental and physical health-related quality of life in 238 patients with chronic disease (age 56.5 ± 17.4 years).

The discrepancy, however, may stem from the methods of analyses such as multiple regressions versus structural equation modelling. Although Newsom and Schulz (1996) applied structural equation modelling analyses to examine the mediation effects of social support, the health characteristics which had significant direct effects on health-related quality of life were not measured in the mode. The current study, thus demonstrated that the health characteristics and depressive symptoms had direct effects on health-related quality of life, and hence the role of mediator of social support was not supported in this regard.

With respect to the mediation effects of social support on BMI, the results indicated that perceived social support was not significantly associated with BMI, instead the health characteristics had significant direct effects on BMI. The participants who had more risk factors of hospital readmission, co-morbidities, and cognitive impairment were likely to have lower BMI, indicating increased risk of malnutrition. This finding is consistent with those reported on the factors that are related to malnutrition risk, including co-morbidities (Ülger et al., 2010), risk factors of hospital readmission such as advanced age, functional impairment, living alone and lack of social support (Johansson et al., 2009; Kubrak & Jensen, 2007; Ülger et al., 2010), and cognitive impairment (Jurschik et al., 2010; Miller, Bannerman, Daniels, & Crotty, 2006).

From a statistical point of view, however, the construct of nutritional status was abandoned as the two indicators (BMI and CAMA) may not be sufficiently different enough to measure the same concept. Further research investigating the concept of nutritional status should be incorporated with broader nutritional parameters as indicators to capture the concept of nutritional status when applied to structural equation modelling.

7.3.3 Mediation effects of social support and self-efficacy on three health outcomes.

In this study three full structural equation models were tested to examined the possible role of social support and self-efficacy in managing chronic disease as mediators in the relationship between health characteristics, depressive symptoms, and three health outcomes. As hypothesized and consistent with previous research and social cognitive theory, the findings indicated that social support mediated the relationship between health characteristics and self-efficacy in managing chronic disease (Anderson et al., 2010; Bandura, 1997; Raggi et al., 2010). This finding further confirmed that the mechanisms of social support on self-efficacy beliefs may serve as sources of efficacy information such as verbal persuasion and vicarious experiences based on a social cognitive theory perspective (Bandura, 1986).

In related studies, Fukukawa et al. (2008) highlighted social support as a moderator influencing the exercise intervention process for community dwelling older adults through affecting falls self-efficacy. They reported that participants who had received social support from the intervention staff and other participants during their exercise sessions had improved their self-efficacy. Furthermore, Resnick and Nigg (2003) also reported that social support may strengthen self-efficacy beliefs related to exercise by providing verbal encouragement, serving as role models, appraisal activities, and the sharing of information about exercise on health. Although, these studies provide the evidence of how social support influences self-efficacy beliefs, the further relationship between the mediation effects of social support, and self-efficacy beliefs on health outcomes were not examined.

These mediator effects of social support on self-efficacy were supported by Anderson et al. (2010) in their randomised control trial to determine whether the constructs of social cognitive theory could account for treatment-related changes in nutrition and physical activity in 661 community-dwelling adults (18-89 years). They found that, consistent with social cognitive theory, the individuals who perceived more family social support for physical activity had enhanced self-efficacy and use of self-regulatory behaviours, and hence to higher post-treatment physical activity levels. Along with this, the findings of the current study indicated that the partial mediation effects of self-efficacy beliefs on functional status and health- related quality of life are consistent with Anderson et al's. (2010) work. As was the case in the current study, the participants who perceived better social support for managing chronic disease had improvements of self-efficacy, which in turn improved their functional status and health-related quality of life.

In this respect, the current study extends earlier studies by highlighting the role of social support and self-efficacy beliefs as mediators influencing the functional status and health-related quality of life for older adults, as few studies have explored the joint effect of social support and self-efficacy towards positive health outcomes (Raggi et al., 2010). To the best of the author's knowledge, this is the first time that an empirical quantitative model has shown that the variables under discussion are highly relevant, and explain 50% of the variance in functional status and 86% of the variance in health-related quality of life. The model has practical applications, implying that if an improved health characteristic leads to a better functional status and health-related quality of life, this will be translated into increasing social support and an enhanced sense of self-efficacy beliefs.

The hypothesis that depressive symptoms would be mediated by perceived social support was unsupported; rather, the depressive symptoms had strong direct negative effects on self-efficacy beliefs across the three tested models. This finding is consistent with other studies that demonstrate that depressive symptoms influence individuals' confidence in ability to perform certain behaviours (DiIorio et al., 2006; Robinson et al., 2008). In Robinson's et al. (2008) work, they also applied SEM to test a model which examined the relationship between depressive symptoms, social support, self-efficacy and lifestyle management based on social cognitive theory in 306 adults (43.1 years) with epilepsy. Similar to the current study, they found that depressive symptoms had a direct influence on self-efficacy in managing chronic disease. They also reported that depressive symptoms and perceived social support were significantly correlated; however, they did not test the mediation effect of social support between the relationship of the depressive symptoms and self-efficacy beliefs.

Consistent with Bandura’s (1997) social cognitive theory, people who are highly prone to depression misperceived their performance attainments, which results in inefficacy. In the model 3-3b and 3-3c, the path from depressive symptoms to self-efficacy to functional status (model 3-3b) / health-related quality of life (model 3-3c) was significant. These findings support the results from previous studies that found depressive symptoms to reduce self-efficacy, which in turn have impacted on health outcomes (Jerant, Kravitz et al., 2008; Robinson et al., 2008). Thus, these findings suggest that self-efficacy actually mediated the relationship between depressive symptoms and functional status and health-related quality of life in older adults who are at risk of hospital readmission, and perceived social support did not influence these relationships.

A possible explanation for the role of social support not being a mediator between depressive symptoms and self-efficacy might be, as Bandura (1997) stated, that depressed people create depressing environments by their behaviour such as dejection, inadequacy and worthlessness, and they not only view their environment depressingly, they also create the depressing social environment for themselves to view. In this respect, it seems to explain why perceived social support would not be able to mediate between depressive symptoms and self-efficacy beliefs.

This is despite the relationship between depressive symptoms and social support being reported inconsistently in the literature. For instance Newsom and Schulz (1996) found that depressive symptoms are a cause rather than a consequence of lower social support, and several studies report reciprocal relations between social support and depression (Johnson, 1991; Matt & Dean, 1993). Because the current study is cross-sectional, it is not possible to adequately test models proposing reciprocal paths between these variables. Future studies should consider both bidirectional and unidirectional relations between social support and depression symptoms, and verify the role of social support in the relationships between depressive symptoms and self-efficacy beliefs.

It is also noted that in contrast to what is expected, the impact of perceived social support on health-related quality of life was negative. This finding seems to contrast with the relevant literature, which reported social support to predict a positive impact on health-related quality of life (Barry, Kasl, Lichtman, Vaccarino, & Krumholz, 2006; Bennett et al., 2001), especially for mental health-related quality of life (Barry et al., 2006). Due to this unexpected finding, further multiple regression analyses were conducted to inspect the potential explanations. The results suggested that positive interaction support was positively significantly related to PCS ($\beta = .45$, $p = .02$), and emotional and information support had an inverse impact on PCS ($\beta = -.36$, $p = .05$). There was no statistical significance found in MCS. It is not clear why the participants who had lower emotional and information support, were likely to have better physical health-related quality of life. A narrative qualitative study is warranted for future study in this area.

In summary, Study Three adds a significant contribution to the literature through examining the mediation effects of self-efficacy in managing chronic disease and social support based on the social cognitive theory for older adults who are at risk of hospital readmission. Additionally, the study also validates the health characteristics construct based on conceptual and statistical grounds, which appeared to have the strongest direct effects on BMI, functional status and health-related quality of life. These findings provide unique evidence for designing effective intervention programs not only for older adults at risk of hospital readmission but also for health professionals on the benefits of chronic disease management. For the parent study, these findings offer information that can be an anchor for assessment of the intervention effects.

Conclusion

This chapter has discussed the key findings from Study One to Study Three. Study One's findings suggested that the prevalence of malnutrition risk ranged from 10.9% to 27.4%, depending on the measurements. This finding was lower than other rates reported in the literature. This may be due to the fact that the present study's participants were still relatively healthy with reasonable functional ability, although they were identified as at risk of hospital readmission. However, the prevalence of malnutrition continues to cause concern as one in five of participants suffered from malnutrition.

A significant finding from Study One also confirmed that the nutrition screening tool, the MST, is a valid and useful tool for older adults in acute hospital settings. Consistent with the literature, the findings of Study Two indicated significant predictors for nutritional status, functional status and health-related quality of life, included self-efficacy in managing chronic diseases, depressive symptoms, the number of hospital readmission risk factors, perceived social support and age.

Finally, the findings of Study Three supported the relevance of social cognitive theory for examining the mediation effects of self-efficacy beliefs and social support. The study also revealed that there is scant research examining the role of social support in relation to depressive symptoms and self-efficacy beliefs. Validating the health characteristics' construct in Study Three may also provide a significant implication in the clinic setting such as a comprehensive health characteristics' check list or index that may be developed for older adults, as this construct had the strongest influence on patients' health outcomes. The following chapter will describe the study's implications and limitations in more detail.

Chapter 8: Conclusion

Introduction

With the rising aging population, a new focus for aging care has emphasized not only acute care but also the prevention and management of chronic conditions. As older adults generally have more co-morbidities, managing multiple complex chronic conditions can be a crucial part of their lives. The management of chronic disease has been studied extensively by using different health behaviour theories in the general population. However, there has been limited investigation on the mechanism of self-efficacy in managing chronic disease and health outcomes in older adults who are at risk of hospital readmission. The overall purpose of this PhD research was to examine the potential mechanisms in the relationship between the variables using social cognitive theory and focusing on three health outcomes. In other words, the purpose was to test social cognitive theory related to self-efficacy for managing chronic disease in relation to three health outcomes: nutritional status; functional status; and, health-related quality of life, in older adults who are at risk of hospital readmission.

This study offers a comprehensive understanding of the factors and constructs that influence older adults' self-efficacy for managing chronic disease and health outcomes through the lens of social cognitive theory. The present study advances previous findings to demonstrate that social cognitive theory provides a useful framework for understanding and predicting three fundamental health outcomes (nutritional status, functional ability and health-related quality of life) in older adults. The results from the present study also highlight the applicability of social cognitive theory in guiding health intervention programmes focusing on improving chronic disease self-management and health outcomes among older adults at risk of hospital readmission.

This is the first study that tests social cognitive theory in relation to chronic disease self-management for older adults who are at risk of hospitalisation. Three integrated studies were undertaken to address each of the objectives. The objectives were to:

1. determine the nutritional status and prevalence of malnutrition among older adults who are at risk of hospital readmission, and validate the Malnutrition Screening Tool (MST) in this population;

2. explore the relationships between participants' characteristics, self-efficacy in managing chronic disease and health outcomes based on the study's hypothesized model (Figure 3.4);

3. test a theoretical model based on social cognitive theory, which examines potential mechanisms of the mediation effects of social support and self-efficacy beliefs.

The chapter begins by synthesizing the key findings from three studies, followed by a discussion of the strengths and limitations of each study. Finally, the implications of the findings for theory development, clinical practice, and future research are presented.

8.1 Synthesis of Significant Findings

Nutrition plays a vital role in an individual's health and wellbeing. The findings of Study One highlighted that the prevalence of malnutrition risk ranged from 10.9% to 27.4%, depending on the measurements. According to a valid nutrition assessment tool, SGA, about one in five of the participants suffered from malnutrition (20.6%). As expected, a nutritional screening tool, the MST, has identified the highest rates of malnutrition risk (27.4%) compared to the BMI, CAMA, and SGA. These findings continue to raise concern for health care practitioners as the prevalence of malnutrition remains reasonably high.

Another important finding of Study One confirms that the MST is a valid and useful nutrition screening tool for older adults at risk of readmission. The MST was found to be effective in detecting participants at risk of malnutrition when compared to the nutritional assessment tool, the SGA, with high sensitivity (94%), specificity (89%), positive predictive value (70%) and negative predictive value (98%). Moreover, the finding also shows a substantial agreement between these two methods, the MST and the SGA (kappa = .74, $p < .001$). This finding suggests that the MST is a valid and practical nutrition screening tool for older adults in the hospital setting.

In Study Two, the significant influential factors were identified for self-efficacy in managing chronic disease, and three health outcomes (nutritional status, functional status, and health-related quality of life) through the study's hypothesized model (Figure 3.4). Among the significant predictors, depressive symptoms and perceived social support were the two strongest influential factors for self-efficacy in managing chronic disease. Other factors that were related to chronic disease self-efficacy management included: (1) educational attainment was positively related with self-efficacy beliefs; and (2) the numbers of hospital readmission risk factors were negatively associated with self-efficacy beliefs. Age and income were not found to relate to self-efficacy beliefs. However, it is noteworthy that apart from the current study, limited studies have explored and reported the influential factors of socio-demographic and health or illness characteristics on self-efficacy for managing chronic disease in older adults, indicating the need for future research in this area.

Two predictors were significantly related to malnutrition risk. They are self-efficacy in managing chronic disease and the number of hospital readmission risk factors. Although these two factors were supported by the literature that contributes to malnutrition risk, the statistical assumption of normality in multivariate analysis was violated. Thus, this result needs to be interpreted cautiously as there are other potential predictors which might not be included in the model. Future studies are encouraged to include broader and extensive factors to validate this model.

Further, advancing age, depressive symptoms and less tangible support are three important predictors for malnutrition in older adults who are at risk of hospital readmission. These findings may shed light on preventing malnutrition for this particular population. Interestingly, self-efficacy in managing chronic disease was not associated with malnutrition. A possible explanation is that among the ten facets of the chronic disease self-efficacy scale, none have incorporated nutritional self-efficacy, which may result in an inability to capture the relationships between self-efficacy beliefs and malnutrition. This may suggest that there is a need to incorporate nutritional self-efficacy when measuring self-efficacy in managing chronic disease. Finally, an important finding was that advancing age was associated with lower BMI, which highlights the importance of monitoring and preventing low BMI in older adults.

With regard to functional status, five predictors were found to be associated with the instrumental activities of daily living (IADL), and two major predictors were associated with walking impairment. Perceived social support was the strongest predictor for IADL, followed by self-efficacy in managing chronic disease, the number of hospital readmission risk factors, age, and the number of co-morbidities. The finding provides essential information and considerations for helping older adults in performing IADL.

Consistent with the literature, perceived higher self-efficacy in managing chronic disease was associated with better performance in walking distance, speed and stair climbing; and, an inverse relationships was found between the number of hospital readmission risk factors and walking impairments. In contrast with the literature, however, depression was not an independent predictor for walking impairment in the current study. This may be due to the fact that among those depressed participants, the majority of them were mildly depressed and hence their walking ability was not affected.

In Study Two, the factors related to health-related quality of life were also examined. The findings demonstrated: (1) the number of hospital readmission risk factors adversely affected the physical health-related quality of life; (2) depressive symptoms adversely influenced mental health-related quality of life; and (3) self-efficacy in managing chronic disease was positively associated with mental health-related quality of life. These findings highlight the following key points. Firstly, an importance of identifying older adults who have more risk factors of hospital readmission in clinical settings, as the number of hospital readmission risk factors were the strongest predictors of physical health-related quality of life. Secondly, depressive symptoms play a vital role in influencing mental health-related quality of life. Finally, the finding provides evidence of enhanced self-efficacy in managing chronic disease, which in turn improves mental health-related quality of life.

In Study Three, a series of model tests were undertaken to determine the mediation effects of self-efficacy in managing chronic disease and social support on three health outcomes (nutritional status, functional status, and health-related quality of life) based on social cognitive theory. Three main research questions were addressed in Study Three. The first research question was to examine whether self-efficacy mediated the effect of health characteristics, and depression on three health outcomes as mentioned above. The finding indicated that self-efficacy partially mediated the effect of health characteristics and depression on health-related quality of life. The findings also showed that health characteristics had the strongest direct effects on functional status and BMI, while self-efficacy beliefs did not have an influence on these relationships. These findings emphasize the possibility of improving health-related quality of life in older adults by enhancing their self-efficacy beliefs, and address the issues of health characteristics to improve their functional status and BMI.

The second research question of Study Three was to examine social support as a mediator between the relationship of health characteristics, depression and three health outcomes. The finding revealed that social support partially mediated the relationship between health characteristics and functional status. As more than half of participants lived alone, and reported having limitations on travelling, shopping, preparing meals and doing house work independently, tangible support may be particularly useful for this population. Another key finding was that health characteristics and depression had strong negative direct effects on health-related quality of life, and hence the role of mediator of social support was not supported in this regard.

Finally, the third research question was to determine the possible role of social support and self-efficacy in managing chronic disease as mediators in the relationship between health characteristics, depression and the three health outcomes. Social support fully mediated the effect of health characteristics on self-efficacy in managing chronic disease. The finding may suggest that the role of social support serves as a source of efficacy information from a social cognitive theory perspective. The findings also indicated that self-efficacy in managing chronic disease partially mediated the effect of social support on functional status and health-related quality of life. In other words, the participants who perceived better social support for managing chronic disease had improvements in self-efficacy, which in turn improved their functional status and health-related quality of life.

However, the study's hypothesis that social support mediated the effect of depression on self-efficacy beliefs was unsupported; rather, depression had strong direct negative effects on self-efficacy beliefs. Additionally, self-efficacy beliefs were actually found to mediate the effect of depression on functional status and health-related quality of life, and social support did not influence self-efficacy beliefs in these relationships. The relationship between social support and depression, however, is reported inconsistently in the literature, future studies are recommended to test the reciprocal relations between these two variables.

Study Three is also unique in that this is the first study that created a formative construct of health characteristics in older adults who are at risk of hospital readmission. The finding provides empirical evidence that the structure of the health characteristics is conceptually and statistically supported. As this construct also shows strong direct effects on BMI, functional status, and health-related quality of life, it may provide a significant implication for clinical practices.

8.2 Strengths and limitations

This thesis provides three distinctive contributions to the existing knowledge in relation to chronic disease self-efficacy in older adults. Firstly, Study One used comprehensive nutrition parameters to assess nutritional status for the study population, and confirmed that the MST is a valid and useful nutritional screening tool for older adults who were at risk of hospital readmission. Secondly, Study Two was the first study that provided a comprehensive and in-depth examination of the relationships between self-efficacy in managing chronic disease and the three health outcomes mentioned above in older adults who are at high risk of hospital readmission. In the past, researchers have focused on examining the factors that are associated with self-efficacy in managing chronic disease and other outcome measures such as well-being, but not nutritional status, functional status and health-related quality of life.

Thirdly, Study Three also adds significant contributions to the literature in terms of testing social cognitive theory in relation to chronic disease self-management among older adults using a SEM approach. The study was particularly unique in that it tested the role of social support and self-efficacy in managing chronic disease as mediators, and their joint effects towards three health-related outcomes. In addition, using SEM is a powerful technique in testing social cognitive theory, as SEM tests theoretical models using the scientific method of hypothesis testing to advance the understanding of the complex relationship amongst constructs (Schumacker & Lomax, 2004). For example, the present study defined and validated the construct of health characteristics and revealed this construct had a great direct impact on chronic disease self-efficacy and health outcomes. As there are limited studies that have tested social cognitive theory in this area and using the SEM approach, this study hence provides empirical evidence in these areas.

Despite the unique strengths of the study, there are some limitations that need to be taken into consideration. As this is a cross-sectional study design, causality cannot be unequivocally determined from this study. Additionally, the sample size for Study Three was at the lower boundary generally recommended for SEM (Kline, 2005). Retesting and validating of the models with a larger sample is warranted for future study. Furthermore, the samples used in the study cannot be generalized to the older hospitalized population as a whole. People who had dementia and severe functional impairments were excluded from the study, which would potentially contribute to a higher rate of malnutrition, and lower self-efficacy in managing chronic disease. As a result, this leads to a limitation in generalization to the entire population.

Another limitation of the study is that the constructs of SCT, outcome expectation and chronic disease management behaviour, were not measured. Although it would be ideal to test the entire theoretical constructs, in reality this is generally not achievable in consideration of minimising responder burden. A future research focus on this topic could include these two constructs in the model, but may use shorter measurements such as the chronic disease self-efficacy scale short form.

Finally, the construct of nutritional status was abandoned as the two indicators (BMI and CAMA) were not sufficiently different enough to measure the same concept. Further research investigating the concept of nutritional status should be incorporated with broader nutritional parameters as indicators to capture this concept when using an SEM approach.

8.3 Implications

Based on the distinctive findings of this thesis, some noteworthy implications are generated for theory development, clinical practice and future research. These implications are presented below.

8.3.1 Theoretical implications.

The conceptual framework of this study was based on the social cognitive theory (SCT) that was developed by Bandura (1986). The SCT's theoretical framework provided an adequate fit to the data and supported the majority of the hypothesized relationships and findings. The current study not only confirmed the mediation role of self-efficacy beliefs, but also strengthened its strong influence on health outcomes such as nutritional status, functional status and health-related quality of life in older adults who are at risk of hospital readmission. Additionally, the study also demonstrated that the role of social support was a mediator that influenced the information sources, which in turn impacted on self-efficacy beliefs in the context of SCT.

In general, the findings accounted for a significant amount of variance in most of the constructs. For instance, the model (3.3b and 3.3c) that tested both social support and self-efficacy beliefs as mediators explained about 30% and 66% of the variance in social support and self-efficacy beliefs respectively, and accounted for 50% in functional status and 86% in health-related quality of life. This finding makes a distinctive contribution to SCT literature through the amount of variance explained in these models. These findings imply that the hypothesized constructs under discussion are highly relevant, which also suggests that SCT provides a useful framework for understanding chronic disease self-management and health outcomes. It could, therefore, guide intervention programmes focusing on improving chronic disease self-management and health outcomes among those older adults at risk of hospital readmission. The findings of this study, thus, are particular striking and useful, as there is scant literature testing social cognitive theory in relation to chronic disease management in older adults.

In this study, two constructs, health characteristics and depression, were hypothesized to represent the personal factors in the SCT theoretical framework. The construct of health characteristics was formed by three indicators, including cognitive status, the number of co-morbidities and the number of hospital readmission risk factors. As the older adults tend to have these three issues, this construct was particularly meaningful. From a statistical point of view these three indicators explained about 68-74% of variance in the construct and this fitted the data well, proving substantial evidence of the validity of this construct. Additionally, health characteristics had a strong direct influence on depression, self-efficacy beliefs, social support, and three health outcomes. These findings emphasised the significance of this construct not only for clinical practice, but also in extending the knowledge of the SCT theory in older adults, as there are no previous studies that have explored this area.

Among the health outcomes, nutritional status was constructed by two elements of nutritional parameters, BMI and CAMA. Although, this construct was not statistically supported, it provides an initial step to build and capture the concept of nutritional status among older adults. Moreover, the construct of nutritional status was modelled as a reflective model in this study; further study may also model this construct as a formative model with more than three indicators to capture the concept of nutritional status in older adults. Thus, this study has provided a building block for future study in the health field and theory development.

Finally, depression was postulated as a person's perception in the context of SCT's theoretical framework (Shortridge-Baggett & van der Bijl, 1996), and the findings provided the evidence that the depression construct was the strongest negative predictor for self-efficacy beliefs, which in turn influence health outcomes. However, the role of social support as a mediator between depression and self-efficacy beliefs was not supported. While the relationships between depression and social support are reported inconsistently in the literature, some studies suggested reciprocal relations between these two constructs. The current study was limited to test the reciprocal relationship between these constructs, as this was a cross-sectional study. Further studies are recommended to test bi-directional relations between depression and social support in longitudinal studies to verify the role of social support in these relationships.

In short, incorporating the results of Study Two and Study Three, the results of the conceptual framework for this study are summarised in Figure 8.1. This conceptual framework reveals the impact of personal factors such as health characteristics towards chronic disease self-efficacy, which in turn affects health outcomes. As mentioned earlier, the mediation effects of chronic disease self-efficacy and social support are also presented. Additionally, this conceptual framework provides key elements within social cognitive theory to examine the association between each main concept, which supports the application of social cognitive theory for chronic disease self-management in older adults. Furthermore, this conceptual framework has built the fundamental structural base on social cognitive theory for future research to validate the model. This is particularly important for older adults, as these three health outcomes, nutritional status, functional status, and health-related quality of life, have significant impacts on individuals' everyday lives and general health and well-being.

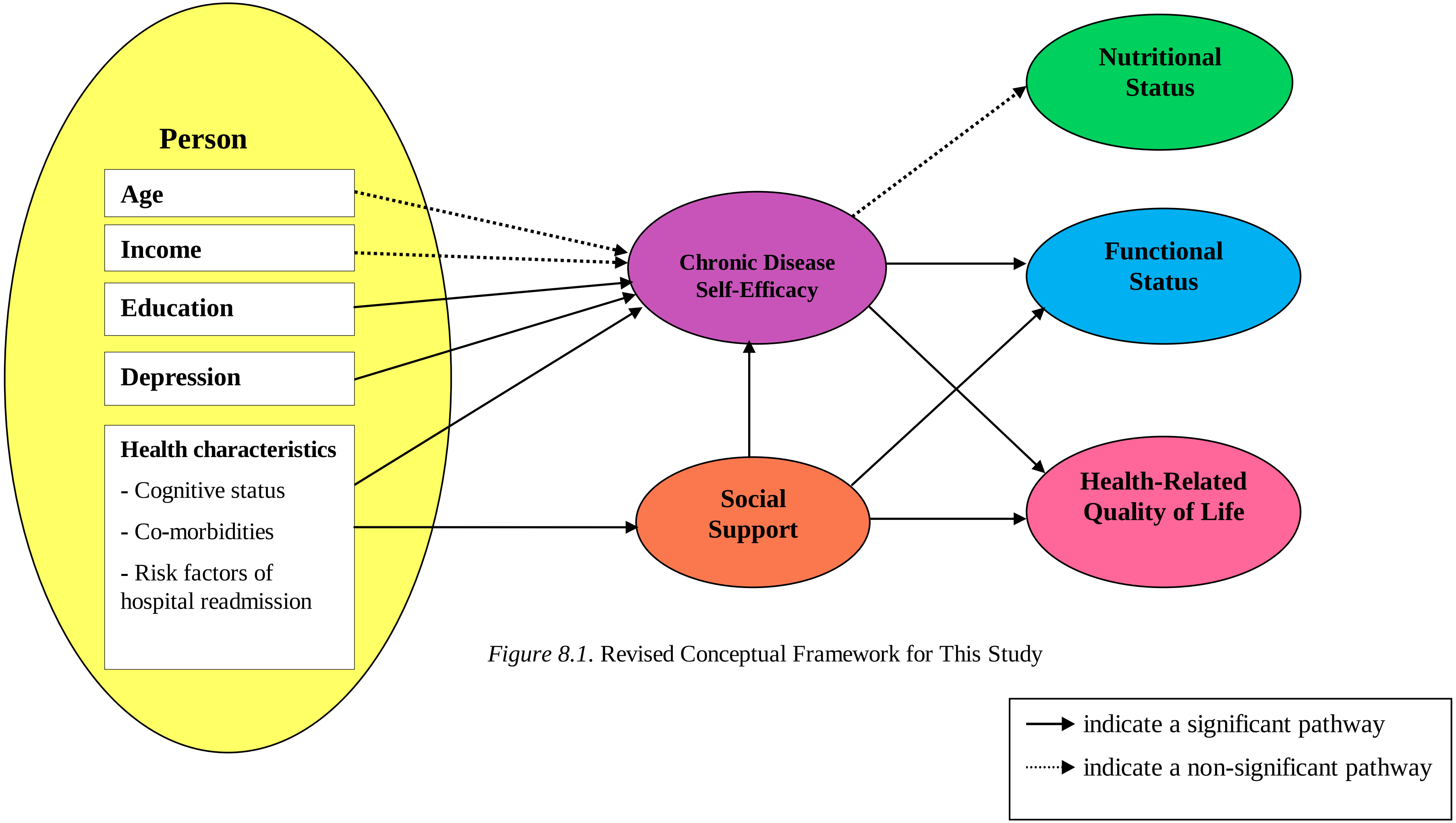


Figure 8.1. Revised Conceptual Framework for This Study

8.3.2 Implications for clinical practice.

The primary aim of the present study was to test a hypothesized self-efficacy model in relation to chronic disease self-efficacy and health outcomes based on SCT through three studies. The studies' results support the value of using a model of social cognitive theory variables to predict health outcomes in older adults at risk of hospital readmission. The observed inter-relationship among the variables of the study's hypothesized model (Figure 3.4) provided direction for developing chronic disease self-management interventions. The details of the important clinical implications from the significant findings of the three studies are presented next.

In Study One, the findings highlight that the prevalence of malnutrition continues to be considerably high, as one in five of participants suffered from malnutrition. This finding suggests that primary, secondary and tertiary prevention should take place through early detection, early referral, and early treatment and regular follow-ups to prevent any nutrition-related clinical complications for older adults who are at risk of hospital readmission. As this population of older patients who are identified as at risk of readmission are relatively healthy and potentially able to live independently, they would particularly benefit from primary and secondary prevention.

In addition, the MST demonstrates substantial sensitivity, specificity and agreement with the SGA, indicating it can be used as a valuable tool for identifying malnutrition risk in acute hospitalized older adults at high risk of readmission. The simplicity, speed and ease of use of the nutrition screening tool is a crucial consideration for nursing staff in clinical practice, given the constraints of time and workload they have to face in their everyday clinical practice. Furthermore, the MST is widely used in Australian teaching hospitals. Using the same nutrition screening tool would not only benefit the nursing staff but also the patients, as nurses would be familiar with the method regardless of the different clinical settings, which in turn would shed light on improving the identification of malnutrition for older hospitalised patients..

In Study Two, the findings highlight the important factors that influence chronic disease self-efficacy, nutritional status, functional status, and health-related quality of life, suggesting that when caring for the older adults who are at risk of hospital readmission, these factors should be taken into consideration. For instance, the findings suggest that advanced age and depressive symptoms are associated with malnutrition, indicating that regular and routine screening for malnutrition risk and depression is critically important for older adults. This screening can be conducted by the health care providers who have regular contact with older adults such as general practitioners and community nurses in community settings.

In the hospital, although the patient is screened for malnutrition risk within 24-72 hours of admission, the malnutrition screening is recommended to be conducted weekly for every older hospitalised patient, rather than just for those who have identified at admission. The importance of rescreening to detect those who may have been well-nourished when admitted but are at nutrition risk during the course of hospitalization is reinforced. Furthermore, the older hospitalized patients should also be screened for malnutrition risk and depression before they are discharged, and if risks are identified then appropriate referral and follow-up care should take place.

The findings from this study also suggest that self-efficacy in managing chronic disease and the risk factors of hospital readmission are important in relation to improving nutritional status, functional status, and health-related quality of life. Health care providers should maximize their efforts to promote chronic disease self-management through enhancing self-efficacy beliefs and identifying the risk factors of hospital readmission. Then specific interventions can be tailored and health outcomes can be improved.

Further implications are suggested from the results of Study Three, including:

(1) there is a need to develop a comprehensive health characteristics check list for older adults. The results of the study highlight that the construct of health characteristics which encompasses three indicators (SPMSQ, number of hospital readmission risk factors, and number of co-morbidities) had a strongly significant impact on depression, social support, chronic disease self-efficacy, functional status, and health-related quality of life. It is therefore suggested that a comprehensive health characteristics check list should be developed, as it can be used as an important strategy for preventing hospital readmission for older adults.

In addition, this health characteristics check list should be conducted as a part of the clinical assessment in admission for every older adult, so as to prevent adverse events and allow appropriate interventions and treatments to be put in place efficiently.

(2) strategies for using social support as information sources to enhance self-efficacy beliefs are promising, as the mediation role of social support on chronic disease self-efficacy was confirmed in the study. In other words, the results indicated that increasing social support would enhance chronic disease self-efficacy, which results in better functional status and health-related quality of life. Intervention programmes and care plans for chronic disease self-management are therefore, suggested to incorporate patients' significant others such as families, relatives, close friends or relevant health care providers in care to maximize efforts in enhancing self-efficacy in managing chronic diseases. This may be particularly meaningful and useful due to the increasing number of older adults who live alone in communities, and especially for those vulnerable older adults who live alone and have just been discharged from the hospital.

(3) it is recommended to apply social cognitive theory to underpin the design of intervention programs on chronic disease self-management in older adults. The findings of this study revealed that the main concept of social cognitive theory, self-efficacy beliefs, was a mediator of health outcomes. Given that older people are likely to have more co-morbidities, managing chronic conditions becomes part of their lives, and yet it can still be challenging for them. Self-efficacy in managing chronic disease may shed light on improving self-management behaviours, which in turn will prevent functional decline and maintain health, so that the older adults can continue to live independently in the community without diminishing their quality of life. From a cost effective point of view, this approach may also save money for health care systems. Furthermore, older adults should be screened for depression when considering the strategies to enhance self-efficacy in managing chronic disease, as depression remains quite prevalent among older adults, and more importantly, it has strong and negative impacts on self-efficacy beliefs.

8.3.3 Implications and recommendations for future research.

There are several noteworthy implications and recommendations for future research that are identified through this study. In Study One, the results confirmed that the MST is a valid nutrition screening tool, however further studies are required to determine the predictive validity of the MST in terms of length of stay and readmission for acute hospitalized older adults. For Study Two, the influential factors of socio-demographic and health or illness characteristics on self-efficacy in older adults are recommended to be explored and reported more extensively, as limited studies have focused in this area. Moreover, the future research on investigating the factors that influence malnutrition risk should consider a broad range of factors such as severity of the disease, medical treatment and sensory loss to identify significant factors in older hospitalized older adults.

For Study Three, retesting and validating of the models (Figure 8.1) with a larger sample is warranted for future study. More specifically, if it is possible, more constructs from social cognitive theory should be included in the model using the SEM approach when testing the model based on social cognitive theory on chronic disease self-management in older adults. Findings from this study suggest there is more work that needs to be done in regard to developing and validating the constructs within the theory. For instance, the construct of the nutritional status in this study provides a building block for future research, and it is encouraged that this construct can continue to be developed and validated further. In addition, when developing the construct, further studies are also required to consider whether to use a formative model or reflective model, as the wrong approach leads to bias and invalid results.

Finally, longitudinal trials are needed to explore the impact of the reciprocal relationship of the major concepts on chronic disease self-management behaviour, particularly in the examination of the relation to depression, social support and chronic disease self-efficacy in older adults. In terms of statistical application, growth curve analysis may be more suitable for longitudinal trials than the SEM approach. Further studies are recommended, using multi-level growth curve modelling, to investigate the relationships of trajectory changes over time so that the causality of the relationships can be assessed and concluded.

Conclusion

The main purpose of this study was to test social cognitive theory (SCT) in relation to chronic disease self-efficacy and three health outcomes (nutritional status, functional status, and health-related quality of life) in older adults who are at risk of hospital readmission. The findings confirmed SCT is useful for predicting the above mentioned three health outcomes in the study population. The results also provide clear direction for developing chronic disease self-management interventions; in particular, the interventions that involve enhancing chronic disease self-efficacy, and the factors that influence nutritional status, functional ability and health-related quality of life.

Three studies were undertaken to achieve the study's goals. Study One focused on determining the prevalence of malnutrition and validate the MST, suggesting the high prevalence of malnutrition continues to be a concern and that effective strategies for prevention and management are urgently needed. Additionally, the findings also confirmed that the MST is a valid nutrition screening tool for hospitalized older adults at risk of hospital readmission. This finding has a significant impact on the prevention and management of malnutrition, as the MST is a valid, easy and quick to use tool for nursing staff, which in turn may increase the detection rate of malnutrition.

Study Two emphasized exploring the factors that influenced self-efficacy in managing chronic disease, nutritional status, functional status, and health-related quality of life. The findings of this study provide comprehensive information for health care providers to target these factors for effective interventions, and the need for further research, such as incorporating a broad range of predictors for malnutrition risk. It is also recommended that further research studies explore and report the socio-demographic factors associated with self-efficacy in managing chronic disease in older adults so that the patterns of the influential socio-demographic factors can be identified, and the strategies for enhancing self-efficacy beliefs in older adults can be tailored in this area.

Study Three was designed to test the theory that focused on examining the mediation effects of social support and self-efficacy beliefs. A series of model tests were undertaken in Study Three using an SEM approach, and the results confirmed the mediation role of social support and self-efficacy beliefs in the context of SCT.

Further, the model fitted the data well with a relative high variance explained by the models, implying the hypothesized constructs under discussion were highly relevant, and hence the application for SCT in the context of chronic disease self-management in older adults is supported. Finally, the revised conceptual framework (Figure 8.1) provides a unique fundamental base for further studies in terms of theory development and can be used to underpin the development of intervention programs on chronic disease self-management in older adults.

In conclusion, this thesis highlights the applicability of SCT on chronic disease self-management in older adults who are at high risk of hospital readmission. As the important gaps were identified in Chapter 2 that limited studies have applied SCT on chronic disease self-management in relation to the three health outcomes (nutritional status, functional status, and health-related quality of life) in older adults at risk of hospital readmission, this thesis makes a significant contribution to the literature and fills the gaps in this area. Further studies are recommended to validate and continue to extend the development of SCT on chronic disease self-management in older adults to improve the nutritional and functional status, and health-related quality of life for older adults.

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Appendices

Appendix A
Information for participants

Exceptional People. Exceptional Care.

Australian Government
Australian Research Council

Queensland University of Technology

INFORMATION FOR PARTICIPANTS

Project Title: Preventing hospital readmissions and loss of functional ability in high risk older adults: a randomised controlled trial

Purpose of the research project

Older people often have higher rates of hospital admission, re-admissions and longer length of stay compared to the general population. During hospitalisation, many older people experience a decline in their physical abilities, which can affect their future levels of independence and quality of life.

This research project aims to evaluate new discharge planning, follow-up care and/or exercise strategies as a means of promoting health and preventing hospital re-admissions.

It is hoped that the benefits of this study will include improved knowledge on promoting well-being and health, maintenance of independence levels, prevention of physical decline and prevention of hospital re-admissions.

YOUR INVOLVEMENT

If you agree to consent to participate in this study, the Research Assistant will assist you in filling out a questionnaire with questions on your general health, nutrition and well-being. You will then be randomly allocated to **one** of the following four groups; either:

Study group 1 - If you are allocated to the Study group 1, you will receive the routine discharge planning and rehabilitation advice provided to patients. If in-home visits are required, they will be organised in the routine manner.

A university based Research Assistant will then follow-up via telephone to collect information about your general health and well-being at 4 weeks, 12 weeks, and 24 weeks following your hospital discharge.

Study group 2 - If you are allocated to this group you will be visited in hospital by an Advanced Practice Gerontic Nurse (APGN) and Physiotherapist who will undertake a health assessment and assess your physical and functional abilities using measures of independence in Activities of Daily Living (e.g. managing bathing / dressing / toileting /meal times); and performance tests of balance and gait. This information will be used to design an individualised discharge plan and exercise program that will aim to improve your strength, stability, coordination, endurance, mobility, and self confidence. The exercise programs include 4 components: stretching exercises, a walking program, strength exercises (utilising elastic Therabands) and balance exercises. You will also be given a pedometer to wear and a journal to record your activity. The evaluation and exercise prescription will be developed using a team approach involving you, your caregiver (if applicable), your doctor and other health professionals involved in your care. The nurse will visit you regularly during your hospital stay to help establish and implement the program and assist in planning for your discharge home.

When you are discharged from hospital, you will have one in-home visit by the nurse. This will occur within the first 2 days following discharge from hospital. The purpose of this visit is to ensure that you (and caregiver if applicable) are comfortable with the program, that your home is safe for you to manage your program and that you have enough medication, information and supplies. In addition, an exercise physiologist Research Assistant will conduct four x 6 weekly home visits to reassess the physical measures and functional capacity, evaluate progress with the exercise program and reset program goals accordingly. This Research Assistant will also repeat the nutritional assessment on the last visit.

The APGN will telephone weekly for the first 4 weeks following discharge from hospital to collect feedback about your health, assist with information and support and to check if there are any problems requiring assistance. After this time a once/month telephone follow-up will be undertaken by APGN up to 24 weeks following discharge.

A university based Research Assistant will also follow-up via telephone to collect information about your general health and well-being at 4 weeks, 12 weeks, and 24 weeks following your hospital discharge.

Study group 3 - If you are allocated to this group you will be visited in hospital by a physiotherapist who will assess your physical and functional abilities using measures of independence in activities of daily living and performance tests of balance and gait. This information will be used to design an individualised exercise program that will aim to improve your strength, stability, coordination, endurance, mobility, and self confidence. The exercise programs include 4 components: stretching exercises, a walking program, strength exercises (utilising elastic Therabands) and balance exercises. You will also be given a pedometer to wear and a journal to record your activity. The evaluation and exercise prescription will be developed using a team approach involving you, your care giver, your doctor and other health professionals involved in your care.

Following discharge from hospital, an exercise physiologist Research Assistant will conduct four x 6-weekly home visits to reassess the physical measures and functional capacity, evaluate progress with the exercise program and reset program goals accordingly. This Research Assistant will also repeat the nutritional assessment on the last visit.

A university based Research Assistant will also follow-up via telephone to collect information about your general health and well-being at 4 weeks, 12 weeks, and 24 weeks following your hospital discharge.

Study group 4 - If you are allocated to this group you will be visited in hospital by an Advanced Practice Gerontic Nurse (APGN) who will undertake a health assessment. This information will be used to design an individualised discharge and follow-up care plan. The plan will be developed using a team approach involving you, your caregiver (if applicable), your doctor and other health professionals involved in your care. The nurse will visit you regularly during your hospital stay to assist and coordinate planning for your discharge home.

When you are discharged from hospital, you will have one in-home visit by the nurse. This will occur within the first 2 days following discharge from hospital. The purpose of this visit is to ensure that you (and caregiver if applicable) are comfortable with the discharge and follow-up care plan, that your home is safe for you to manage your activities and that you have enough medication, information and supplies.

The APGN will telephone weekly for the first 4 weeks following discharge from hospital to collect feedback about your health, assist with information and support and to check if there are any problems requiring assistance. After this time a once/month telephone follow-up will be undertaken by APGN up to 24 weeks following discharge.

A university based Research Assistant will also follow-up via telephone to collect information about your general health and well-being at 4 weeks, 12 weeks, and 24 weeks following your hospital discharge.

PARTICIPATION
Participation in the project is voluntary and you may elect not to participate or to withdraw at any time without comment, penalty or loss of benefits. A decision not to participate, or to withdraw, will have no impact upon your present or future care in any way.
There are no additional costs for participants in the study. Participants remain responsible for all costs in relation to their medical care, which may be recovered from Medicare and/or your health fund in the usual way.
A nutrition screen will be included in the assessment at the beginning of the study. If your nutrition screen score suggests you may be at risk of a nutritional deficiency, a referral will be made to the hospital dietitcian for follow up.

Confidentiality of information
This study will involve access to your medical records to obtain information on demographic and medical details. Only the members of the research team will have access to information provided by participants. All information will be coded and kept in a locked filing cabinet within Queensland University of Technology.
No identifying names or information will be included in any transcripts, research reports or publications.

Questions or concerns
You are welcome to contact the research investigators (contact numbers below) regarding any questions or concerns you may have about this research study. If at any time you are not satisfied with this response, you may direct your enquiries to the Research Ethics Officer on 3138 2340 (or Email: ethicscontact@qut.edu.au) or the Mater Hospitals Research Secretariat on 3163 1585. The Research Secretariat may contact the Patient Representative or Hospital Ethicist at its discretion.
You may request feedback from the study by contacting the Chief Investigators or Project Coordinator, whose contact numbers are below.

Thank you for considering participation in this study. Your involvement is appreciated.

Regards,

Professor Mary Courtney

Appendix B
Consent form

Mater Exceptional People. Exceptional Care.

Australian Government
Australian Research Council

Queensland University of Technology

CONSENT FORM

Chief Investigator:

Professor Mary Courtney

Faculty of Health, Queensland University of Technology, Kelvin Grove

Phone: 3138 3887 / 3138 9639

Email: m.courtney@qut.edu.au

Project Title: Preventing hospital readmissions and loss of functional ability in high risk older adults: a randomised controlled trial

Participant's Name: ______________________________

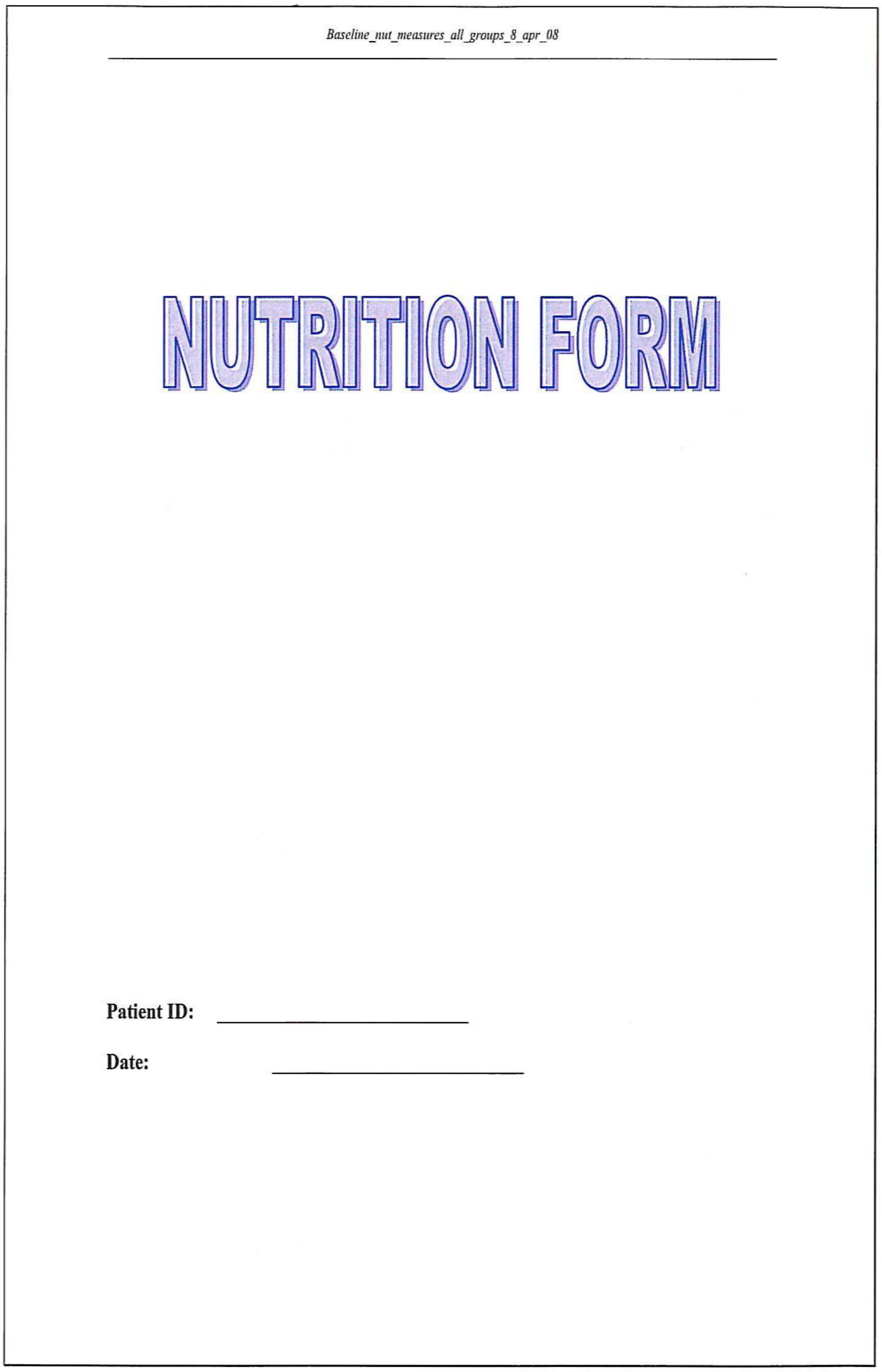
I Have

- Read and understood the information package;
- Had any questions or queries answered to my satisfaction;
- Been informed of the possible risks or side effects of the tests or procedures being conducted;
- Understood that the project is for the purpose of research and not for treatment;
- Understood that the project will involve randomisation of participants;
- Been informed that the confidentiality of the information will be maintained and safeguarded;
- Given permission for access to my medical records, for the purpose of this research;
- Given permission for medical practitioners, other health professionals, hospitals or laboratories outside this hospital, to release information concerning my disease and treatment which is needed for this trial and understand that my identity will remain confidential;
- Give permission for my General Practitioner (GP) to be contacted if my depression score is above 10;
- Been assured that I am free to withdraw at any time without comment or penalty; and
- Agreed to participate in the project.

Signatures: .Participant ______________________ Date __________

Witness ______________________ Date __________

Appendix c
Nutrition assessment tools



Baseline_nut_measures_all_groups_8_apr_08

NUTRITION FORM

Patient ID: ______________________

Date: ______________________

NUTRITIONAL MEASURES – to be assessed by the data collector

DOB: ____________________

Weight history:
Current weight (kg) __________ Date measured ________
Weight 6 months ago (kg) ______ Date measured ________ self report/chart
Percentage weight loss (%) _____ (= current weight- weight 6 months ago / Weight 6 months ago x 100%)

Height: *(use either stadiometer or callipers)*
Stadiometer measure: ________ ***or*** Knee height with callipers (cm)(sitting/lying)_____
Stadiometer measure(2): ________ ***or*** Knee height (2) (cm)(sitting/lying) _____

MUAC (mid-upper arm circumference) (cm) ________
(=mid point btn shoulder & elbow & measured with a tape measure)
MUAC (2)(cm) __________

TSF (Tricep skin fold) (mm) __________
(=same point as above on back of arm 1cm below mid mark using callipers: Read at 2 seconds)
TSF (2) (mm) ___________
TSF (3) (mm) ___________

Malnutrition Screening Tool		**Score**
1) Have you lost weight in the last six months without trying?		
(a) No		0
(b) Unsure		2
(c) Yes: how much weight has been lost?		
	1-5kg	1
	6-10kg	2
	11-15kg	3
	>15kg	4
2) Have you been eating poorly because of a decreased appetite?		
(a) No		0
(b) Yes		1
	Total__________	

(MST score ≥2 may be at nutritional risk)

***Body composition print out from Tanita foot-to-foot BIA (to attach)**

SGA Tool Pg. 2.

Criteria - Physical examination	A	B	C
SUBCUTANEOUS FAT			
eyes	slightly bulged fat pads		hollow look, depression, dark circles, loose skin
triceps	ample fat tissue		very little space between fingers, or fingers touch
biceps	ample fat tissue		very little space between fingers, or fingers touch
little or no depletion in most or all areas	•		
moderate to severe depletion in some all areas		•	
mild to moderate depletion in most or all areas		•	
severe depletion in most or all areas			•
MUSCLE WASTING			
temple	can see well-defined muscle, flat	slight depression	hollowing, depression
clavicle	not visible in males; may be visible but not prominent in females	some protrusion; may not be all the way along	protruding/prominent bone
shoulder	round; curves at junction of shoulder and neck or arm	no square look; acromion process may protrude slightly	square look; bones prominent
scapula/ribs	bones not prominent; no significant depressions	mild depressions or bone may show slightly; not all areas	prominent, visible bone; depressions between ribs, scapula and shoulder or spine
quadriceps	well rounded; no depressions	mild depression on inner thigh; thin	depression on inner thigh; obviously thin
calf	well developed		thin; no muscle definition
knee	muscle protrudes; bone not prominent		bones prominent
interosseous	muscle protrudes; could be flat in females		flat or depressed area between thumb and forefinger
little or no depletion in most or all areas	•		
moderate to severe depletion in some areas		•	
mild to moderate depletion in most or all areas		•	
severe depletion in most or all areas			•
OEDEMA (related to malnutrition)	no sign	mild to moderate	severe
ASCITES (related to malnutrition)	no sign	mild to moderate	severe
OVERALL SGA RATING			

Appendix D
Survey instruments

A-1 SF-12v2

This questionnaire asks for views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Thank you for completing the questionnaire!

34. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

35. The following questions are about activities you might do during a typical day. Does <u>your health now limit you</u> in these activities? If so, how much?

		Yes, limited a lot	Yes, limited a little	No, not limited at all
a	<u>Moderate activities</u>, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐ 1	☐ 2	☐ 3
b	Climbing <u>several</u> flights of stairs	☐ 1	☐ 2	☐ 3

36. During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. <u>Accomplished less</u> than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Were limited in the <u>kind</u> of work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

37. During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. <u>Accomplished less</u> than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Did work or other activities <u>less carefully than usual</u>	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

38. During the <u>past 4 weeks</u>, how much did <u>pain</u> interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

These questions are about how you feel and how things have been with you <u>during the past 4 weeks</u>. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the <u>past 4 weeks</u>…

		All of the time	Most of the time	Some of the time	A little of the time	None of the time
a	Have you felt calm and peaceful?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b	Did you have a lot of energy?	☐ 1.	☐ 2	☐ 3.......	☐ 4	☐ 5
c	Have you felt downhearted and depressed?	☐ 1.	☐ 2	☐ 3	☐ 4	☐ 5

39. During the <u>past 4 weeks</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting with friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

A-2 Walking Impairment Questionnaire (modified)

2. *Please place a √ in the box that best describes how hard it was for you to walk on level ground without stopping to rest for each of the following distances during the last week:*

***During the last week**, how difficult was it for you to:*	**No Difficulty**	**Slight Difficulty**	**Some Difficulty**	**Much Difficulty**	**Unable to Do**	**Didn't Do for Other Reasons**
a. Walk indoors, such as around your home?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
b Walk 50 feet?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
c. Walk 150 feet? (1/2 block)?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
d. Walk 300 feet? (1 block)?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
e. Walk 600 feet? (2 blocks)?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
f. Walk 900 feet? (3 blocks)?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
g. Walk 1500 feet? (5 blocks)?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6

. *Please place a √ in the box that best describes how hard it was for you to walk one city block on level ground at each of these speeds without stopping to rest during the last week. Please note 1 block is roughly equivalent to 300 feet.*

***During the last week**, how difficult was it for you to:*	**No Difficulty**	**Slight Difficulty**	**Some Difficulty**	**Much Difficulty**	**Unable to Do**	**Didn't Do for Other Reasons**
a. Walk 1 block slowly?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
b. Walk 1 block at average speed?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
c. Walk 1 block quickly?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
d. Run or jog 1 block?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6

4. *Please place a √ in the box that best describes how hard it was for you to climb stairs without stopping to rest during the last week. Please note 1 flight of stairs is roughly equal to 14 steps.*

***During the last week**, how difficult was it for you to:*	**No Difficulty**	**Slight Difficulty**	**Some Difficulty**	**Much Difficulty**	**Unable to Do**	**Didn't Do for Other Reasons**
a. Climb 1 flight of stairs?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
b. Climb 2 flights of stairs?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6
c. Climb 3 flights of stairs?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5	❑ 6

A-3 Instrumental Activities of Daily Living (IADL)

I = Independent **A = Assistance Required** **D = Dependent**

Obtained from patient	**Obtained from informant**	**Activity**	**Guidelines for Assessment**
I A D	I A D	Using Telephone	I = able to look up numbers, dial, receive and make calls without help A = Able to answer phone or dial operator in an emergency but needs special phone or help in getting number or dialling D = Unable to use telephone
I A D	I A D	Travelling	I = Able to drive own car or travel alone on buses or taxis A = Able to travel but needs someone to travel with D = Unable to travel
I A D	I A D	Shopping	I = Able to take care of all food / clothes A = Able to shop but needs someone to shop with D = Unable to shop
I A D	I A D	Preparing Meals	I = Able to plan and cook full meals A = Able to prepare light foods but unable to cook full meals alone D = Unable to prepare any meals
I A D	I A D	Housework	I = Able to do heavy housework, i.e., scrub floors A = Able to do light housework, but needs help with heavy tasks D = Unable to do any housework
I A D	I A D	Taking Medicine	I = Able to prepare / take medications in the right dose at the right time A = Able to take medications, but needs reminding or someone to prepare them D = Unable to take medications
I A D	I A D	Managing Money	I = Able to manage buying needs, i.e., write checks, pay bills A = Able to manage daily buying needs but needs help managing checkbook, paying bills D = Unable to handle money

A-4 Index of Activities of Daily Living (ADL)

For each area of functioning listed below, tick the description that applies. (The word “assistance” means supervision, direction, or personal assistance.)

Bathing – either sponge bath; tub bath, or shower		
☐ Receives no assistance (gets in and out of tub by self if tub is usual means of bathing)	☐ Receives assistance in bathing only one part of the body (such as back or a leg)	☐ Receives assistance in bathing more than one part of the body (or not bathed)
Dressing – gets clothes from closets and drawers – including underclothes, outer garments and using fasteners		
☐ Gets clothes and gets completely dressed without assistance	☐ Gets clothes and gets dressed without assistance except for assistance in tying shoes	☐ Receives assistance in getting clothes or in getting dressed, or stays partly or completely undressed.
Toileting – going to the toilet for bowel and urine elimination; cleaning self after elimination, and arranging clothes		
☐ Goes to “toilet room”, cleans self, arranges clothes without assistance (may use object for support such as cane, walker, or wheelchair; may manage night bedpan or commode, emptying in morning)	☐ Receives assistance in going to “toilet room” or in cleansing self or in arranging clothes after elimination or in use of night bedpan or commode	☐ Doesn’t go to room termed “toilet” for the elimination process
Transfer -		
☐ Moves in and out of bed as well as in and out of chair without assistance (may be using object for support such as cane or walker)	☐ Moves in and out of bed or chair with assistance	☐ Doesn’t get out of bed
Continence -		
☐ Controls urination and bowel movement completely by self	☐ Has occasional “accidents”	☐ Supervision helps keep urine or bowel control; catheter is used, or is incontinent
Feeding -		
☐ Feeds self without assistance	☐ Feeds self except for getting assistance in cutting meat or buttering bread	☐ Receives assistance in feeding or is fed partly or completely by using tubes or intravenous fluids

A-5 The short portable mental status questionnaire (SPMSQ)

Question	**Response**	**Incorrect Responses**
1. What are the date, month, and year?		
2. What is the day of the week?		
3. What is the name of this place?		
4. What is your phone number?		
5. How old are you?		
6. When were you born?		
7. Who is the current prime minister?		
8. Who was the prime minister before him?		
9. What was your mother's maiden name?		
10. Can you count backward from 20 by 3's?		

A-6 The Geriatric Depression Scale

Choose the best answer for how you felt over the last week	
1. Are you basically satisfied with your life?	Yes / No
2. Have you dropped many of your activities and interests?	Yes / No
3. Do you feel that your life is empty?	Yes / No
4. Do you often get bored?	Yes / No
5. Are you in good spirits most of the time?	Yes / No
6. Are you afraid that something bad is going to happen to you?	Yes / No
7. Do you feel happy most of the time?	Yes / No
8. Do you often feel helpless?	Yes / No
9. Do you prefer to stay at home, rather than go out and do new things?	Yes / No
10. Do you feel that you have more problems with memory than most?	Yes / No
11. Do you think it is wonderful to be alive now?	Yes / No
12. Do you feel pretty worthless the way you are now?	Yes / No
13. Do you feel full of energy?	Yes / No
14. Do you feel that your situation is hopeless?	Yes / No
15. Do you think that most people are better off than you are?	Yes / No

A-7 The Medical outcomes study social support survey

1. About how many close friends and close relatives do you have (people youfeel at ease with and can talk to about what is on your mind)?Write in the number of close friends and close relatives:

People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it?

	(Circle one number on each line)				
	None of the time	**A little of the time**	**Some of the time**	**Most of the time**	**All of the time**
2. Someone to help you if you were confined to bed	1	2	3	4	5
3. Someone you can count on to listen to you when you need to talk	1	2	3	4	5
4. Someone to give you good advice about a crisis	1	2	3	4	5
5. Someone to take you to the doctor if you needed it	1	2	3	4	5
6. Someone who shows you love and affection	1	2	3	4	5
7. Someone to have a good time with	1	2	3	4	5
8. Someone to give you information to help you understand a situation	1	2	3	4	5
9. Someone to confide in or talk to about yourself or your problems	1	2	3	4	5
10. Someone who hugs you	1	2	3	4	5
11. Someone to get together with for relaxation	1	2	3	4	5
12. Someone to prepare your meals if you were unable to do it yourself	1	2	3	4	5
13. Someone whose advice you really want	1	2	3	4	5
14. Someone to do things with to help you get your mind off things	1	2	3	4	5
15. Someone to help with daily chores if you were sick	1	2	3	4	5
16. Someone to share your most private worries and fears with	1	2	3	4	5
17. Someone to turn to for suggestions about how to deal with a personal problem	1	2	3	4	5
18. Someone to do something enjoyable with	1	2	3	4	5
19. Someone who understands your problems	1	2	3	4	5
20. Someone to love and make you feel wanted	1	2	3	4	5

A-8 Chronic disease self-efficacy scales

We would like to know how confident you are in doing certain activities. For each of the following questions, please choose the number that corresponds to your confidence that you can do the tasks regularly at the present time.

1. How confident are you that you can do gentle exercises for muscle strength and flexibility three to four times per week (range of motion, using weights, etc.)?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

2. How confident are you that you can do aerobic exercise such as walking, swimming, or bicycling three to four times each week?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

3. How confident are you that you can exercise without making symptoms worse?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

Get Information about Disease Item

1. How confident are you that you can get information about your disease from community resources?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

Obtain Help from Community, Family, Friends Scale

1. How confident are you that you can get family and friends to help you with the things you need (such as household chores like shopping, cooking, or transport)?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

2. How confident are you that you can get emotional support from friends and family (such as listening or talking over your problems)?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

3. How confident are you that you can get emotional support from resources other than friends or family, if needed?

not at all confident	1	2	3	4	5	6	7	8	9	10	totally confident

4. How confident are you that you can get help with your daily tasks (such as housecleaning, yard work, meals, or personal hygiene) from resources other than friends or family, if needed?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
Communicate With Physician Scale			
1. How confident are you that you can ask your doctor things about your illness that concerns you?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
2. How confident are you that you can discuss openly with your doctor any personal problems that may be related to your illness?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
3. How confident are you that you can get work out differences with your doctor when they arise?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
Manage Disease in General Scale			
1. Having an illness often means doing different tasks and activities to manage your condition. How confident are you that you can do all the things necessary to manage your condition on a regular basis?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
2. How confident are you that you can judge when the changes in your illness mean you should visit a doctor?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
3. How confident are you that you can do the different tasks and activities needed to manage your health condition so as to reduce your need to see a doctor?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident
4. How confident are you that you can reduce the emotional distress caused by your health condition so that it does not affect your everyday life?	not at all confident	1 2 3 4 5 6 7 8 9 10	totally confident

5. How confident are you that you can do things other than just taking medication to reduce how much your illness affects your everyday life?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident	

Do Chores Scale

1. How confident are you that you can complete your household chores, such as vacuuming and yard work, despite your health problems?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident
2. How confident are you that you can get your errands done despite your health problems?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident
3. How confident are you that you can get your shopping done despite your health problems?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

Social/Recreational Activities Scale

1. How confident are you that you can continue to do your hobbies and recreation?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident
2. How confident are you that you can continue to do the things you like to do with friends and family (such as social visits and recreation)?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

Manage Symptoms Scale

1. How confident are you that you can reduce your physical discomfort or pain?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident
2. How confident are you that you can keep the fatigue caused by your disease from interfering with the things you want to do?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident
3. How confident are you that you can keep the physical discomfort or pain of your disease from interfering with the things you want to do?	not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

4. How confident are you that you can keep any other symptoms or health problems you have from interfering with the things you want to do?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

5. How confident are you that you can control any symptoms or health problems you have so that they don't interfere with the things you want to do?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

Manage Shortness of Breath Item

1. How confident are you that you can keep your shortness of breath from interfering with what you want to do?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

Control/Manage Depression Scale

1. How confident are you that you can keep from getting discouraged when nothing you do seems to make any difference?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

2. How confident are you that you can keep from feeling sad or down in the dumps?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

3. How confident are you that you can keep yourself from feeling lonely?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

4. How confident are you that you can do something to make yourself feel better when you are feeling lonely?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

5. How confident are you that you can do something to make yourself feel better when you are feeling discouraged?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

6. How confident are you that you can do something to make yourself feel better when you feel sad or down in the dumps?

not at all confident | 1 2 3 4 5 6 7 8 9 10 | totally confident

Appendix E
Baseline demographics

Mater
Exceptional People. Exceptional Care.

Australian Government
Australian Research Council

QUT

Comprehensive Discharge Planning and Rehabilitation

BASELINE

(Source: front page of Mater medical record)

Question no.			Coding
1. Age	65 – 70	☐	**0**
	71 – 75	☐	**1**
	76 – 80	☐	**2**
	81 – 85	☐	**3**
	86 – 90	☐	**4**
	>90	☐	**5**
	Male	☐	**0**
2. Sex	Female	☐	**1**
	Australian:	☐	**0**
3. Ethnicity	ATSI	☐	**1**
	UK	☐	**2**
	North America	☐	**3**
	European	☐	**4**
	African	☐	**5**
	Asian	☐	**6**
	South Pacific	☐	**7**
	Other	☐	**8 Specify:**
4. Living arrangements	Partner	☐	**0**
	Other family member or friend	☐	**1**
	Alone	☐	**2**
	Residential Village / Hostel	☐	**3**
5. Hospital insurance status	Medicare	☐	**0**
	Private ins.	☐	**1**
	DVA	☐	**2**
	Elective	☐	
6. Type of admission	Emergency	☐	**1**
	Transfer	☐	**2**
7. Admission – Diagnosis	Diagnosis:		Code: (number as per co-morbities)

8. Comorbidities	0. Cardiac ☐ Yes (1) ☐ No (0) 1. Respiratory ☐ Yes (1) ☐ No (0) 2. GIT ☐ Yes (1) ☐ No (0) 3. Falls ☐ Yes (1) ☐ No (0) 4. Renal ☐ Yes (1) ☐ No (0) 5. Skin ☐ Yes (1) ☐ No (0) 6. Diabetes ☐ Yes (1) ☐ No (0) 7. Endocrine (other) ☐ Yes (1) ☐ No (0) 8. Back pain ☐ Yes (1) ☐ No (0) 9. Other ☐ Yes (1) ☐ No (0)	___________________________
9. Length of stay		**(Can be calculated from date of admission – date of discharge)**
10. Education	< 7 years ☐ Completed primary schooling ☐ 7 – 12 years ☐ Completed High School ☐ Post 2^{o} vocational education ☐ Tertiary education ☐	**0** **1** **2** **3** **4** **5**
11. Income	< $30K ☐ $30 - $60K ☐ > $60K ☐	**0** **1** **2**
12. Smoker	No, previous smoker ☐ Current: How many packets per **week**? < 1 ☐ 1-2 ☐ 2-3 ☐ 3-4 ☐ >4 ☐	**0/1** **1** **2** **3** **4** **5**
13. Alcohol	No, previous drinker ☐ Current: How many standard drinks per **week**? < 1 ☐ 1-2 ☐ 2-3 ☐	**0/1** **1** **2** **3**
14. Risk Factors	75 years or older ☐ Hospitalised in last 6 months ☐ Hospitalised in last 30 days ☐ Lacks social support ☐	Some functional impairment ☐ History of depression ☐ Fair-poor self-rating of health ☐ Lives alone ☐ Multiple comorbidities ☐